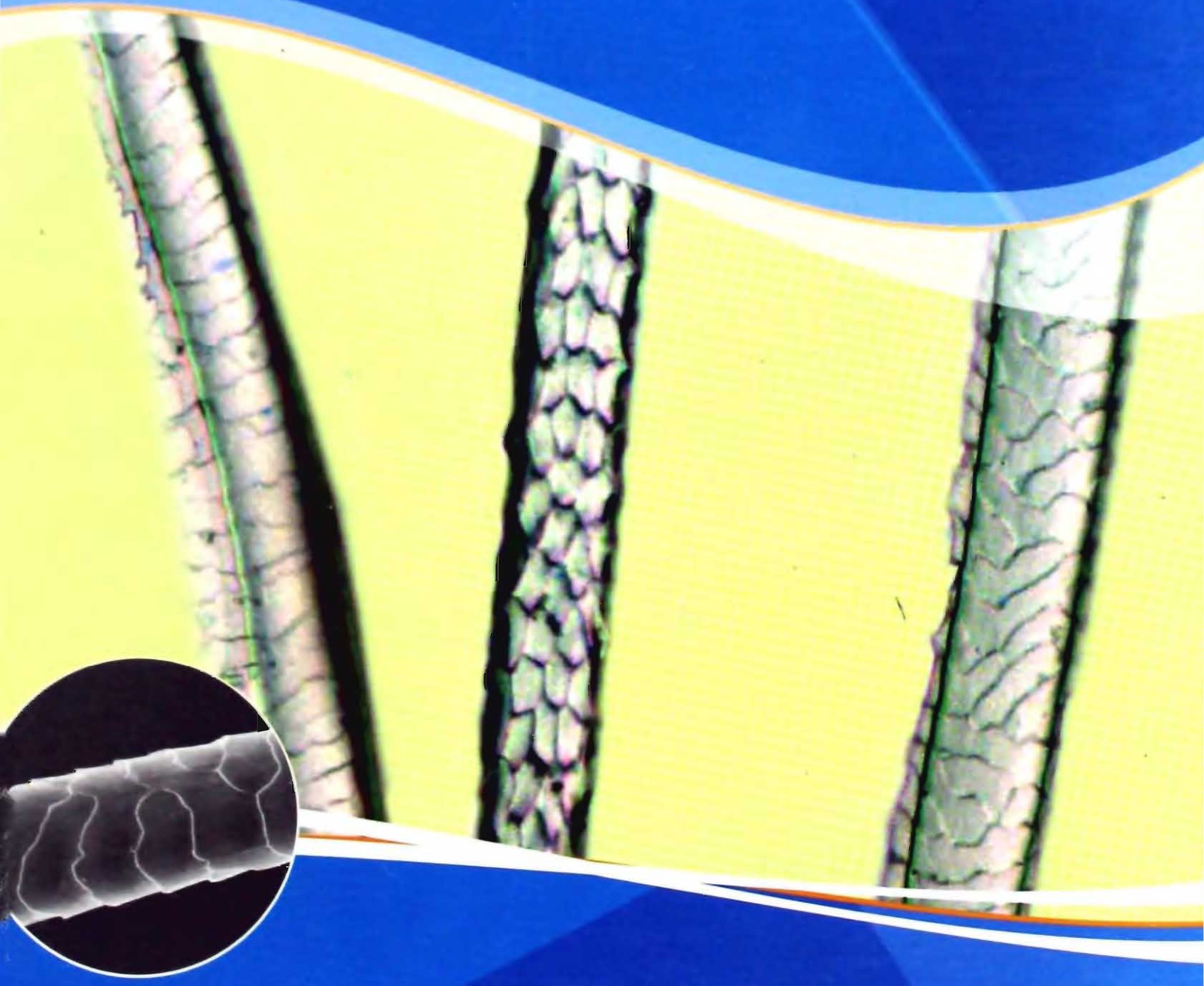
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TRICHOTAXONOMY of species of families SCIURIDAE, VIVERRIDAE, MUSTELIDAE, HERPESTIDAE and TRAGULIDAE

Archana Bahuguna



ZOOLOGICAL SURVEY OF INDIA

OCCASIONAL PAPER NO. 331

RECORDS OF THE ZOOLOGICAL SURVEY OF INDIA

Trichotaxonomy of species of the Families SCIURIDAE, VIVERRIDAE, MUSTELIDAE, HERPESTIDAE and TRAGULIDAE

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Towards 100 years



K. Venkataraman, Director
Zoological Survey of India
Ministry of Environment and Forests
Government of India





FOREWORD

Trichotaxonomy is well known for its utility in wildlife forensic, for ecological study of the animals, in wildlife management and conservation. The major threats to mammals are habitat deterioration and poaching. It has been realized that most of the cases related to wildlife forensic can be solved by using trichotaxonomy. Hair analysis is also useful in determining the prey-predator relationship as well as other ecological studies.

The present document depicts the hair analysis of species from dorsal, ventral, head and tail regions of families Sciuridae, Viverridae, Herpestidae, Mustelidae and Tragulidae. Most of the species examined for hair characteristics in the present study are listed under Indian Wildlife Protection Act 1972. The species of family Sciuridae are known to be data deficient and we are loosing them because of habitat destruction & poaching. The civets are poached and tortured for making the perfumes from secretions of anal gland. Species of family Herpestidae (Mongoose) are killed for making the brushes. Otters are killed for making the fur coat. The present study describes the characteristic features of primary guard hair with illustrations. thus is very useful in dealing with wildlife forensic cases and ecological study of the species

Aug, 2011

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PREFACE

The present study describes the characteristics of primary guard hair of species of Sciuridae, Tragulidae, Herpestidae, Viverridae and Mustelidae from dorsal, ventral, tail and head regions. Earlier workers have described mainly the microscopic structure of hair from dorsal region. But it was realized that there is need to examine hair features from all regions as reference data mainly for wildlife forensic and to find out the consistency in the features from large number of samples. My previous experience also revealed that hair structures from head, tail and ventral regions are equally important as from dorsal region in describing the species through trichotaxonomy. Trichotaxonomy of Indian species of Family of Sciuridae was done for the first time and it was noted that small mammals, rodents can also be identified through hair characteristics. In general primary guard hair is used for identification of species. The present work also describes the features of fur hair and secondary guard hair for some of the species where they are depicting characteristics relevant for identification of the family. Longitudinal sections of medulla was taken to know the medulla type as usually the presence of pigments hides the actual structure of medulla.

Archana Bahuguna

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INTRODUCTION

Trichotaxonomy is being utilized for identification of species inhabiting a den or tree and for food habit studies of mammals (Mathiak, 1938, Mayer, 1952, Koppikar and Sabnis, 1975). It is useful in providing strong scientific proofs in Wildlife forensic cases as in case of identification of species from hair in Shahtoosh wool product (Anon 1995, Bahuguna and Mukherjee, 2000), for brushes made from mongoose hair (Chakraborty and Chakraborty, 1998) and of Indian lesser cats (Chakraborty and De, 1995). Earlier studies revealed that the structure of hair has definite taxonomic values in the different systematic categories at least for some groups of mammals (Day, 1966, Debrot *et al.*, 1982, Teerink 1991, Wallis, 1993, Chakraborty *et al.*, 1999, Chakraborty and De, 2001, 2002, De and Chakraborty, 2002). The history of trichotaxonomy begins when Hausman (1920, 1924, 1930) presented data on the configuration of cuticle scales and medullae for different hair of 166 fur bearing mammals. Since then many workers developed the key for identification of species through hair (Mathiak, 1938, Wildman, 1940, Mayer, 1952, Appleyard 1960, Lyne and McMohan, 1951) and described various characteristic features of hair of mammals. The technique has been found to be useful in studies of prey–predator relationship, hence in wildlife management for conservation areas (Nath and Joseph, 1981). The importance of hair characteristics of mammals has been recognized in identification of species of different groups of mammals. Using written description and simplified drawings, Hausman (1920, 1924, 1930) presented data on the configuration of cuticular scales and medulla for different hair of 166 fur bearing mammals. Mathiak (1938) described a key to the identification of hair of the mammals of Southern Michigan. Williams (1938) provided a key to the identification of hair of moles and shrew. The dorsal guard hair of four Indian species of bear have been studied by De and Chakraborty in 2006 and they formulated the key for identification of species through characteristics of dorsal guard hair (i.e medulla type, cross section and cuticular along with medullary index). A further account of work was given by Appleyard (1960) in his guide to the identification of animal fibers.A descriptive study of hair of some Indian mammals was also given by Nath and Joseph (1981) and Koppikar and Sabnis (1975). A reference guide for identification of selected species of Indian mammals representing the features of primary guard hair (dorsal) of 57 species was prepared by Bahuguna *et al.*, 2010. This reference guide is useful for solving the wildlife forensic cases (Bahuguna *et al.*, 2010). Trichotaxonomy of squirrels of Indian species revealed the utility of hair characteristics in identification of small mammals (Bahuguna, 2007, Bahuguna, 2008). Longitudinal sections of medulla was prepared for the first time and utilized for description for the first time in trichotaxonomy.

The present study was done to know the differences among families selected for study based on characteristics of primary guard hair, to know the characteristics of PGH of the species from dorsal, ventral, head and tail regions, to prepare the key for identification of species by utilizing the characteristics of primary guard hair of dorsal, ventral, head and tail regions and to prepare the document for identification of species through PGH that could be useful for wildlife forensic as well as for prey–predator relationships and other biological studies.

MATERIAL AND METHODS

Hair from species of Sciuridae, Herpestidae, Viverridae; Mustelidae and Tragulidae were collected from Department of Mammals HQ ZSI, Kolkatta and from museum of NRC, ZSI Dehra Dun.

Primary guard hair was collected (n=10 or more) randomly from dorsal, ventral, head and tail regions of the specimen. For each type of the study (medulla type, cross section, cuticular and SEM examination) around 10 hair were examined. The samples were washed in graded series of acetone i.e. 50 %, 70%, 80%, 90% and 95 % of acetone for 30 min.in each grade and finally kept in pure acetone overnight.

Medulla

To study the type of medulla, the cleaned hair was mounted in DePeX (Gurr) for whole mount. When mounting, the hair tuft, it is necessary to ensure that the individual hair is well separated. For temporary mounting Paraffin oil is a most convenient medium.

Cross section : For the present study, hair cross sections were obtained by simple hand sectioning (Bahuguna *et al.*, 2010).

Scale casts : Procedures for studying scale pattern usually involve the use of special media to obtain a cast or impression of the actual hair surface. These are often produced directly onto the glass slides and viewed under the microscope. Various media are available for the study including gelatin, celluloid and polyvinyl acetate. For getting the cast, the cleaned hair was kept with the help of the fine forceps on thin film of the gelatin medium on slide for some time till the medium was air-dried. After drying of gelatin the hair was removed gently. For very long hair they can be cut into sections to have complete picture of scales at tip, mid and basal region of hair. Another medium polyvinyl acetate (PVA in 50% distilled water) can be used (Appleyard 1960). For cuticle studies different parts of hair i.e. distal (tip), mid and proximal part (base) of hair were examined.

Photomicrographs were taken for cross section, medulla type and cuticular studies at 200X and 400X, under compound light microscope, Olympus CX41, BX41, BX51 and Leica DMR.

Scanning Electron Microscope (SEM) study

This was performed for studying details of cuticular pattern and to find out the *Scale index* for dorsal primary guard hair. This can be applied for PGH of other regions (i.e ventral, head and tail too). After cleaning the hair, small section of hair were kept on adhesive pasted on stub. The stubs were coated with thin film (15-20 Å) of gold and kept in the chamber to view details of scale pattern. The electron micrographs thus obtained were used to find out *Scale index*, types of scales and scale margins. SEMicrographs were taken at Wadia Institute of Himalayan Geology (Dehra Dun) from SEM Zeiss EVO40.

Hair measurements : Hair measurements were also taken like mean of thickness of hair and of medulla and their ratios (*Medullar index*) as important characteristic features to identify species.

Nomenclature of medulla type was adopted from Wildman (1954) and for cuticular and cross section types from that given by Brunner and Coman (1974).

Scale for photomicrographs and for text and plates

Scale : 1 cm = 50 μm at mag 200x

Abbreviations

PGH : Primary Guard Hair

SP : Scale pattern

SM : Scale margin

DS : Distance between scale

IPWA : Indian Wildlife Protection Act

CITES : Convention on International Trade in Endangered species of Wild Fauna and Flora

IUCN : International Union for Conservation of Nature

CAMP : Conservation Assessment and Management Plan

DD : Data deficient

Order RODENTIA

Family SCIURIDAE Hemprich, 1820

The total number of Indian species of family sciuridae is 27. They are medium to large sized rodents with a long bushy, thick tail, short muzzle, large incisors and have arboreal life style. It has been divided into two sub families : Sciurinae and Petauristinae. Within Sciurinae, the Ratufini tribe comprises giant squirrels that live in the tropical forests of southern and eastern India. The *Funambulini* tribe comprises the striped squirrels. The *Callosciurini* tribe contains all non striped diurnal squirrels including the northeastern species such as the Pallas's, the Hoary-bellied and Orange bellied squirrels. *Callosciurus* are oriental squirrels, populating the northern regions of the Indian Penninsula (Himalaya), the Greater and Lesser Sunda Islands, the Molluccas and Philippines. Unfortunately, so far very little is known about their biology. The oriental squirrels are exceptional, being known for their bright colors (yellow, a brilliant gold, orange, brown, black and white and other intermediate shades of these colors), with individual areas often being sharply demarcated against each other (Krapp,1989). The squirrels in the Petauristinae sub-family are nocturnal and include the flying squirrels. They glide with the help of flaps of skin that connect their limbs. The two ground dwelling marmots are also considered to be members of the Sciuridae family (Menon 2003).

Very few studies so far have been conducted on hair of rodents. (Williams, 1938, Bahuguna, 2007). The present study describes the hair characteristics of dorsal, ventral, head and tail regions of 23 species of family sciuridae. The study will help in dealing with the wildlife forensic cases for comparative study as many of the species are being poached for their skin and have been listed under Indian Wildlife Protection Act (1972) as well as for habitat study of the species. Among squirrels *Ratufa indica dealbata* (Blanford), Dangs Giant squirrel is endemic to India (CAMP : EX, IUCN EX, IWL (P) : II, CITES II, the species as such *Ratufa indica* (Blanford 1897) has been declared vunerable, population trends is indeterminate, IWL (P) II, CITES II, endemic: *Ratufa macroura* (Pennant, 1769), Grizzled Giant Squirrel is vunerable, population trends is indeterminate, IWL (P) I, CITES II: *Callosciurus pygerythrus* (I Geoffroy Saint Hilaire 1831), Irrawaddy Squirrel is vunereble under IUCN category and population trends in indeterminate (Kumar and Khanna, 2006).

Subfamily SCIURINAE Hemprich,1820

Genus ***Callosciurus*** Gray, 1867

1867. *Callosciurus* Gray, *Ann. Mag. Nat. Hist.*, (Sec 3), **20** : 277

Callosciurus caniceps (Gray, 1842)

Golden backed squirrel; Gray bellied squirrel

1842. *Sciurus caniceps* Gray, *Ann. Mag. Nat. His. (Ser.)*, 1.**10** : 263.

Status : Not known

Dorsal (Plate 1a)

A. **Physical characteristics**

Profile and colour : Banded, black and yellow bands; *Thickness of hair at mid (T)* : 72.8 ± 1.57 µm; *Length of hair* : 14.5 ± 1.08 mm; *Length index (L/T)* 19.74 ± 1.30; *Shape and Nature* : Straight and thin; *No. of bands* 5; *Width of bands* for range of length 13-15 mm : 5(b) : 2 (y) : 3(b) : 2(y) : **2-4 (b)**

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : At mid, SP regular wave, SM smooth, DS near; at proximal and distal, SP : Simple coronal, SM rippled, DS near.

Scale index 2.7± 0.29

C. **Medulla**

Medulla configuration : multiserial ladder; *Medulla thickness (M)* : 61 14 ±1.06 µm; *Medullar index* M/T : 0.83 ± 0.04.

D. **Cross section**

Type of cross section : oval; *Medulla size in cross section* : large.

Ventral (Plate 1b)

A. Physical characteristics

Profile and colour : banded with yellow and black bands; *Total thickness (T)* : 41.8 ± 0.3 μm; *Shape and Nature* : Straight and thin; *No. of bands* : 5; *Width of bands* : 2(b) :2(y) :3(b) :1(y) :3(b).

B. Surface structure

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid, SP regular wave, SM smooth, DS near; proximal and distal, SP regular wave, SM rippled, DS near.

C. Medulla

Medulla configuration : Multiserial ladder; *Medulla thickness* : 31.8±0.25 μm; *Medullar index* : M/T : 0.76 ± 0.0.

D. Cross section

Type of cross section : oval; *Medulla size in cross section* : large

Head (Plate 1 c)

A. Physical characteristics

Profile and colour : banded with yellow and black bands; *Total thickness (T)* : 80.18 ± 0.06; *Shape and Nature* : Straight and thin; *No. of bands* : 5; *Width of bands* : 2(b) :1(y) : 3(b) : 1(y) :1(y).

B. Surface structure

Scale pattern (SP), scale margin(SM), distance between scales (DS) :at mid, SP regular wave, SM smooth, DS near; at proximal and distal, SP : regular wave, SM rippled, DS near

C. Medulla

Medullary configuration : multiserial ladder; *Medulla thickness* : 70.1± 0.06 μm; *Medullar index* 0.87± 0.0.

D. Cross section

Type of cross section : oval; *Medulla size in cross section* : large.

Tail (Plate 1 d)

A. Physical characteristics

Profile and colour : banded with yellow and black bands; *Total thickness (T)* : 60. ± 0.1 μm; *Shape and Nature* : Straight and thin; *No. of bands* : 7; *Width of bands* : 3(b) 2(y) 0.5 (b) 2.5 (y) 4 (b) 3 (y) 1(b).

B. Surface structure

Scale pattern (SP) and Scale margin (SM) : at mid : SP regular wave SM smooth, DS near; proximal, SP regular wave SM smooth, DS near; distal : SP regular wave SM smooth, DS near

C. **Medulla**

Medulla configuration multiserial ladder; *Medulla thickness* : 50.3 ± 0.12 µm; *Medullar index* M/Γ = 0.83 ± 0.0.

D. **Cross section**

Type of cross section : circular, oval; *Medulla size in cross section* : large.

Callosciurus erythraeus (Pallas, 1779), Pallas's squirrel

1779. *Sciurus erythraeus* Pallas, *Nova Spec. Quad.* Gli, Ord. p. 377.

Status : CAMP LRnt (Nationally), DD (Globally).

Dorsal (Plate 2 a)

A. **Physical characteristics**

Profile and colour : banded with black and yellow bands; *Thickness of hair (T)* : 69.8 ± 0.42 µm; *Length of hair* 16.65 ± 0.41 mm; *Length index (L/T)* 27.67 ± 0.39; *Shape and Nature* : Straight and thin; *No. of bands* 7; *Width of bands* for 16-17 mm of range : 6-5 (b) : 1(y) :3(b) : 1(y) :3(b) : 1 (y) : 2(b)

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal, SP regular wave SM rippled, DS near; distal : SP Broad petal to coronal, SM Smooth, DS near

Scale index : 4.7±0.43

C. **Medulla**

Medullary configuration : multiserial ladder; *Thickness of medulla* 59.2 ± 0.9 µm; *Medullary index (M/T)* : 0.84± 0.0.

D. **Cross section**

Type of cross section : oval and oblong; *Medulla size in cross section* : large.

Ventral (Plate 2 b)

A. **Physical characteristics**

Profile and colour : banded with yellow and black bands; *Total thickness (T)* : 70.4 ± 0.10 µm; *Shape and Nature* : Straight and thin; *No. of bands* : 7; *Width of bands* : 7(b) : 2(y) : 5(b) : 2(y) : 4.5 (b) 2(y) : 6(b).

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS near;distal, SP regular wave SM rippled, DS near; proximal : SP regular wave, SM rippled, DS near.

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 60.1 ± 0.06 μm; *Medullar index* : M/T 0.85±0.0.

D. Cross section

Type of cross section : oval; *Medulla size in cross section* : large.

Head (Plate 2 c)

A. Physical characteristics

Profile and colour : banded with yellow and black bands; *Total thickness (T)* : 70.0 ±0.0 μm; *Shape and Nature* : Straight and thin; *No. of bands* : 3 and 4; *Width of bands* : 1.5(b) : 1(y) : 4(b) for length 8 mm; 2(b) : 1(y) : 2(b) : 1(y) for length 10 mm.

B. Surface structure

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; distal, SP single chevron SM smooth, DS near; proximal : SP single chevron, SM smooth, DS near.

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 50.0 ± 0.0 μm; *Medullar index* : 0.85± 0.0.

D. Cross section

Type of cross section : oval; *Medulla size in cross section* : large.

Tail (Plate 2d)

A. Physical characteristics

Profile and colour : banded with yellow and black bands; *Total thickness (T)* : 70.5 ± 0.09 μm; *Shape and Nature* : Straight and thin; *No. of bands* : 7; *Width of bands* : 7(b) : 2(y) : 5(b) : 2(y) : 4.5(b) : 2(y) : 6(b).

B. Surface structure

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM slightly rippled, DS near;distal, SP regular wavec SM rippled, DS near; proximal : SP double chevron to regular mosaic, SM rippled, DS near.

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* 60.0 ± 0.0 μm; *Medullar index* : 0.85± 0.0.

D. Cross section

Type of cross section : oval; *Medulla size in cross section* : large.

Callosciurus pygerythrus (I. Geoffroy Saint Hilarie)
Irrawaddy squirrel

1831. *Sciurus pygerythrus* I. Geoffroy Saint Hilaire. *Mag. Zool.* Paris, p 5; pl 4-6

Status IUCN : VU, CAMP : LRnt (Nationally), DD (Globally)

Dorsal (Plate 3 a)

A **Physical characteristics**

Profile and colour : Banded, black and yellow bands; *Total thickness (T)* :59.7 ± 0.48 µm; *Length of hair* : 9.8 ± 0.2 mm; *Length index (L/T)* : 19.71 ± 0.252; *Shape and Nature* : Straight and thin; *No. of bands* : 5; *Width of bands* for 9.5-10mm of length range : 4-3 (b) 1.5 (y) :2(b) 1(y) : 2(b).

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) near, at mid (SP) regular wave, (SM) slightly rippled margin, (DS) near; tip and base : simple coronal (SP), smooth (SM), near (DS).

Scale index : 3.14 ± 0.16 (at mid of hair)

C. **Medulla**

Medulla configuration : multiserial ladder; *Medulla thickness* 49.9 ± 0.73 µm; *Medullar index* 0.82 ± 0.014.

D. **Cross section**

Type of cross section :oval and oblong; *Medulla size in cross section* : large.

Ventral (Plate 3 b)

A. **Physical characteristics**

Profile and colour banded with yellow and black bands; *Total thickness (T)* : 40.9 ± 0.2 µm; *Shape and Nature* Straight and thin; *No. of bands* 2.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS near; distal, SP regular mosaic SM smooth, DS near; proximal SP coronal, SM smooth, DS near.

C **Medulla**

Medulla configuration : multiserial ladder; *Medulla thickness* 20.5 ± 0.1 µm; *Medullar index* 0.50 ± 0.0.

D. **Cross section**

Type of cross section : oval; *Medulla size in cross section* : large.

Head (Plate 3c)

A. Physical characteristics

Profile and colour : banded with yellow and black bands; *Total thickness (T)* : 50.2 ± 0.06 µm; *Shape and Nature* : Straight and thin; *No. of bands* : 3; *Width of bands* : 3(b) : 1(y) : 4(b).

B. Surface structure

Scale pattern (SP) , scale margin (SM), distance between scales (DS) : at mid SP regular wave, SM slightly rippled, DS near; distal, SP double chevron SM smooth, DS near; proximal : SP double chevron , SM smooth, DS near

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 40.5 ± 0.10 µm; *Medullar index* 0.80 ± 0.0.

D. Cross section

Type of cross section oval; *Medulla size in cross section*: large.

Tail (Plate 3d)

A. Physical characteristics

Profile and colour : banded with yellow and black bands; *Total thickness (T)* 80.3 ±0.03 µm; *Shape and Nature* : Straight and thin; *No. of bands* : 10; *Width of bands* : 0.5(y) : 1. 5 (b) : 2.0(y) : 2(b); 2(y) : 3.5(b) : 1 (y) : 5 (b) 4(y) 1(b).

B. Surface structure

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS near; distal, SP regular wave SM smooth, DS near; proximal : SP regular wave, SM smooth, DS near

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 60.5 ±0.09 µm; *Medullar index* M/T 0.75± 0.0.

D. Cross section

Type of cross section : oval.

Medulla size in cross section : large.

Key to the three Indian species of the Genus *Callosciurus* based on characteristic of primary guard hair

Dorsal

1a. Number of hair bands 5 ..... 2, 3

1b. Number of hair bands 7 Medullary index M/T 0.84 ± 0.0, Cuticular pattern of regular wave, with rippled margin at mid and proximal portion of hair but towards distal, broad petal to simple coronal with smooth margin , *Scale index* : 4.73 ± 0.438 ... . *Callosciurus erythraeus* (Pallas)

2. Medullary index M/T 0.83± 0.04;Cuticular pattern of regular wave with smooth margin at mid of hair, but at distal and proximal, simple coronal with rippled margin, *Scale index* : 2.7 ± 0.29 ..... *Callosciurus caniceps* (Gray)

3. Medullary index M/T 0.82± 0.0;Cuticular pattern of regular wave with slightly rippled margin; pattern at mid of hair changed to double chevron type towards proximal part of hair, whereas at distal and proximal portion, simple coronal with smooth margin, *Scale index* : 3.14 ± 0.164 ..... *Callosciurus pygerythrus* (I. Geoffroy Saint Hilarie)

Ventral

1 Banded profile, medulla multiserial ladder,cross section oval, large 2,3,4

2. Bands 5 : 2(b) 2(y) : 3(b) : 1(y) : 3(b); Medullary index M/T 0.76 ± 0.0; Cuticular : at mid : regular wave, smooth, near; at proximal & distal : regular wave, rippled, near ..... *Callosciurus caniceps* (Gray)

3. Bands 7 : 7(b) : 2(y) :5(b) : 2(y) :4.5(b) : 2(y) : 6(b); Medullary index : 0.85±0.01;Cuticular : at mid SP regular wave, SM smooth, DS near;at distal : SP regular wave, SM rippled, DS near; at proximal : SP regular wave, SM rippled, DS near ..... *Callosciurus erythraeus* (Pallas)

4. Bands 2; Medullary index M/T 0.50±0.0 ;Cuticular : at mid : SP regular wave, SM smooth, DS near; at distal SP : regular mosaic, SM smooth, DS near, Proximal SP coronal, SM smooth, DS near .... *Callosciurus pygerythrus* (I. Geoffroy Saint Hilarie)

Head

1 Medulla : Multiserial ladder, Cross section : Oval & large ..... 2, 3, 4.

2. Bands 5 : 2(b) : 1(y) : 3(b) : 1(y) : 1(y); medullary index : M/T 0.87±0.0; Cuticular : At mid : SP regular wave, SM smooth, DS near; at proximal and at distal : SP regular wave, SM rippled, DS near ..... *Callosciurus caniceps* (Gray)

3. Band 3-4 : 1.5(b) : 1(y) : 4(b); for length 8 mm 2(b);1(y);2 (b); 1(y); medullary index M/T 0.85± 0.0; Cuticular : at mid SP regular wave, SM rippled, DS near; at distal, SP single chevron SM smooth, DS near; at proximal : SP single chevron, SM smooth, DS near ..... *Callosciurus erythraeus* (Pallas)

4. Band 3 : 3(b) : 1(y) : 4(b); medullary index M/T 0.80 ± 0.0; Cuticular : At mid : SP regular wave, SM : slightly rippled, DS near; at distal : SP double chevron, SM smooth, DS near; at proximal : SP double chevron, SM smooth, DS near .... *Callosciurus pygerythrus* (I. Geoffroy Saint Hilarie)

Tail

1 Multiserial ladder; Cross section ..... 2, 3, 4.

2. Bands 7 : 3(b) : 2(y) : 0.5(b) : 2.5(y) :4(b) : 3(y) : 1(b); M/T 0.83 ± 0.0 Circular, Oval, Large Cuticular : At mid :, distal, proximal SP regular wave, SM Smooth, DS near ..... *Callosciurus caniceps* (Gray)

3. Bands 7 : 7(b) : 2(y) : 5(b) : 2(y) : 4.5(b) : 2(4) : 6(b); medullary index M/T 0.85 ± 0.0 Cuticular : At mid and distal : SP regular wave, SM slightly rippled, DS near at proximal : SP double chevron to regular mosaic, SM rippled, DS near .... *Callosciurus erythraeus* (Pallas)

4. Bands 10 : 0.5(y) : 1.5(b) : 2.0(y) :2(b) :2(y) : 3.5(b) : 1(y) : 5(b) : 4(y) 1(b); medullary index M/T 0.75 ± 0.0; Cuticular structure at mid, distal and proximal : SP regular wave, SM smooth, DS near .... *Callosciurus pygerythrus* (I. Geoffroy Saint Hilarie)

Genus ***Dremomys*** Heude 1898

1898. *Dremomys* Heude, *Mem. Hist. Nat. Emp.* Chin., **4** (2) : 54

Dremomys lokriah (Hodgson, 1836)
Orange bellied Himalayan squirrel

1836. *Sciurus lokriah* Hodgson, J. Asiat Soc. Bengal, **5** : 232

Status : CAMP : LRnt (Nationally), DD (Globally)

Dorsal (Plate 4a)

A. Physical characteristics

Total thickness (T) : 50.27± 0.467μm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : At mid : Regular wave(SP), smooth(SM), near (DS), proximal : Single chevron (SP), smooth (DS), near (DS) and distal regions of hair : regular wave (SP), slightly rippled (SM), near (DS).

Scale index at mid : 7.4 ± 0.1

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 40.95 ± 0.52 μm; *Medullar index* :0.8 ± 0.0.

D. **Cross section**

Type of cross section oblong; *Medulla size in cross section* : large.

Ventral (Plate 4b)

A. **Physical characteristics**

Total thickness (T) : 30.81 ± 0.46 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave SM smooth (slightly rippled), DS near; proximal, SP regular wave, SM smooth (slightly rippled); DS near distal : SP regular wave, SM smooth (slightly rippled), DS near

C. **Medulla**

Medulla configuration : multiserial ladder; *Medulla thickness* 30.02 ± 0.09 μm; *Medullar index* : 0.97 ± 0.09.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Head (Plate 4c)

A. **Physical characteristics**

Total thickness (T) : 40.14 ± 0.23 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), Distance between scales (DS) : at mid : SP regular wave SM slightly rippled, DS near; proximal, SP regular mosaic, SM smooth, DS near; distal; SP regular wave SM smooth, DS near

C. **Medulla**

Medulla configuration : wide medulla lattice; *Medulla thickness* : 30.63 ± 0.55 μm; *Medullar index* : 0.76± 0.05.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large

Tail (Plate 4d)

A. **Physical characteristics**

Total thickness (T) : 60.45 ± 0.52 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave SM slightly rippled DS near; proximal, SP regular wave, SM slightly rippled, DS near; distal SP regular wave, SM slightly rippled, DS near

Special feature : very long, with depressions after certain *Length of hair.*

C. **Medulla**

Medullary configuration : Wide medulla lattice; *Medulla thickness* 50.36 ± 0.50 µm; Medullary index : 0.83 ± 0.0.

D. **Cross section**

Type of cross section : oircular; *Medulla size in cross section* : large;

Dremomys pernyi (Milne-Edwards, 1867)
Perny's long nosed squirrel

1867 *Sciurus pernyi* Milne-Edwards, *Rev. Mag. Zool.* (Paris), (Ser 2), **19** : 19

Status : not known

Dorsal (Plate 5a)

A. **Physical characteristics**

Total thickness (T) : 30.5 ± 2.0 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), Distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal, SP regular wave, SM smooth DS near; distal : SP regular wave, SM smooth, DS near

Scale index : 12.12 ± 0.19 (at mid dorsal)

C. **Medulla**

Medulla configuration : multiserial ladder; *Medulla thickness* : 30.1± 0.15 µm; *Medullar index* :0.98 ± 0.0.

D. **Cross section**

Type of cross section : oblong, circular; *Medulla size in cross section* : large.

Ventral (Plate 5b)

A. **Physical characteristics**

Total thickness (T) : 30.23 ± 0.3 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave SM slightly rippled, DS near; proximal, SP single chevron SM smooth, DS near; distal : SP single chevron, SM smooth, DS near.

C. **Medulla**

Medullar configuration multiserial ladder; Medullar thickness : 20.7 ± 0.4 µm; *Medullar index* : 0.68 ± 0.00.

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : large.

Head (Plate 5c)

A. **Physical characteristics**

Total thickness (T) : 40.8 ± 0.4 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave , SM slightly rippled, DS near ; proximal, SP regular wave SM smooth, DS near; at distal : SP regular wave, SM smooth, DS near

C. **Medulla**

Medulla configuration : multiserial ladder; *Medulla thickness* : 30.9 ± 0.6 μm; *Medullar index* : 0.76 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Tail (Plate 5d)

A. **Physical characteristics**

Total thickness (T) : 30.3 ± 0.25 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM) distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near ; proximal, SP irregular wave, SM rippled, DS near; at distal : SP regular wave, SM rippled, DS near

C. **Medulla**

Medulla configuration multiserial ladder; *Medulla thickness* : 20.6 ± 0.5 μm; *Medullar index* : 0.67 ± 0.0.

D. **Cross section**

Type of cross section : circular; *Medulla size in cross section* : large; *Fur hair* : Simple coronal type with smooth margin.

5. ***Dremomys rufigenis*** (Blanford, 1878)

Red checked squirrel

1878 *Sciurus rufigenis* Blanford, *J. Asiat. Soc. Bengal*, **47** (2) : 156

Status not known

Dorsal (Plate 6a)

A. **Physical characteristics**

Total thickness (T) : 50.4 ± 0.5 μm; *Shape and Nature* : Straight and thin

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave SM rippled, DS near; proximal, SP regular mosaic, SM smooth, DS near; distal : SP regular wave, SM smooth, DS near.

Scale index : 4.16 ± 0.0

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 40.4 ± 0.5 μm; *Medullar index* : 0.80 ± 0.01

D. Cross section

Type of cross section : circular; *Medulla size in cross section* : large.

Ventral (Plate 6 b)

A. Physical characteristics

Total thickness (T) : 30.0 ± 0.15 μm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave SM rippled, DS near; proximal, SP regular mosaic, SM smooth, DS near; at distal : SP regular wave, SM smooth, DS near.

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 20.8 ± 0.1 μm; *Medullar index* : 0.69 ± 0.0.

D. Cross section

Type of cross section : circular; *Medulla size in cross section* : large.

Head (Plate 6c)

A. Physical characteristics

Total thickness (T) : 30.3 ± 0.23 μm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), Distance between scales (DS) : Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS near; proximal, SP regular wave, SM smooth; DS near; at distal : SP regular wave SM smooth, DS near.

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 30.1 ± 0.14 μm; *Medullar index* : 0.99 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Tail (Plate 6d)

A. **Physical characteristics**

Total thickness (T) : 60.7 ± 0.4 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), Distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal, SP regular wave, SM smooth; DS near; distal : SP regular wave SM smooth, DS near.

C. **Medulla**

Medulla configuration : multiserial ladder; *Medulla thickness* : 50.7 ± 0.4 µm; *Medullar index* : 0.83 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large; *Fur hair* : Simple coronal and broad petal, smooth margin, near.

Key for identification of the species :

Based on various features of primary guard hair of dorsal, ventral, head and tail regions, the key for identification of the species was prepared :

Dorsal

1 Medulla : Multiserialladder, Cross section : oblong, large size medulla 2, 3, 4

2. Banded (5bands), black or dark brown & beige, length index 31.8 (highest), *Scale index* 7.4 ± 0.118; Cuticular architecture : at mid regular wave, smooth,near, at proximal regular mosaic, smooth, near; at distal regular wave, slightly rippled, near.. ..... *Dremomys lokriah* (Hodgson)

3. Some Banded (3bands), some completely black, length index 19.6, *Scale index* 12.12 ± 0.19; Cuticular architecture : at mid regular wave, rippled, near, at proximal regular wave, smooth, near; at proximal : regular wave, smooth, near..... ..... *Dremomys perni* (Milne Edwards)

4. Banded (3bands) dark brown and beige; length index 21.8, *Scale index* 4.16 ± 0.004 at mid regular wave, rippled, near; at proximal and at distal : regular wave, smooth, near..... *Dremomys rufigenis* (Blanford)

Ventral

1 Medulla type : Multiserial ladder, Cross section : Oblong 2, 3, 4

2. Banded (2 bands) black, beige; Cuticular pattern : Regular wave, smooth (slightly rippled), near ..... *Dremomys lokriah* (Hodgson)

3. Banded (4 bands), black-beige-black-beige; Cuticular pattern : at mid regular wave, slightly rippled, near; proximal : single chevron, smooth, near; distal : regular wave, slightly rippled, near ..... *Dremomys perni* (Milne Edwards)

4. Completely black and completely beige; at mid : regular wave, rippled, near; proximal : changing to regular mosaic, smooth, near; distal : regular wave, smooth, near *Dremomys rufigenis* (Blanford)

Head

1 Medulla type : Multiserial ladder, Cuticular pattern : regular wave, smooth (or slightly rippled), near, cross section oblong, large medulla 2, 3, 4

2. Unbanded, black or dark brown, small, length index 24.9; M/T = 0.76 .... *Dremomys lokriah* (Hodgson)

3. Banded (3 bands), length index 12.25, M/T = 0.76 .... *Dremomys perni* (Milne Edwards)

4. Banded (3 bands), length index 16.50, M/T= 0.99 ..... *Dremomys rufigenis* (Blanford)

Tail

1 Cuticular pattern : regular wave, slightly rippled (or smooth), near throughout; Cross section : Oblong, Circular, large size medulla 2, 3, 4

2. Banded (6 bands), wide medulla lattice, L/T 46.3, M/T 0.83 .... *Dremomys lokriah* (Hodgson)

3. Banded (5 bands), Multiserial ladder, L/T 46.3, M/T 0.67 .... *Dremomys perni* (Milne Edwards)

4. Banded (4bands), Multiserial ladder, M/T 0.83, L/T 52.7 .... *Dremomys rufigenis* (Blanford)

Genus ***Funambulus*** Lesson, 1835

1835. *Funambulus* Lesson, *Illustr. Zool*, Pl. 43.

Funambulus palmarum (Linnaeus, 1766)
Indian palm squirrel

1766. *Sciurus palmarum* Linnaeus. *Syst. Nat*, 12th ed, 1 : 86

Status : CAMP : LRnt (Nationally), DD (Globally)

Dorsal (Plate 7a)

A. Physical characteristics

Total thickness (T) : 60.54 ± 0.52 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; at proximal, SP regular wave SM rippled, DS near; At distal : SP regular wave, SM rippled, DS near

Scale index at mid : 3.25 at mid, 3.75 at proximal, 2.5 at distal

C. **Medulla**

Medullary configuration : multiserial ladder; *Medulla thickness* : 60.29 ± 0.47 µm; *Medullary index* 0.99 ± 0.01

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Ventral (Plate 7b)

A. **Physical characteristics** :

Total thickness (T) : 64.5 ± 0.52 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS close; proximal, SP regular wave SM smooth, DS close; distal : SP regular wave, SM smooth, DS close

C. **Medulla**

Medullary configuration : wide aeriform lattice; *Medulla thickness* 62.9 ± 0.47 µm; *Medullary index* : 0.97 ± 0.01

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* large.

Head (Plate 7c)

A. **Physical characteristics**

Total thickness (T) : 74.5 ± 0.52 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal, SP regular wave SM smooth, DS near; distal :SP regular wave, SM smooth, DS near

C. **Medulla**

Medulla configuration multiserial ladder; *Medulla thickness* 71.4 ± 0.62 µm; *Medullar index* : 0.96 ± 0.01

Table-1. Morphological characteristics and biostatistical analysis (ANOVA) of measurements of primary guard hair of the species examined

Species	**Dorsal**	**Ventral**	**Head**	**Tail**
Dremomys lokriah (Hodgson)				
Shape and Nature	Straight and thin	Straight and thin	Straight and thin	Straight and thin
No. of band	5	2	unbanded	6
Colour of bands	Dark brown, beige	dark brown, beige	Black or dark brown	dark brown, beige
Thickness (in µm)	50.27± 0.5	30.81 ± 0.5	40.14 ± 0.2	60.45 ± 0.5
Length index	31.4 ±0.3 a *vs* b*** a *vs* c***	38.5 ± 0.3 a *vs* b*** a *vs* c***	24.8 ± 0.1 a *vs* b*** a *vs* c***	46.2 ± 0.1 a *vs* b*** a *vs* c ns
Medulla index	0.81 ± 0.2 a vs b** a vs c ns	0.74 ± 0.2 a vs b*** a vs c ns	0.79 ± 0.2 a vs b* a vs c ns	0.77± 0.2 a vs b ns a vs c ns
Scale index	7.4 ± 0.1 a vs b*** a vs c***			
Dremomys rufigenis (Blanford) b				
Shape and Nature	Straight and thin	Wavy and thin	Straight and thin	Straight and thin
No. of bands	3	unbanded	3	4
Colour of bands	Dark brown, beige	completely black, completely beige	Black and beige	Black and beige
Thickness (in µm)	50.4 ± 0.5	30.0± 0.1	30.3 ± 0.2	60.7 ± 0.4
Length index	21.4 ± 0.4 b vs a*** b vs c***	36.5 ± 0.25 b vs a*** b vs c***	16.6 ± 0.08 b vs a*** b vs c***	52.0 ± 0.5 b vs a*** b vs c***
Medullar index	0.75 0.2 b vs a*** b vs c***	0.85 0.2 b vs a*** b vs c***	0.85 0.2 b vs a* b vs c***	0.78 0.2 b vs ans b vs c ns

Species	Dorsal	Ventral	Head	Tail
Scale index	4.14 ± 0.0 b vs a*** b vs c***			
Dremomys pernyi (Milne-Edwards) c				
Shape and Nature	Straight and thin	Straight and thin	Straight and thin	Straight and thin
No. of bands	Some banded 3	4	3	5
Colour of bands	Some completely black, some with Blackdark brown, beige bands	Black-beige-black-beige	Black-beige-black	Black and beige colours
Thickness (in µm)	30.5 ± 2.0	30.23 ± 0.3	40.8± 0.4	30.3 ± 0.25
Length index	19.6 ± 0.1 c *vs* a*** c *vs* b***	33.04 0.03 c *vs* b*** c *vs* b***	12.2 ± 0.02 c *vs* b*** c *vs* b***	46.1± 0.17 c *vs* a ns c *vs* b***
Medulla index	0.82 ± 0.2 c *vs* b*** c *vs* a ns	0.77 ±0.2 c *vs* a ns c *vs* b***	0.74 ± 0.2 c *vs* ans c *vs* b***	0.73 ± 0.2 c *vs* a ns c *vs* b ns
Scale index	12.12 ± 0.1 c *vs* a*** c *vs* b***			

***for P < 0.001 Extremely significant, **for P<0.001 Highly Significant,
* for P < 0.05 Significant ns for P > 0.05 non significant (P values and their symbols)

Table-2. Medullary features

Species	Dorsal	Ventral	Head	Tail
Dremomys lokriah (Hodgson)				
Medulla type	Multiserial ladder	Multiserial ladder	Multiserial ladder	Wide medulla lattice
Dremomys peynyi (Milne-Edwards)				
Medulla type	Multiserial ladder	Multiserial ladder	Multiserial ladder	Multiserial ladder
Dremomys rufigenis (Blanford)				
Medulla type	Multiserial ladder	Multiserial ladder	Multiserial ladder	Multiserial ladder

Table-3. Cuticular features

Species	Dorsal	Ventral	Head	Tail
Dremomys lokriah (Hodgson)				
At mid	regular wave (SP), smooth (SM), near (DS)	regular wave (SP), SM smooth (slightly rippled), near (DS)	SP regular mosaic SM slightly rippled, near (DS)	SP regular wave, SM rippled, near (DS)
At proximal	regular wave (SP), smooth (DS), near (DS)	regular wave (SP), SM smooth (slightly rippled), near (DS)	SP regular mosaic, SM smooth, DS near	SP regular wave, SM rippled, DS near
At distal	regular wave (SP), slightly ripped (SM), near (DS)	regular wave (SP), SM smooth (slightly ripped), near (DS)	SP regular wave SM smooth, DS near	SP regular wave, SM rippled, DS near
Dremomys pernyi (Milne-Edwards)				
At mid	SP regular wave, SM rippled, DS near	SM regular wave SM slightly ripped, DS near	SP regular wave, SM slightly rippled, DS near	SP regular wave, SM rippled, DS near
At proximal	SP regular wave, SM smooth DS near;	SP single chevron SM smooth, DS near	SP regular wave, SM smooth, DS near;	SP irregular wave, SM rippled, DS near
At distal	At distal : SP regular wave, SM smooth, DS near	SP regular wave, SM slightly rippled, DS near	SP regular wave, SM smooth, DS near	SP regular wave, SM rippled, DS near

Species	Dorsal	Ventral	Head	Tail
Dremomys rufigenis (Blanford)				
At mid	SP regular wave SM rippled, DS near	SP regular wave SM rippled, DS near	SP regular wave, SM smooth, DS near	SP regular wave, SM rippled, DS near
At proximal	SP regular mosaic, SM smooth, DS near;	SP regular mosaic, SM smooth, DS near;	SP regular wave, SM smooth; DS near;	SP regular wave, SM rippled, DS near
At distal	SP regular wave, SM smooth, DS near	SP regular wave, SM smooth, DS near.	SP regular wave, SM smooth, DS near.	SP regular wave, SM rippled, DS near.

Scale pattern (SP), Scale margin (SM), distance between scales (DS)

Table-4. Cross section types

Dremomys lokriah (Hodgson)	Dorsal	Ventral	Head	Tail
Cross section type	oblong	oblong	oblong	circular
Medulla size	large	large	large	large
Dremomys perynyi (Milne-Edwards)				
Cróss section type	oblong, circular	oblong circular	oblong	circular
Medulla size	large	large	large	large
Dremomys rufigenesis (Blanford)				
Cross section type	oblong	oblong	oblong	circular
Medulla size	large	large	large	large

D. Cross section

Type of cross section : oblong; *Medulla size in cross section* : large.

Tail (Plate 7d)

A. Physical characteristics

Total thickness (T) : 85.4 ± 0.52 μm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal, SP regular wave SM smooth, DS near; distal : SP regular wave, SM smooth, DS near

C. Medulla

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 75.4 ± 0.52 μm; *Medullar index* : 0.88 ± 0.0.

D. Cross section

Type of cross section : oblong; *Medulla size in cross section* : large.

Funambulus sublineatus sublineatus (Waterhouse, 1838)
Red checked squirrel

1838. *Sciurus sublineatus* Waterhouse, *Proc. Zool. Soc.* London, 1839 : 19

Status : CAMP : LRnt (Nationally)

Dorsal (Plate 8a)

A. Physical characteristics

Total thickness (T) : 41.8 ± 0.40 μm; *Shape and Nature* Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) at mid : SP regular wave, SM rippled, DS near; proximal SP regular wave SM smooth, DS distant; distal : SP regular wave, SM rippled, DS near

Scale index : at mid 17.0 ± 0.0, proximal 2.3 ± 0.01, at distal 4.0 ± 0.0

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 39.8 ± 0.40 μm; *Medullar index* : 0.95 ± 0.0.

D. Cross section

Type of cross section : oblong; *Medulla size in cross section* large.

Ventral (Plate 8b)

A. **Physical characteristics**

Total thickness (T) : 43.6 ± 1.66 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS near; proximal, SP regular wave SM slightly rippled, DS near; distal : SP regular wave, SM slightly rippled, DS near

C. **Medulla**

Medulla configuration Multiserial ladder· *Medulla thickness* : 23.6 ± 0.5 µm; *Medullar index* : 0.54 ± 0.01

D. **Cross section**

Type of cross section : Oblong; *Medulla size in cross section* : medium sized.

Head (Plate 8c)

A. **Physical characteristics**

Total thickness (T) : 55.4 ± 0.52 µm; *Shape and Nature* Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : At mid SP regular wave, SM rippled, DS near; at proximal, SP regular wave SM slightly rippled , DS near; At distal : SP regular wave, SM slightly rippled, DS near

C. **Medulla**

Medullary configuration : multiserial ladder; *Medulla thickness* : 53.4 ± 0.5 µm; *Medullary index* : 0.96 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Tail (Plate 8d)

A. **Physical characteristics**

Total thickness (T) : 59.4 ± 0.08 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS near; proximal : SP regular wave SM rippled, DS near; distal : SP regular wave, SM rippled, DS near

C. **Medulla**

Medulla configuration multiserial ladder; *Medulla thickness* : 39.6 ± 0.05 µm; *Medullar index* : 0.66 ± 0.0.

D. Cross section

Type of cross section : oblong; *Medulla size in cross section* : large.

Funambulus tristatus (Waterhouse, 1837)
Jungle striped squirrel

1837. *Sciurus tristriatus* Waterhouse, *Mag. Nat. His.* (Charlesworth's), **1** : 499

Status : CAMP : LRnt (Nationally)

Dorsal (Plate 9a)

A. Physical characteristics

Total thickness (T) : 50 ± 0.0 μm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS near; proximal : SP regular wave SM rippled, DS near; distal : SP regular wave, SM rippled, DS near.

Scale index : 8.0 ± 0.0 at mid, 5.3 ± 0.01 at proximal, 3.0 ± 0.0 at distal.

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 45 ± 0 μm; *Medullar index* :0.9 ± 0.01

D. Cross section

Type of cross section : oblong; *Medulla size in cross section* : large.

Ventral (Plate 9b)

A. Physical characteristics

Total thickness (T) : 43.6 ± 0.5 μm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS near; proximal : SP regular wave SM smooth, DS near; distal :SP regular wave, SM smooth, DS near

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 38.6 ± 0.50 μm; *Medullar index* : 0.88 ± 0.0.

D. Cross section

Type of cross section : oblong; *Medulla size in cross section* : large.

Head (Plate 9c)

A. **Physical characteristics**

Profile and colour : banded with yellow and black bands; *Total thickness (T)* : 53.6 ± 0.50 µm; *Shape and Nature* Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS close; proximal SP regular wave SM smooth, DS close; distal : SP regular wave, SM rippled, DS close

C. **Medulla**

Medulla configuration multiserial ladder; *Medulla thickness* : 46.3 ± 0.0 µm; *Medullar index* : 0.86 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Tail (Plate 9d)

A. **Physical characteristics**

Total thickness (T) : 70 ± 0.7 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS close; proximal SP regular wave SM rippled, DS close; distal : SP regular wave, SM rippled, DS close

C. **Medulla**

Medulla configuration multiserial ladder; *Medulla thickness* : 60 ± 0.77 µm; *Medullar index* : 0.86 ± 0.02.

D. **Cross section**

Type of cross section circular; *Medulla size in cross section* : large.

Funambulus pennantii Wroughton, 1905, **Plates 23, 24, 27**

Status IWPA : Schedule IV; CAMP : LRlc (Nationally), DD (Globally)

Dorsal

A. **Physical characteristics**

Total thickness (T) : 50.0 ± 0.0 µm; *Shape and Nature* : Straight and thin; Small light and dark bands.

B. Surface structure

At distal SP Regular wave, SM rippled, DS near; mid SP Regular wave, SM rippled, DS near; proximal SP Regular wave, SM rippled, DS near.

C. Medulla

Medullary configuration : wide aeriform lattice; *Medulla thickness* : M 40 ± 0.0 μm; *Medullary index* : 0.8± 0.0.

D. Cross section

Type of cross section : Reniform, oblong; *Medulla size in cross section* : large.

Ventral

A. Physical characteristics

Total thickness (T) : 50 ± 0.0 μm; *Shape and Nature* : Straight and thin, small light dark bands.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at distal SP Regular wave, SM rippled, DS near; mid SP Regular wave, SM rippled, DS near; proximal SP Regular wave, SM rippled, DS near

C. Medulla

Medulla configuration : wide aeriform lattice; *Medulla thickness* :M 40.0 ± 0.0 μm; *Medullar index* : 0.8 ± 0.0.

D. Cross section

Type of cross section : oblong; *Medulla size in cross section* : large.

Head

A. Physical characteristics

Profile and colour : Small, light and dark bands; *Total thickness (T)* : 50.0 ± 0.0 μm

Shape and Nature : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) :at distal SP : regular wave, SM rippled, DS near; mid SP Regular wave, SM rippled, DS near; proximal SP Regular wave, SM rippled, DS near

C. Medulla

Medulla configuration : wide aeriform lattice; *Medulla thickness* : M 40.0 ± 0.0 μm

Medullar index 0.8 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Tail

A. **Physical characteristics**

Total thickness (T) : 60.0 ± 0.0 µm; Profile and Nature : Straight and thin; Small light and dark bands.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at distal SP Regular wave, SM rippled, DS near; mid SP Regular wave, SM rippled, DS near; proximal SP Regular wave, SM rippled, DS near

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : M 40.0 ± 0.0 µm; *Medullar index* : 0.8 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Key for identification of the species of Genus *Funambulus*

Dorsal

A. Medulla : Multiserial ladder, Cross section : Oblong with large medulla 1, 2, 3

B. Medulla : Wide aeriform lattice, Cross section : reniform, oblong, large 4

1 Medullary index M/T 0.99 ± 0.01; Cuticular at mid, distal and proximal SP regular wave, SM rippled, DS near. *Scale index* at mid 3.25, at proximal 3.75, at distal 2.5 .... *Funambulus palmarum* (Linneaus)

2. Medullary index 0.95 ± 0.0; Cuticular at mid & distal SP regular wave, SM rippled, DS near; proximal SP regular wave, SM smooth,DS distant; *Scale index* at mid 17.0± 0±.0; proximal 2.3 ± 0.01, at distal 4.0 ± 0.0 .... *Funambulus sublineatus sublineatus*

3. Medullary index 0.9 ± 0.01; Cuticular at mid SP regular wave, SM smooth, DS near; proximal & distal SP regular wave, SM rippled, DS near .... *Funambulus tristatus* (Waterhiuse)

4. Medullry index 0.8 ± 0.0; Cuticular : mid ,distal and proximal : SP regular wave, SM rippled, DS near ..... *Funambulus pennantii* Wroughton

Ventral

A. Medulla : wide aeriform lattice, Cross section : oblong, large 1, 2

B. Medulla multiserial ladder 3, 4

1 M/T 0.97 ± 0.01, Cuticular : at mid SP regular wave, SM rippled, DS close; proximal : SP regular wave, SM smooth, DS close; distal : SP regular wave, SM smooth, DS close ..... *Funambulus palmarum* (Linnaeus)

2. M/T 0.8 ± 0.0; Cuticular : at mid, proximal and distal : SP regular wave, SM rippled, DS near ..... *Funambulus pennantii* Wroughton

3. M/T 0.54± 0.01, Cross section : oblong, medium; Cuticular : at mid SP : regular wave, SM smooth, DS near; proximal & distal SP regular wave, SM slightly rippled, DS near ..... *Funambulus sublineatus sublineatus* (Waterhouse)

4. M/T 0.88 ± 0.0, Cross section : oblong, large; Cuticular : at mid, distal & proximal SP regular wave, SM smooth, DS near ..... *Funambulus tristatus* (Waterhouse)

Head

A. Medulla : Multiserial ladder 1, 2

B. Medulla : Wide aeriform lattice 3

1 Cross section : oblong, large medulla 1a,1b

1a. M/T 0.96 ± 0.0; Cuticular : at mid SP regular wave, SM rippled, DS near; at proximal and distal SP regular wave, SM Smooth, DS near .... *Funambulus palmarum* (Linnaeus)

1b. M/T 0.96 ± 0.0; Cuticular :at mid : SP regular wave, SM rippled, DS near; proximal and distal : SP regular wave, SM slightly rippled, DS near .... *Funambulus sublineatus sublineatus* (Waterhouse)

2. Cross section : oblong, medium; M/T 0.86 ± 0.0; Cuticular at mid SP regular wave, SM rippled, DS close; proximal SP regular wave, SM smooth, DS close; distal : SP regular wave, SM rippled, DS close ..... *Funambulus tristatus* (Waterhouse)

3. M/T 0.8 ± 0.0 ; Cross section : oblong, large medulla, Cuticular at mid, distal and proximal SP regular wave, SM rippled, DS near ... *Funambulus pennantii* Wroughton

Tail

A. Medulla : Wide aeriform lattice, Cross section :oblong, large medulla 1, 2

B. Mutiserial ladder 3, 4

1 M/T 0.88 ± 0.0, Cuticular : at mid regular wave, SM rippled, DS near; proximal and distal regular wave, smooth, near .... *Funambulus palmarum* (Linnaeus)

2. M/T 0.8 ±0.0; Cuticular : at distal, mid, proximal SP regular wave, SM rippled, DS near ..... *Funambulus pennantii* Wroughton

3. M/T 0.66 ± 0.0; Cross section : Oblong, large; at mid SP regular wave, SM smooth, DS near; at proximal & distal SP regular wave, SM rippled, DS near .... *Funambulus sublineatus sublineatus (Waterhouse)*

4. M/T 0.86 ± 0.02, Cross section Circular and large medulla, at mid ,proximal and distal SP regular wave, SM rippled, DS close..... *Funambulus tristatus* (Waterhouse)

Genus ***Marmota*** Blumenbach, 1779

1779. *Marmota* Blumenbach, *Hand. Hilfsb. Nat.*, **1** : 79

Marmota himalayanum himalayanum (Hodgson, 1841)

1841. *Arctomys himalayana* Hodgson,. *J. Asiat. Soc. Bengal.*, **10** : 777

Status : CITES Appendix III, IWL(P)A : Schedule II.

Dorsal Plate 10a

A. **Physical characteristics**

Total thickness (T) 76.3 ± 0.5 µm; *Shape and Nature* Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP Flattened regular wave, SM slightly rippled, DS near; proximal, SP regular wave SM rippled, DS distant; distal SP regular wave, SM slightly rippled, DS distant

Scale index : 4.0 ± 0.0 at mid, 3.6 ± 0.01 at proximal, 3.75 ± 0.02 at distal

C. **Medulla**

Medullary configuration : multiserial ladder; *Medulla thickness* : 44.5 ± 0.52 µm; *Medullary index* 0.58 ± 0.01

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Ventral Plate 10b

A. **Physical characteristics**

Total thickness (T) : 52.7 ± 0.46 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal : SP egular wave SM rippled, DS near; distal : SP regular wave, SM rippled, DS near

C. **Medulla**

Medullary configuration Fragmental; *Medulla thickness* : 11.3 ± 0.23 µm; *Medullary index* : 0.21 ± 0.0.

D. **Cross section**

Type of cross section : oblong, circular; *Medulla size in cross section* : small. Head Plate 10c.

A. **Physical characteristics**

Total thickness (T) : 64.5 ± 0.52 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near (distant at soe places); proximal : SP regular wave SM rippled, DS distant; distal :SP regular wave, SM smooth (slightly rippled), DS near

C. **Medulla**

Medullary configuration : multiserial ladder; *Medulla thickness* : 44.5 ± 0.52 μm; *Medullary index* : 0.68 ± 0.0.

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : large.

Tail Plate 10d

A. **Physical characteristics**

Total thickness (T) : 112.7 ± 0.78 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM slightly rippled, DS near; proximal : SP regular wave SM slightly rippled, DS near; distal: SP regular wave, SM slightly rippled, DS near

C. **Medulla**

Medullary configuration : wide medulla lattice; *Medulla thickness* 56.3 ± 0.5 μm; *Medullary index* : 0.49 ± 0.0.

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : medium.

Genus ***Raufa*** Gray, 1867

1867. *Ratufa* Gray, Ann. Mag. Nat. Hist. (Ser.3), **20** : 273

Ratufa bicolor (Sparrman, 1778)

Large Malaya squirrel

1778. *Sciurus bicolor* Sparrman, *Samhelle Hand* (Wet. Afd.), **1** : 70

Status : IWPA : Schedule II, Part II, CITES : Appendix II; CAMP : VU (Nationally), DD (Globally).

Dorsal Plate 11a

A. **Physical characteristics**

Colour : Both light brown and dark brown; *Total thickness (T)* : 86.3 ± 1.5 μm; *Length-index (L/T)* : 30.3 ± 0.09; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal, SP regular wave SM rippled, DS near; distal :SP regular wave, SM rippled, DS near.

Scale index : 6.0 ± 0.0

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* 60.9 ± 1.0 : μm; *Medullar index* (M/T) 0.70 ± 0.66.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Ventral Plate 11b

A. **Physical characteristics**

Colour : light brown; *Total thickness (T)* : 49.8 ± 0.0 μm; *Length index* : 24.5 ± 0.0; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal, SP regular wave SM rippled, DS near; distal :SP regular wave, SM rippled, DS near.

C. **Medulla**

Medullary configuration : wide aeriform attice; *Medulla thickness* : 29.8 ± 0.06 μm; *Medullary index (M/T)* 0.59 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : medium.

Head Plate 11c

A. **Physical characteristics**

Colour : dark brown with light brown tips; *Total thickness (T)* : 109.0 ± 1.0 μm; *Length index* : 16.88 ± 0.0; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM scalloped margin, DS near; proximal, SP regular wave, SM scalloped, DS near; distal : SP regular wave, SM scalloped, DS near

C. **Medulla**

Medulla configuration : wide aeriform attice; *Medulla thickness* 89.0 ± 1.0 μm; *Medullar index* : 51 7 ± 0.25

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Tail Plate 11d

A. **Physical characteristics**

Colour : Dark brown; *Total thickness (T)* : 92.7 ± 0.4 µm; Length index : 51 7 ± 0.25; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; proximal : SP Irregular wave, SM slightly rippled, DS near; distal : SP Irregular wave, SM smooth, DS near

C. **Medulla**

Medullary configuration : wide aeriform lattice; *Medulla thickness* : 82.7 ± 0.4 µm; *Medullary index* : 0.89 ± 0.01

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Ratufa indica (Erxleben, 1777)
Indian giant squirrel, Malabar squirrel

1777. *Sciurus indica* Erxleben, *Syst. Regn. Anim.*, 1 : 420

Status : IWPA : Schedule II, Part II; CITES : Appendix II : CAMP : VU (Nationally), DD (Globally).

Dorsal Plate 12a

A. **Physical characteristics**

Colour : dark brown or black; *Total thickness (T)* : 85.4 ± 0.52 µm; Length index : 39.22 ± 0.1; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal, SP regular wave SM rippled, DS near; distal :SP regular wave, SM rippled, DS near

Scale index : 6.0 ± 0.45

C **Medulla**

Medulla configuration : Simple medulla; *Medulla thickness* 65.4 ± 0.52 : µm; *Medullar index* : 0.52 ± 0.01

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large

Ventral Plate 12b

A. **Physical characteristics**

Colour : light brown and beige; *Total thickness (T)* 84.5 ± 0.32 µm; Length index : 14.6 ± 0.16; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM slightly rippled, DS near; proximal : SP regular wave, SM slightly rippled, DS near; distal : SP regular wave, SM rippled, DS near

C. **Medulla**

Medullary configuration : wide aeriform lattice; *Medulla thickness* : 44.5 ± 0.52 µm; *Medullary index* : 0.52 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : medium.

Head Plate 12c

A. **Physical characteristics**

Colour : light brown at tips, mid dark brown and black; *Total thickness (T)* : 69.6 ± 0.08 µm; Length index : 17.81 ± 0.06; *Shape and Nature* : Straight and thin

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal : SP regular wave, SM rippled, DS near; distal :SP regular wave, SM rippled, DS near

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 49.2 ± 0.21 µm; *Medullar index* : 0.706 ± 0.026.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Tail Plate 12d

A. **Physical characteristics**

Total thickness (T) : 79.2 ± 0.16 µm; *Length index* : 57.19 ± 0.25; *Shape and Nature* Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal, SP regular wave SM rippled, DS near; distal :SP regular wave, SM rippled, DS near

C. Medulla

Medulla configuration : wide aerifom lattice; *Medulla thickness* : 60.7 ± 0.16 μm; *Medullar index* : 0.766 ± 0.01

D. Cross section

Type of cross section : circular, oblong; *Medulla size in cross section* : large.

Ratufa macroura (Pennant, 1769)
Grizzled Indian (Giant) squirrel

1769. *Sciurus macrourus* Pennant, *Indian Zool.*, **1**, pl 1.

Status : IWPA : Schedule 1 (Part I) CITES : Appendix II; CAMP : EN (Nationally), DD (Globally)

Dorsal Plate 13a

A. Physical characteristics

Colour : Dark brown/black with light brown tips; *Total thickness (T)* : 69.72 ± 0.06 μm; *Length index* : 46.04 ± 0.05; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal : SP regular wave, SM rippled, DS near; distal : SP regular wave, SM rippled, DS near.

Scale index : 6.24 ± 0.32

C. Medulla

Medullary configuration : wide aeriform lattice; *Medulla thickness* : 60.3 ± 0.08 μm; Medullary index : 0.86 ± 0.013.

D. Cross section

Type of cross section : oblong; *Medulla size in cross section* : large.

Ventral Plate 13b

A. Physical characteristics

Colour : dark brown/black and light brown; *Total thickness (T)* : 29.9 ± 0.0 μm; Length index : 35.45 ± 0.016; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal : SP regular wave, SM rippled, DS near; distal :SP regular wave, SM rippled, DS near

C. **Medulla**

Medullary configuration : Simple medulla; *Medulla thickness* : 20.0 ± 0.0 µm; *Medullary index* : 0.66 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : medium.

Head Plate 13 c

A. **Physical characteristics**

Colour : Slightly light brown at tips, mid is dark; *Total thickness (T)* : 87.27 ± 1.0 µm; Length index : 13.76 ± 0.047; *Shape and Nature* : Straight and thin

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal : SP regular wave, SM rippled, DS near; distal :SP regular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 67.2 ± 1.0 µm; *Medullar index* : 0.77 ± 0.01

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Tail Plate 13d

A. **Physical characteristics**

Colour : black/dark brown throughout; *Total thickness (T)* : 102.7 ± 0.46 µm; Length index : 39.4 ± 0.07; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid SP regular wave, SM smooth, DS distant; proximal, SP regular wave SM smooth, DS distant; distal : SP regular wave, SM smooth, DS distant.

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* 86.3 ± 0.50 µm; *Medullar index* : 0.84 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Key for identification of Indian species of the Genus *Ratufa* based on characteristics of primary guard hair

Dorsal

1 Medulla type : Wide Aeriform Lattice, cross section :oblong, large size medulla; Scale Pattern : regular wave, Scale Margin : rippled, Distance between scales near; mean scale indices range : 6.0 to 6.2 - Medullary index : 0.70 ± 0.66, length index 30.3 ± 0.09 - *Ratufa bicolor*; Medullary index > 0.70, length index : > 30.3 2

2a. Medullary index 0.86 ± 0.01, length index 46.04 ± 0.5 ..... *Ratufa macroura* (Pennant)

2b. Medullary index 0.76 ± 0.01, length index 39.2 ± 0.1 ..... *Ratufa indica* (Erxleben)

Ventral

1 Cross section : Oblong, Medium sized medulla;Scale pattern : regular wave, Scale margin rippled, Distance between scales : near-, Medulla Wide Aeriform lattice 2

Medulla simple 3

2a. Meduallary index 0.59 ± 0.0, Length index 24.5 ± 0.0, *Scale index* 5.3 ± 0.01 .... *Ratufa bicolor* (Sparrman)

2b. Medullary index 0.52 ± 0.01, Length index 14.6 ± 0.16, *Scale index* 6.5 ± 0.01 .... *Ratufa indica* (Erxleben)

3. Medullary index 0.66 ± 0.0, Length index 35.4 ± 0.0, *Scale index* 6.3 ± 0.0 .... *Ratufa macroura* (Pennant)

Head

1. Cross section : Oblong, Large sized medulla; Medulla : Wide Aeriform Lattice -Scale pattern : regular wave, Scale margin : rippled, Distance between scales : near 2

Scale margin scalloped 3

2a. Length index : 13.7 ± 0.0, Medullary index 0.77 ± 0.04. *Scale index* 4.4 ± 0.0 .... *Ratufa macroura* (Pennant)

2b. Medullary index 0.70 ± 0.0,Length index 17.8 ± 0.0,*Scale index* 7.3 ± 0.0 .... *Ratufa indica* (Erxleben)

3. Medullary index 0.51 ± 0.2, length index 16.8± 0.0, *Scale index* 4.17 ± 0.0 .... *Ratufa bicolor* (Sparrman)

Tail

1 Cross section : oblong, large medulla, Medulla : Wide Aeriform Lattice, medullary index < 0.80 2

Medullary index > 0.80 3

2a. Scale pattern : regular wave, Scale margin : rippled, Distance between scales near; Medullary index 0.76 ± 0.0; Length index 57.2 ± 0.2, *Scale index* 6.5 ± 0.01 .... *Ratufa indica* (Erxleben)

2b. At proximal : Scale pattern : Irregular wave, Scale margin : rippled, Distance between scales : near; at mid : Scale pattern Irregular wave, Scale margin : slightly rippled, Distance between scales : near; at distal : Scale pattern Irregular wave, Scale margin : smooth, Distance between scales near; Medullary index 0.89 ± 0.01, Length index 57.7 ± 0.2; *Scale index* 4.25 ± 0.01 ..... *Ratufa bicolor* (Sparrman)

3. Scale pattern : regular wave, Scale margin : smooth. Distance between scales : distant; Medullary index 0.84 ± 0.01; Length index : 39.0± 0.0, *Scale index* 4.25 ± 0.01 ... . *Ratufa macroura* (Pennant)

Genus ***Tamiops*** Allen, 1906

1906. *Tamiops* J.A. Allen, *Bull. Amer. Mus. Nat. Hist.*, **22** : 475

9. *Tamiops macclellandi* (Horsfield, 1840)

Himalayan stripped squirrel

1840. *Sciurus macclellandi* Horsfield, *Proc. Zool. Soc., London*, **1839** : 152

Status CAMP : LRnt (Nationally), DD (Globally)

Dorsal Plate 14a

A. **Physical characteristics**

Total thickness (T) : 40.6 ± 0.1 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth (slightly rippled), DS near; proximal : SP single chevron/ regular wave, SM smooth , DS near; distal : SP regular wave, SM smooth, DS near *Scale index* : 2.5 ± 0.01 at mid, 3.0 ± 0.0 at proximal, 2 ± 0.02 at distal

C. **Medulla**

Medullary configuration : multiserial ladder; *Medulla thickness* : 39.18 ± 0.09 µm; Medullary index : 0.96 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Ventral Plate 14b

A. **Physical characteristics**

Total thickness (T) : 30.18 ± 0.06 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS near; proximal : SP regular wave, SM smooth, DS near; distal :SP regular wave, SM smooth, DS near

C. **Medulla**

Medulla configuration : multiserial ladder; *Medulla thickness* : 15.2 ± 0.09 μm; *Medullar index* :0.50 ± 0.1

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : medium, divided medulla.

Head Plate 14c

A. **Physical characteristics**

Total thickness (T) : 35.75 ± 0.45 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS close; proximal : SP regular wave, SM smooth, DS close; distal : SP regular wave, SM smooth, DS closer.

C. **Medulla**

Medulla configuration multiserial ladder; *Medulla thickness* : 26.36 ± 0.5 μm; *Medullar index* : 0.73 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Tail Plate 14d

A. **Physical characteristics**

Total thickness (T) : 48.6 ± 0.23 μm

Shape and Nature : Straight and thin

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS near; proximal : SP regular wave, SM smooth, DS near; distal : SP regular wave, SM smooth, DS near

C. **Medulla**

Medullary configuration : multiserial ladder; Medullan thickness : 32.7 ± 0.26 μm; Medullary index : 0.67 ± 0.2.

D. **Cross section**

Type of cross section : circular; *Medulla size in cross section* large.

Subfamily PETAURISTINAE Miller, 1912

Genus ***Belomys*** Thomas, 1908

1908 *Belomys* Thomas, *Ann, Mag. Nat. Hist.* (Ser.8), **1** : 2

Belomys pearsonii (Gray, 1842)
Hairy footed flying squirrel

1842 *Sciuropeterus pearsonii* Gray, *Ann. Mag. Nat. Hist.*, (Ser. 1), **10** : 263.

Status : CAMP : LRnt (Nationally), DD (Globally)

Dorsal Plate 15a

A. **Physical characteristics**

Total thickness (T) : 50 ± 0.0 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS close; proximal SP regular wave, SM rippled, DS close; distal : SP single chevrn, SM smooth (slightly rippled), DS close.

Scale index 2.4 ± 0.0 at mid, 2.5 ± 0.01 at proximal, 3.5 ±0.01 at distal

C. **Medulla**

Medullary configuration : multiserial ladder; *Medulla thickness* : 50 ± 0.0 µm; *Medullary index* : 1.0 ± 0.0.

D. **Cross section**

Type of cross section oblong; *Medulla size in cross section* : large.

Ventral Plate 15b

A. **Physical characteristics**

Total thickness (T) : 39.8 ± 0.04 µm; *Shape and Nature* Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM slightly rippled, DS near; proximal : SP regular wave, SM slightly rippled, DS near; distal SP single chevron, SM slightly rippled, DS near

C. **Medulla**

Medulla configuration : multiserial ladder; *Medulla thickness* 39.3 ± 0.05 µm. *Medullar index* : 0.99 ± 0.0.

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : large.

Head Plate 15c

Medulla : multiserial ladder

Cross section : oblong, circular.large medulla

Cuticular : at mid SP regular wave, SM smooth (slightly rippled), DS near proximal and distal : SP single chevron, SM smooth, DS near.

Tail Plate 15d

A. **Physical characteristics**

Total thickness (T) : 60.54 ± 0.12 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM slightly rippled, DS close; proximal : SP single chevro, SM slightly rippled, DS close; distal : SP regular wave, SM rippled, DS close

C. **Medulla**

Medulla configuration : wide medulla lattice; *Medulla thickness* : 58.5 ± 0.09 μm; *Medullar index* : 0.96 ± 0.01

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* large, divided medulla.

Genus ***Hylopetes*** Thomas, 1908

1908. *Hylopetes* Thomas, *Ann. Mag. Nat. Hist.*, (Ser. 8), **1** : 6

10. ***Hylopetes alboniger*** (Hodgson, 1836)
Particoloured flying squirrel

1836. *Sciuropterus alboniger* Hodgson, *J. Asiat.Soc. Bengal*, **5** : 231

Status CAMP : VU, DD (Globally)

Dorsal Plate 16a

A. **Physical characteristics**

Total thickness (T) : 50.5 ± 0.09 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM slightly rippled, DS near; proximal : SP single chevron, SM smooth, DS near; distal : SP regular wave, SM smooth, DS near.

Scale index : 2.8 ± 0.0 at mid, 1.8 ± 0.01 at distal, 2.0 ±0.0 at proximal

C. **Medulla**

Medulla configuration multiserial ladder; *Medulla thickness* : 49.2 ± 0.04 µm; *Medullar index* : 0.97 ± 0.0.

D. **Cross section**

Type of cross section circular, reniform; *Medulla size in cross section* : large.

Ventral Platee 16b

A. **Physical characteristics**

Total thickness (T) 21.4 ± 0.09 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS near; proximal : SP regular wave, SM smooth, DS near; distal :SP single chevron, SM smooth, DS near

C. **Medulla**

Medulla configuration : multiserial ladder; *Medulla thickness* : 19.9 ± 0.03 µm; *Medullar index* : 0.93 ± 0.03.

D. **Cross section**

Type of cross section circular; *Medulla size in cross section* large.

Head Plate 16c

A. **Physical characteristics**

Total thickness (T) 20.4 ± 0.10 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid SP regular wave, SM smooth, DS near; proximal SP regular wave, SM smooth, DS near; distal :SP single chevron, SM smooth, DS near

C. **Medulla**

Medulla configuration multiserial ladder; *Medulla thickness* 20.3 ± 0.06 µm; *Medullar index* : 0.99 ± 0.0.

D. **Cross section**

Type of cross section : reniform; *Medulla size in cross section* : large, divided medulla.

Tail Plate 16d

A. **Physical characteristics**

Total thickness (T) 60.6 ± 0.14 µm; *Shape and Nature* Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales. (DS) : at mid : SP regular wave, SM smooth, DS near; proximal, SP regular wave SM smooth, DS near; distal :SP regular wave, SM smooth, DS near.

C. Medulla

Medulla configuration : multiserial; *Medulla thickness* : 50.0 ± 0.0 μm; *Medullar index* : 0.82 ± 0.0.

D. Cross section

Type of cross section : oblong, reniform; *Medulla size in cross section* : large.

Hylopetes barberi barberi (Blyth, 1847)

1847. *Sciuropterus barberi* Blyth, *J. Asiat. Soc. Bengal.*, 16 : 866

Status : CAMP : DD (Nationally and Globally)

Dorsal Plate 17a

A. Physical characteristics

Total thickness (T) : 68.6± 0.15 μm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave,SM slightly rippled, DS near; proximal : SP single chevron, SM smooth, DS near; distal : SP single chevron, SM smooth, DS near.

Scale index : 7.0 ± 0.01at mid, 4.0 ± 0.0 at distal, 14 ± 0.0 at proximal.

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 68.18 ± 0.2 μm; *Medullar index* : 0.99 ± 0.1

D. Cross section

Type of cross section : oblong; *Medulla size in cross section* : large.

Ventral Plate 17b

A. Physical characteristics

Total thickness (T) : 30.0 ± 0.0 μm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM slightly rippled, DS near; proximal : SP single chevron, SM smooth, DS near; distal : SP single chevron, SM smooth DS near.

C. **Medulla**

Medullary configuration : narrow medulla lattice; *Medulla thickness* : 18.0 ± 0.0 µm; *Medullar index* : 0.60 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : medium.

Head Plate 17c

A. **Physical characteristics**

Total thickness (T) : 69.0 ± 0.14 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS distant; proximal : SP regular wave, SM slightly rippled, DS distant; distal : SP regular wave, SM slightly rippled, DS distant

C. **Medulla**

Medulla configuration wide medullalattice; *Medulla thickness* : 59.5 ±0.10 µm; *Medullar index* ; 0.86 ± 0.0.

D. **Cross section**

Type of cross section : oval; *Medulla size in cross section* : large.

Tail Plate 17d

A. **Physical characteristics**

Total thickness (T) : 69.6 ± 0.08 µm; *Shape and Nature* : Straight and thin.

B. **Surface stru**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP single chevron/regular wave, SM slightly rippled, DS near; proximal : SP regular wave, SM slightly rippled, DS near; distal : SP single chevron, SM slightly rippled/smooth, DS near.

C. **Medulla**

Medullary configuration : multiserial ladder; *Medulla thickness* : 67.7 ± 0.09 µm; *Medullary index* : 0.97 ± 0.0.

D. **Cross section**

Type of cross section : oblong. *Medulla size in cross section* : Large; *Fur hair* : Simple coronal, smooth and distant. Secondary Guard hair Single chevaron, smooth and distant.

Hylopetes fimbriatus (Gray, 1837)
Small Kashmir flying squirrel, Pygmy flying squirrel

1837. *Sciuropterus fimbriatus* Gray. *Ann. Mag. Nat. Hist.*, **1** : 584

Status : CAMP : LRnt (Nationally), DD (Globally)

Dorsal Plate 18a

A. **Physical characteristics**

Total thickness (T) : 60.45 ± 0.15 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM slightly rippled, DS close; proximal : SP regular wave, SM smooth, DS near; distal : SP single chevron, SM smooth, DS near.

Scale index : 2.6 ± 0.01 at mid, 1 7 ± 0.01 at distl, 3.2 ± 0.0 at proximal

C. **Medulla**

Medulla configuration : multiserial ladder; *Medulla thickness* : 58.3 ± 0.12 μm; *Medullar index* : 0.96 ± 0.1

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Ventral Plate 18b

A. **Physical characteristics**

: *Total thickness (T)* : 22.72 ± 0.26 μm

Shape and Nature : Straight and thin

B. **Surface structure** Scale pattern (SP), Scale margin (SM), distance between scales (DS) at mid : SP regular wave, SM smooth/slightly rippled, DS near; proximal : SP regular wave, SM slightly rippled, DS near; distal : SP regular wave, SM slightly rippled, DS near

C. **Medulla**

Medulla configuration : multiserial ladder; *Medulla thickness* : 12.7 ± 0.26 μm; *Medullar index* : 0.55 ± 0.2.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large; *Secondary guard hair* : Surface structure : single chevron. smoth, distant.

Head Plate 18c

Medulla multiserial ladder

Cuticular at distal : Single chevron, SM smooth, DS near; mid SP regular wave, SM smooth,DS near, proximal SP regular wave, SM rippled, DS near.

Tail Plate 18d

A. **Physical characteristics**

Total thickness (T) : 59.0 ± 0.3 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS distant; proximal : SP simple coronal, SM smooth, DS distant; distal : SP simple coronal, SM smooth, DS distant

C. **Medulla**

Medullary configuration : multiserial ladder; *Medulla thickness* : 57.18 ± 0.2 µm; *Medullary index* : 0.96 ± 0.2.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Hylopetes phyayeri (Blyth, 1859)
Phayer's flying squirrel

1859. *Sciuropterus phayeri Blyth., J. Asiat. Soc.* Bengal, **28** : 278.

Dorsal Plate 19a

A. **Physical characteristics**

Total thickness (T) : 40.18 ± 0.04 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP single chevron/regular wave, SM smooth, DS near; proximal : SP regular wave, SM smooh, DS near; distal : SP single chevron, SM smooth, DS near

Scale index : 5.0 ± 0.01 at mid, 2.2 ± 0.0 at distal, 3.2 ± 0.0 at proximal

C. **Medulla**

Medulla configuration : multiserial ladder; *Medulla thickness* : 39.0 ± 0.0 µm; *Medullar index* : 0.97 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Ventral Plate 19b

A. **Physical characteristics**

Total thickness (T) : 40.18 ± 0.06 µm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave/single chevron, SM smooth, DS near; proximal : SP single chevron, SM smooth, DS near; distal : SP single chevron, SM smooth, DS near

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 30.0 ± 0.03 μm; *Medullar index* : 0.75 ± 0.01

D. Cross section

Type of cross section : oblong; *Medulla size in cross section* : large.

Head Plate 19c

A. Physical characteristics

Total thickness (T) : 40.36 ± 0.67 μm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS close; proximal : SP regular wave, SM smooh, DS close; distal : SP regular wave, SM smooth, DS close.

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 38.6 ± 0.05 μm; *Medullar index* : 0.95 ± 0.05.

D. Cross section

Type of cross section : oblong, reniform; *Medulla size in cross section* : large.

Tail Plate 19d

A. Physical characteristics

Total thickness (T) : 48.6 ± 0.23 μm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS close; proximal : SP regular wave, SM smooh, DS close; distal : SP regular wave, SM smooth, DS close.

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 38.1 ± 0.25 μm; *Medullar index* : 0.78 ± 0.2.

D. Cross section

Type of cross section : circular; *Medulla size in cross section* : large

Key for identification of species of *Hylopetes* based on characteristics of primary guard hair

Dorsal

A. Medulla : Multiserial ladder 1, 2, 3, 4, 5, 6

1 Cross section : Circular, reniform, medulla large 3

2. Cross section : Oblong, large medulla 4, 5, 6

3. M/T 0.97 ± 0.0; Cuticular : at mid SP regular wave, SM slightly rippled, DS near; proximal SP single chevron, SM smooth, DS near; distal SP regular wave, SM smooth, DS near. *Scale index* 2.8 ± 0.0 at mid, 1.8 ± 0.01 at distal, 2.0 ± 0.0 at proximal ..... *Hylopetes alboniger* (Hodgson)

4. M/T 0.99 ± 0.1, Cuticular : at distal, mid and proximal SP single chevron, SM smooth, DS near; *Scale index* : 7.0± 0.01, 4.0± 0.0 at distal; 14.0 ± 0.0 at proximal ..... *Hylopetes barberi barberi* (Blyth)

5. M/T 0.96 ± 0.1, Cuticular : at mid SP regular wave, SM slightly rippled, DS close; at proximal SP regular wave, SM smooth, DS near; at distal SP single chevron, SM smooth, DS near. *Scale index* 2.6 ± 0.01 at mid, 1 7 ± 0.01 at distal,3.2 ± 0.0 at proximal ..... *Hylopetes fimbriatus* (Gray)

6. M/T 0.97 ± 0.0, Cuticular : at mid SP single chevron/regular wave, SM smooth,DS near; at proximal SP regular wave, SM smooth, DS near; at distal SP single chevron, SM smooth, DS near; *Scale index* : 5.0 ± 0.01 at mid, 2.2 ± 0.0 at distal, 3.2 ± 0.0 at proximal ..... *Hylopetes phyayeri* (Blyth)

Ventral

A. Multiserial ladder 1

B. Medulla : Narrow medulla lattice 2

1 M/T 0.93± 0.0; cross section : Circular, large medulla, Cuticular : at mid and proximal : SP regular wave, SM smooth, DS near; distal SP single chevron, SM smooth, DS near ..... *Hylopetes alboniger* (Hodgson)

2. Cross section : Oblong, medium 3, 4, 5

3. M/T 0.60 ± 0.0, Cuticular : at mid SP regular wave, SM slightly rippled, DS near; at proximal : SP sigle chevron, SM smooth,DS near; at distal SP single chevron, SM smooth, DS near ..... *Hylopetes barberi barberi* (Blyth)

4. M/T 0.55 ± 0.2; Cuticular at mid SP regular wave, SM smooth, DS near; at proximal SP regular wave, SM slightly rippled, DS near ..... *Hylopetes fimbriatus*(Gray)

5. M/T 0.75 ± 0.01, Cuticlar : at mid SP regular wave/single chevron, SM smooth, DS near; at proximal SP single chevron, SM smooth, DS near; at distal : SP single chevron, SM smooth, DS near ..... *Hylopetes phyayeri* (Blyth)

Head

A. Medulla : Multiserial ladder, cross section reniform, oblong, medulla large (divided). 1, 2, 3

B. Medulla : Wide medulla lattice, Cross section : Oval and large medulla 4

1 M/T 0.99± 0.0, Cuticular at mid SP regular wave, SM smooth, DS near; proximal SP regular wave, SM smooth, DS near; distal SP single chevron, SM smooth, DS near ..... *Hylopetes alboniger*(Hodgson)

2. M/T 0.9± 0.0; Cuticular : at distal single chevron, SM smooth, DS near; at mid SP regular wave, SM smooth, DS near; at proximal SP regular wave, SM rippled, DS near ..... *Hylopetes fimbriatus* (Gray)

3. M/T 0.95 ± 0.05, Cuticular at mid, proximal and distal SP regular wave, SM smooth, DS close ..... *Hylopetes phyayeri*(Blyth)

4. M/T 0,86± 0.0, Cuticular : at mid, distal and proximal SP regular wave, SM rippled, DS distant; at proximal and at distal SP regular wave, SM slightly rippled, DS distant ..... *Hylopetes barberi barberi* (Blyth)

Tail

A. Medulla : Multiserial ladder 1, 2

1 Cross section : Oblong, large medulla 3, 4, 5

2. Cross section Circular, large medulla 6

3. M/T 0.82 ± 0.01, Cuticulr : at mid, distal and proximal SP regular wave, SM smooth, DS near ..... *Hylopetes alboniger* (Hodgson)

4. M/T 0.97 ± 0.0; Cuticular at mid SP single chevron/regular wave, SM slightly rippled, DS near; at proximal SP regular wave, SM slightly rippled, DS near; at distal SP single chevron, SM slightly rippled/smooth, Ds near ..... *Hylopetes barberi barberi* (Blyth)

5. M/T 0.96 ± 0.2, at mid SP regular wave, SM smooth, DS distant; at proximal SP single coronal, SM smooth, DS distant; at distal SP single coronal, SM smooth, DS distant ..... *Hylopetes fimbriatus* (Gray)

6. M/T 0.78 ± 0.2; Cuticular at mid, proximal and distal : SP regular wave, SM smooth, DS close ..... *Hylopetes phyayeri* (Blyth)

Genus *Petaurista* Link, 1795

1795. *Petaurista* Link., *Zool. Beytr.*, 1(2) : 52, 78

Petaurista magnificus hodgsoni (Hodgson, 1836)
Hodgsoni's flying squirrel

1836 *Pteromys magnificus* Hodgson, *J. Asiat. Soc. Bengal*, **5** : 231

Status : LRnt, IWL (P) A : Schedule II (Part II).

Dorsal Plate 20a

A. **Physical characteristics**

Total thickness (T) : 80.9 ± 0.2 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS close; proximal : SP regular wave, SM smooth, DS close; distal SP regular wave, SM smooth, DS close.

Scale index : 4.3 ± 0.01 at mid, 4.25 ± 0.0 at distal.

C. **Medulla**

Medullary configuration : multiserial ladder; *Medulla thickness* : 60.9 ± 0.2 µm; *Medullary index* 0.75 ± 0.01.

D. **Cross section**

Type of cross section : concavoconvex; *Medulla size in cross section* : large.

Ventral Plate 20b

A. **Physical characteristics**

Total thickness (T) : 60.3 ± 0.08 µm; *Shape and Nature* Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; proximal, SP regular wave SM smooh, DS near; distal :SP regular wave, SM smooth, DS near

C. **Medulla**

Medulla configuration : multiserial ladder; *Medulla thickness* : 40.5 ± 0.0 µm; *Medullar index* : 0.67 ± 0.0.

D. **Cross section**

Type of cross section : reniform; *Medulla size in cross section* : medium sized.

Head Medulla : wide medulla lattice.

Tail Plate 20c and d

Medulla : multiserial lader

Cuticular : At mid : single chevron, SM slightly rippled, DS near; at proximal : SP regular wave, SM smooth, DS near; aAt distal : SP regular wave, SM smooth, DS near.

Petaurista nobilis singheri (Gray, 1842)

1842 *Pteromys nobilis* Gray, *Ann.Mag. Nat. Hist.*, **10** : *263*

Status : LRnt, CAMP : EN; IWL (P) A : Schedule II (Part II).

Dorsal Plate 21a

A. **Physical characteristics**

Total thickness (T) : 102 ± 0,46 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS close; proximal : SP regular wave, SM smooh, DS close; distal :SP single chevron/regular wave, SM smooth, DS close

Scale index : 5.3 ± 0.0 at mid, 5.0 ± 0.01 at proximal, 5 ± 0.0at distal

C. **Medulla**

Medullary configuration : multiserial ladder; *Medulla thickness* : 82.7 ± 0.46 μm.

D. **Cross section**

Type of cross section : oblong, circular; *Medulla size in cross section* : large.

Ventral Plate 21b

A. **Physical characteristics**

Total thickness (T) : 74.5 ± 0.9 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP single chevron/regular wave, SM smooth, DS close; proximal : SP single chevron, SM smooh, DS close; distal : SP single chevron, SM smooth, DS close.

C. **Medulla**

Medulla configuration : multiserial ladder; *Medulla thickness* : 64.5 ± 0.93 μm; *Medullar index* : 0.86 ± 0.01

D. **Cross section**

Type of cross section : oblong, circular; *Medulla size in cross section* : large.

Head Plate 21c

A. **Physical characteristics**

Total thickness (T) : 98.18 ± 0.4 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure** Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP single chevron, SM smooth, DS close; proximal : SP regular wave, SM smooh, DS close; distal :SP regular wave, SM smooth, DS close.

C. **Medulla**

Medulla configuration multiserial ladder; *Medulla thickness* : 92.2 ± 0.0 µm; *Medullar index* : 0.94 ± 0.01

D. **Cross section**

Type of cross section : oblong, circular; *Medulla size in cross section* : large.

Tail Plate 21d

A. **Physical characteristics**

Total thickness (T) : 42.5 ± 0.46 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth, DS close; proximal : SP regular wave, SM smooth, DS close; distal : SP regular wave, SM smooth, DS close

C. **Medulla**

Medulla configuration : wide medulla lattice; *Medulla thickness* : 38.6 ± 0.32 µm; *Medullar index* : 0.90 ± 0.02.

D. **Cross section**

Type of cross section : oblong, circular; *Medulla size in cross section* : large.

Petaurista philippensis (Elliot, 1839)
Indian Giant Flying squirrel

1839. *Petromys phillippensis Elliot.* Madras, *J. Litt. Sci.*, **10** : 217

Status : IWL (P) A : Schedule II.

Dorsal Plate 22a

A. **Physical characteristics**

Total thickness (T) : 60.0 ± 0.0 µm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS close; proximal : SP Irregular wave, SM rippled, DS close; distal : SP regular wave, SM smooth, DS close.

Scale index : 4 at mid, 12 at proximal, 4 at distal.

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 50.0 ± 0.0 μm; *Medullar index* : 0.83 ± 0.0.

D. Cross section

Type of cross section : oblong, circular; *Medulla size in cross section* : large.

Ventral Plate 22b

A. Physical characteristics

Total thickness (T) : 29.5 ± 0.15 μm; *Shape and Nature* :

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP single chevron, SM smooth, DS close; proximal : SP single chevron, SM smooh, DS close; distal :SP single chevron, SM smooth, DS close.

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 24.5 ± 0.15 μm; *Medullar index* : 0.83 ± 0.1

D. Cross section

Type of cross section : oblong, circular; *Medulla size in cross section* : large.

Head Plate 22 c

A. Physical characteristics :

Total thickness (T) : 43.6 ± 0.50 μm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP single chevron, SM smooth, DS close; proximal : SP single chevron, SM smooth, DS close; distal : SP single chevron, SM smooth, DS close.

C. Medulla

Medulla configuration : multiserial ladder; *Medulla thickness* : 33.6 ± 0.5 μm; *Medullar index* : 0.77 ± 0.02.

D. **Cross section**

Type of cross section : oblong, circular; *Medulla size in cross section* : large.

Tail Plate 22d

A. **Physical characteristics**

Total thickness (T) : 59.09 ± 0.2 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM smooth (slightly rippled), DS near; proximal : SP regular wave, SM smooth, DS near; distal : SP regular wave, SM smooth, DS near.

C. **Medulla**

Medullary configuration wide medulla lattice; *Medulla thickness* : 49.09 ± 0.2 µm *Medullar index* : 0.83 ± 0.01

D. **Cross section**

Type of cross section : oblong, circular; *Medulla size in cross section* : large.

Petaurista petaurista (Pallas)
Red Giant Flying squirrel

Status : IWL (P) A : Schedule II.

Dorsal Plate 23-24

A. **Physical characteristics**

Total thickness (T) : 60 ± 0.0 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP),Scale margin (SM), distance between scales (DS) : at mid SP regular wave, SM smooth to rippled, DS near; at dista; SP regular wave, SM smooth, DS near to close; proximal SP regular wave, SM smooth, DS near.

C. **Medulla**

Medullary configuration : wide aeriform lattice; *Medulla thickness* : 50.0 ± 0.0 µm; *Medullar index* : 0.83 ± 0.0.

D. **Cross section**

Type of cross section : oblong, circular; *Medulla size in cross section* : large.

Ventral Plate 25

A. **Physical characteristics**

Total thickness (T) : 50.0 ± 0.0 µm; *Shape and Nature* Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SPregular wave, SM smooth, DS near; proximal : SP regular wave, SM slightly rippled, DS near; distal : SP single chevron, SM scalloped margin, DS near.

C. **Medulla**

Medulla configuration wide aeriform lattice; *Medulla thickness* : 40 ± 0.0 μm; *Medullar index* : 0.8 ± 0.01

D. **Cross section**

Type of cross section : reniform, oblong; *Medulla size in cross section* : large.

Head Plate 26

A. **Physical characteristics**

Total thickness (T) : 60.0 ± 0.1 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM slightly rippled, DS near, proximal : SP regular wave, SM slightly rippled, DS near; distal : SP single chevron, SM scalloped, smooth, DS near.

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 50 ± 0.0 μm; *Medullar index* : 0.83 ± 0.0.

D. **Cross section**

Type of cross section : oblong, circular; *Medulla size in cross section* : large.

Tail

A. **Physical characteristics**

Total thickness (T) : 50.0 ± 0.0 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal, SP regular wave SM rippled, DS near; distal : SP regular wave, SM rippled DS near.

C. **Medulla**

Medulla configuration : wide medulla lattice; *Medulla thickness* : 40 ± 0.0 μm; *Medullar index* : 0.8 ± 0.0.

D. **Cross section**

Type of cross section : reniform,oblong, circular; *Medulla size in cross section* : large.

Key for identification of species of Genus *Petaurista* based on characteristics of primary guard hair

Dorsal

A. Medulla : multiserail ladder, large medulla ..... I, II

B. Medulla : wide aeriform lattice I

!. Cross section : oblong, circular 1, 2, 3

II. Cross section concovoconves 4

1 Medullary index M/T 0.8 ± 0.01; Cuticular at mid and proximal SP regular wave, SM smooth, DS close; at distal SP single chevron/regulr wave, SM smooth, DS close; *Scale index* 5.3 ± 0.0, at mid 5.0 ± 0.01; at proximal 6.0 ± 0.0 at distal .... *Petaurista nobilis singheri* (Gray)

2. Medullary index M/T 0.83 ± 0.0; Cuticular at mid and proximal SP regular wave, SM rippled, DS close; at distal SP regular wave, SM smooth, DS close .... *Petromys phillippensis* (Elliot)

3. Medullary index M/T 0.83 ± 0.01, Cuticular at distal SP regular wave, SM smooth, DS near to close, at mid SP regular wave, SM smooth to rippled, DS near, at proximal SP regular wave, SM smooth, DS near ..... *Petaurista petaurista* (Pallas)

4. Medullary index M/T 0.75 ± 0.01, Cuticular at mid, distal, proximal SP regular wave, SM smooth, DS close ..... *Petaurista magnificus hodgsoni* (Hodgson)

Ventral

A. Medulla : Multiserial ladder ..... I, II

I. Cross section : reniform, medium medulla 1

II. Cross section : Oblong, Circular with large medulla 2, 3

1 Medullary index M/T 0.67 ± 0.0, Cuticular at mid SP irregular wave, SM rippled, DS near; proximal SP regular wave, SM smooth, DS near; distal SP regular wave, SM smooth, DS near ..... *Petaurista magnificus hodgsoni* (Hodgsoni)

2. Medullary index M/T 0.86 ± 0.01; Cuticular at mid, distal and proximal SP single chevron, SM smooth, DS close ..... *Petarista nobilis singheri* (Gray)

3. Medullary inex M/T 0.83 ± 0.1, Cuticular at mid, distal and proximal : SP single chevron, SM smooth, DS close ..... *Petaurista phillippensis* Elliot

B. Medulla : Wide aeriform lattice 4

4. Medullary index : M/T0.8 ± 0.1; Cross section : reniform, oblong, large medulla; Cuticular at distal SP single chevron, SM scalloped margin, DS near; at mid SP regular wave, SM smooth, DS near; at proximal SP regular wave, SM slightly rippled, DS near ..... *Petaurista petaurista* (Pallas)

Head

Medulla : Multiserial ladder 1

Cross section Oblong, large medulla 1, 2

Medullary index : M/T 0.94 ± 0.01, Cuticular at mid, distal and proximal SP single chevron, SM smooth, DS close ..... *Petaurista nbilis singheri* (Gray)

Medullary index : M/T 0.77 ± 0.02, Cuticular at mid, proximal and distal SP single chevron, SM smooth, DS close ..... *Petaurista phillippensis* (Elliot)

Medulla Wide aeriform lattice, Cross section Reniform, Oblong with large medulla 3

Medullary index : M/T 0.8 ± 0.01 Cuticular at distal, mid and proximal SP Single chevron, SM scalloped smooth, DS near, mid SP regular wave, slightly rippled, near ..... *Petaurista petaurista* (Pallas)

Wide medulla lattice, Cross section Oblong, Circular and with large medulla 1, 2

Medullary index : M/T 0.90 ± 0.02,Cuticular at mid, proximal and distal SP regular wave, SM smooth, DS close ..... *Peaturista nobilis singheri* Gray

Medullary index : M/T 0.83 ± 0.01, Cuticular at mid, proximal and distal SP regular wave, SM smooth, DS near ..... *Petaurista phillippensis* (Elliot)

Wide aeriform lattice, Cross section : Reniform, oblong with large medulla 3

Medullary index 0.8 ± 0.0Cuticular : at, distal and proximal : SP regular wave, SM rippled, DS near ..... *Petaurista petaurista* (Pallas)

Order CARNIVORA

Family VIVERRIDAE Gray, 1821

Viverrids or civets can be distinguished from mustelids by the presence of unique civet gland. This is a modified skin gland that is functional in true civets and vestigial in palm civets. Civets differ from cats by having five toes on the hind feet and elongated face. Many viverrids have ringed tails while others are plain in colour.They differ from mongoose as they have large ears with bursa. Mongoose are carnivorous and insectivorous whereas civets are omnivorous eating fruits as well. Most civets are nocturnal while mongoose are diurnal. Mongoose are the most common of the three groups and the Grey Mongoose is the best-known species among them (Menon 2003).

Poaching of civets : Civet cats are rotated in drums as their terror causes secretions which are used to produce a civet fixative for perfumes. They are also murdered for food.

http ://www.msnbc.msn.com/id/1237116 : *The Associated Press, ET, Tues., April. 18, 2006.*

(For comparative study of hair (PGH) between Civet and Otter : See plate 28)

Genus *Arctictis* Temminck, 1824

1824. *Arctictis* Temminck, *Perspectus de Monographies deMammiferes*, : p. xxi

Arctictis binturong (Raffles, 1621)
Binturong or Bear Cat

1821 *Viverra binturong* Raffles, *Trans. Linn. Soc.* London, **13** : 253

Status : IWPA : Schedule I, Part I; RDB : EN; CITES : Appendix III; CAMP : DD (Nationally and Globally)

Dorsal Plate 29a

A. **Physical characteristics**

Profile and colour : long black, with cream coloured band at tips, tips black; *Total thickness (T)* : 109.5 ± 0.08 µm.

B. **Surface structure**

Scale pattern (SP), scale margin(SM), distance between scales (DS) : at mid, SP Irregular wave, SM less rippled, DS near; proximal and distal, SP Irrregular wave, SM rippled, DS near.

Scale index : 4.7 ± 0.01 at mid, 4.0 ± 0.0 at proximal, 2.0 ± 0.0 at distal

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 105.3 ± 0.06 µm; *Medullar index* : 0.96 ± 0.0.

D. **Cross section**

Type of cross section : concovoconvex; *Medulla size in cross section* : large.

Ventral Plate 29b

A. **Physical characteristics**

Profile and colour : long black,with creamish band at tips, tips black; *Total thickness (T)* : 159.5 ± 0.08 µm.

B. **Surface structure**

Scale pattern (SP), scale margin(SM), distance between scales (DS) : At mid, SP regular wave, SM rippled, DS near; proximal and distal, SP : regular wave, SM smooth, DS near.

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 151.3 ± 0.11 µm; *Medullar index* : 0.94 ± 0.1

D. **Cross section**

Type of cross section : concavo convex; *Medulla size in cross section* : large size, divided medulla.

Head Plate 29c

A. **Physical characteristics**

Profile and colour : small, black; *Total thickness (T)* : 140.7 ± 0.11 μm.

B. **Surface structure**

Scale pattern (SP), scale margin(SM), distance between scales (DS) : at mid, SP regular wave, SM rippled, DS near; proximal and distal, SP : regular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 135.5± 0.05 μm; *Medullar index* : 0.96 ± 0.01

D **Cross section**

Type of cross section : circular, oblong, few concavo convex; *Medulla size in cross section* : large.

Tail Plate 29d

A. **Physical characteristics**

Profile and colour : long black,with creamish band at tips, tips black; *Total thickness (T)* : 129.3 ± 0.13 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid, SP regular wave, SM less rippled, DS near; proximal and distal, SP :regular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 120.4 ± 0.08 μm; *Medullar index* : 0.93 ± 0.02.

D. **Cross section**

Type of cross section : oblong, concavoconvex; *Medulla size in cross section* : large (with divided medulla).

Genus ***Paguma*** Gray, 1831

Paguma larvata (Hamilton-Smith)

1827. *Gulo larvatus* Hamilton-Smith, In : Griffith *et al.*, *Anim Kingdom*, **2** : 281

Dorsal Plate 30a

A. **Physical characteristics**

Profile and colour : long with wavy ends; black tip, cream band towards black tip rest black; *Total thickness* : 90.5 ± 0.10 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid, SP Irregular wave, SM rippled, DS near; proximal SP Irregular wave, SM rippled, DS near and distal, SP : Irregular wave, SM rippled, DS near.

Scale index : 5.0 ± 0.0 at mid, 3.0 ± 0.0 at proximal, 1.3 ±0.1at distal.

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 70.4 ± 0.08 µm; *Medullar index* : 0.77 ± 0.0.

D. **Cross section**

Type of cross section : circular; *Medulla size in cross section* : large.

Ventral

A. **Physical characteristics** **Plate 30b**

Profile and colour : long, light cream at tip, mid black, rest cream; *Total thickness (T)* : 70.2 ± 0.07 µm.

B. **Surface structure**

Scale pattern (SP), scale margin(SM), distance between scales (DS) : at mid, SP Irregular wave, SM rippled, DS near; proximal SP Irregular wave, SM rippled, DS near and distal, SP : Irregular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 60.4 ± 0.06 µm; *Medullar index* : 0.86 ± 0.03.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Head Plate 30c

A. **Physical characteristics**

Profile and colour : long, tip black, light band after black tip rest beige; *Total thickness (T)* : 60.3 ± 0.06 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid, SP Irregular wave, SM rippled, DS close; proximal SP Irregular wave, SM rippled, DS close and distal, SP : Irregular wave, SM rippled, DS close.

C. **Medulla**

Medullary configuration : wide aeriform lattice; *Medulla thickness* : 30.8 ± 0.08 µm; *Medullary index* : 0.50 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : medium.

Tail Plate 30d

A. **Physical characteristics**

Profile and colour : long, thin, wavy; *Total thickness (T)* : 80.2 ± 0.06 µm.

B. **Surface structure**

Scale pattern (SP), scale margin(SM), distance between scales (DS) : at mid, SP Irregular wave, SM slightly rippled, DS near; proximal SP regular wave, SM smooth, DS near and distal, SP : regular wave, SM smooth, DS near.

C. **Medulla**

Medullary configuration : wide aeriform lattice; *Medulla thickness* : 40.1 ± 0.03 µm; Medullary index :0.50 ± 0.01

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : medium.

Genus ***Paradoxurus*** Cuvier, 1821

1821. *Paradoxurus* Cuvier, In : E. Geoffroy Saint Hillaire and F.G. Cuvier, *Hist. Nat. Mammiferes*, pt. **2**, **3**(24) : 15 Martredes Palmiers' and pl. 186

Paradoxurus jerdoni caniscus Blanford, 1885
Jerdon's palm civet

1885. *Paradoxurus jerdoni* Blanford, *Proc. Zool.soc. London*, : 613

Status : IWPA : Schedule II, Part II; CITES : Appendix III, CAMP : VU

Dorsal Plate 31a

A. **Physical characteristics**

Profile and colour : Straight, tip black, rest beige, few hair uniformly black; *Total thickness (T)* : 40.0 ± 0.0 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid, SP Irregular wave, SM rippled, DS near; proximal SP regular wave, SM smooth, DS near and distal, SP : regular wave, SM smooth, DS near.

Scale index : 7.0 ±0.0 at mid, 5.0 ±0.0at proximal, 4.25 ± 0.0at distal.

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 30.0 ± 0.0 µm; *Medullar index* : 0.75 ± 0.0.

D. **Cross section**

Type of cross section : circular; *Medulla size in cross section* : large.

Ventral Plate 31b

A. **Physical characteristics**

Profile and colour : straight, light beige; *Total thickness (T)* : 60.2 ± 0.06 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid, SP Irregular wave, SM rippled, DS near; proximal SP Irregular wave, SM rippled, DS near and distal, SP : Irregular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 20.1 ± 0.03 µm; *Medullar index* : 0.33 ± 0.03.

D. **Cross section**

Type of cross section oblong; *Medulla size in cross section* : large.

Head Plate 31c

A. **Physical characteristics**

Profile and colour Straight, black, thin; *Total thickness (T)* : 90.5 ± 0.10 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid, SP regular wave, SM sooth/less rippled, DS near; proximal SP transitional/regular wave, SM smooth, DS near (transitional) and distal, SP : regular wave, SM smooth, DS near.

C. **Medulla**

Medullary configuration : wide aeriform lattice; *Medulla thickness* : 60.2 ± 0.06 µm; *Medullary index* : 0.66 ± 0.03.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : medium.

Tail Plate 31d

A. **Physical characteristics**

Profile and colour : Wavy, beige; *Total thickness (T)* : 80.2 ± 0.06 µm.

B. **Surface structure**

Scale pattern (SP), scale margin(SM), distance between scales (DS) : At mid, SP regular wave, SM smooth, DS near; at proximal SP regular wave, SM rippled, DS near and distal, SP : regular wave, SM less rippled, DS near.

C. **Medulla**

Medullary configuration : wide aeriform lattice; *Medulla thickness* : 40.1 ± 0.03 μm; *Medullar index* : 0.50 ± 0.0.

D. **Cross section**

Type of cross section : oblong, reniform; *Medulla size in cross section* : medium.

Paradoxurus hermaphroditus (Pallas, 1777)

1777. *Viverra hermaphroditus* Pallas, In Schreber., *Die Sagethiere*, 3(25) : 426.

Status : IWPA : Schedule II, Part II; CAMP : LRlc (Nationally), DD (Globally)

Dorsal Plate 32a

A. **Physical characteristics**

Profile and colour : Wavy, with black; *Total thickness (T)* : 120.4 ± 0.09 μm.

B. **Surface structure**

Scale pattern (SP), scale margin(SM), distance between scales (DS) : At mid, SP regular wave, SM rippled, DS near; at proximal SP regular wave, SM rippled, DS near and distal, SP : regular wave, SM rippled, DS near.

Scale index : 9.0 ±0.0 at mid, 7.0 ±0.01at proximal, 5.0 ± 0.02 at distal

C. **Medulla**

Medullary configuration : wide aeriform lattice; *Medulla thickness* : 60.1 ± 0.03; *Medullar index* : 0.5 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : medim.

Ventral Plate 32 b

A. **Physical characteristics**

Profile and colour : straight, light cream, black bands towards tips; *Total thickness (T)* : 40.4 ± 0.06 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid, SP regular wave, SM rippled, DS near; proximal SP regular wave, SM rippled, DS near and distal, SP : regular wave, SM rippled, DS near.

C. **Medulla**

Medullary configuration : wide aeriform lattice; *Medulla thickness* : 10.0 ± 0.0 μm; Medullary index : 0.25 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Head Plate 32c

A. **Physical characteristics**

Profile and colour : straight, small, black; *Total thickness (T)* : 90.1 ± 0.06 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid, SP regular wave, SM rippled, DS near; proximal SP regular wave, SM rippled, DS near and distal, SP : regular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : wide medulla lattice; *Medulla thickness* : 80.2 ± 0.04 µm; *Medullar index* : 0.90 ± 0.02.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large; Secondary guard hair with uniserial ladder (medulla type).

Tail Plate 32d

A. **Physical characteristics**

Profile and colour : long, wavy, black; *Total thickness (T)* : 50.0 ± 0.0 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : At mid, SP Irregular wave, SM rippled, DS near; at proximal SP regular wave, SM rippled, DS near and distal, SP : regular wave, SM rippled, DS near.

C. **Medulla**

Medullary configuration : wide aeriform lattice; *Medulla thickness* : 40.1 ± 0.03 µm; *Medullary index* : 0.80 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Genus ***Viverra*** Linnaeus, 1758

1758. *Viverra Linnaeus.*, *Syst. Nat.* 10th ed.,**1** : 43

Viverra indica (Desmarest, 1804) Plate 28

1804. *Viverra indica* Desmarest, *Tabl. Meth. Hist.Nat.*, In *Nouv. Dict. Hist. Nat.*, **24** : 9, 17.

Status : IWPA : Schedule II; RDB : EN; CITES : Appendix III; CAMP : CR (Nationally).

Dorsal plate 33a

A. **Physical characteristics**

Profile and colour : black and beige banded; *Total thickness (T)* : 120.0 ± 0.05 μm.

B. **Surface structure**

Scale pattern (SP), scale margin(SM), distance between scales (DS) : at mid, SP Irregular wave, SM smooth/less rippled, DS near; towards proximal SP Irregular wave, SM less rippled, DS near, at proximal transitional, SM smooth, DS near and distal, SP : Irregular wave, SM less rippled, DS near.

Scale index : 6.6 ± 0.0 at mid, 2.6 ± 0.01 at proximal, 9.0 ±0.01 at distal.

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 90.0 ± 0.0 μm; *Medullar index* : 0.75 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : large.

Ventral Plate 33b

A. **Physical characteristics**

Profile and colour : light brown, small size; *Total thickness (T)* : 160.0 ± 0.0 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid, SP Irregular wave, SM rippled, DS close; at proximal SP Irregular wave, SM rippled, DS close and distal, SP : Irregular wave, SM rippled, DS close.

C. **Medulla**

Medulla configuration : Wide aeriform lattice; *Medulla thickness* : 100.0 ± 0.0 μm; *Medullar index* : 0.60 ± 0.0.

D. **Cross section**

Type of cross section : oblong; *Medulla size in cross section* : medim.

Head Plate 33 c

A. **Physical characteristics**

Profile and colour : Few completely black and other banded with black and beige bands; *Total thickness (T)* : 35.0 ± 0.10 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid, SP Irregular wave, SM rippled DS near; proximal SP transitional/regular wave, SM smooth, DS near and distal, SP : regular wave, SM rippled, DS near

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 25.0 ± 0.02 µm; *Medullar index* : 0.71 ± 0.01

D. **Cross section**

Type of cross section : oblong, reniform; *Medulla size in cross section* : large.

Tail Plate 33d

A. **Physical characteristics**

Profile and colour : dark brown; *Total thickness (T)* : 100.1 ± 0.01 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid, SP Irregular wave, SM rippled, DS near; proximal SP regular wave, SM rippled, DS near and distal, SP : regular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 51 1 ± 0.20 µm; *Medullar index* : 0.51 ± 0.02.

D. **Cross section**

Type of cross section : circular; *Medulla size in cross section* : large.

Viverra zibetha Linnaeus, 1758
Large Indian Civet

1758. *Viverra zibetha* Linnaeus, *Syst. Nat. 10th ed.*, **1** : 44

Status : IWPA : Schedule II; RDB : EN; CITES : Appendix III; CAMP : CR (Nationally).

Dorsal Plate 34a

A. **Physical characteristics**

Profile and colour : black and beige banded; *Total thickness (T)* 110.5 ± 0.15 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : At mid, SP regular wave, SM smooth/less rippled, DS near; at proximal SP Irregular wave, SM less rippled, DS near and distal, SP : Irregular wave, SM less rippled, DS near.

Scale index : 2.2 ± 0.0 at mid, 2.4 ± 0.01 at proximal, 2.3 ±0.01 at distal.

C. **Medulla**

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 90.0 ± 0.0 µm; *Medullar index* : 0.81 ± 0.0.

D. Cross section

Type of cross section : oblong; *Medulla size in cross section* : large.

Ventral Plate 34b

A. Physical characteristics

Profile and colour : light brown, small size; *Total thickness (T)* : 60.0 ± 0.0 μm.

B. Surface structure

Scale pattern (SP), scale margin(SM), distance between scales (DS) : at mid, SP regular wave, SM rippled, DS near; proximal SP regular wave, SM smooth, DS near and distal, SP : regular wave, SM smooth, DS near.

C. Medulla

Medulla configuration : wide aeriform lattice; *Medulla thickness* : 40.0 ± 0.0 μm; *Medullar index* : 0.67 ± 0.0.

D. Cross section

Type of cross section : oblong; *Medulla size in cross section* : large.

Head Plate 34c

A. Physical characteristics

Profile and colour : Few completely black and other banded with black and beige bands; *Total thickness (T)* : 80.5 ± 0.10 μm.

B. Surface structure

Scale pattern (SP) , scale margin(SM), distance between scales (DS) : at mid, SP regular wave, SM smooth, DS near; proximal SP transitional/regular wave, SM rippled, DS near and distal, SP : regular wave, SM smooth, DS near (pattern changes to transitional type towards base of hair)

C. Medulla

Medullary configuration : wide aeriform lattice; *Medulla thickness* : 60.2 ± 0.06 μm; *Medullary index* : 0.74 ± 0.03.

D. Cross section

Type of cross section : oblong, reniform; *Medulla size in cross section* : large.

Tail Plate 34d

A. Physical characteristics

Profile and colour : dark brown; *Total thickness (T)* : 60.1 ± 0.03 μm.

Table-5. Comparative data of cuticular architecture fom head, tail, ventral and dorsal regions

Species	Dorsal	Ventral	Head	Tail
Paradoxurus hermaphroditus (Pallas)	regular wave, rippled, near throughout	M : Irregular wave, rippled, near B & T : regular wave, rippled, near	regular wave, rippled, near throughout	regular wave, rippled, near throughout
Viverra zibetha Linn.	Regular wave, smooth, near with transitional type to regular wave, rippled, near towards base	Regular wave, rippled, near throughout	M : regular wave, rippled, near B & T regular wave, smooth, near	M : regular wave, smooth, near B & T : irregular wave, rippled, near
Paradoxurus jerdoni Blanford	T Regular wave, smooth, near B transitional type M regular wave, rippled and near	M : regular wave, smooth, near B &T regular wave, rippled, near	Irregular wave, rippled, near throughout	M : irregular wave, rippled, near B & T regular wave, smooth, near
Paguma larvata (Hamilton-Smith)	Irregular wave, rippled, close	B & M Irregular wave, rippled, near T regular wave, smooth, near	Irregular wave, rippled, near	Irregular wave, rippled, near
Arctictis binturong (Raffles)	Regular wave, rippled, near	Regular wave, rippled, near (less rippled at mid)	M regular wave, rippled, near B & T regular wave, smooth, near	Irregular wave (less rippled at mid), rippled, near
B : Proximal, Tdistal, M : mid				

B. Surface structure

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid, SP regular wave, SM rippled, DS near; proximal SP regular wave, SM rippled, DS near and distal, SP : regular wave, SM rippled, DS near.

C. Medulla

Medullary configuration : wide aeriform lattice; *Medulla thickness* : 51.1 ± 0.20 μm; *Medullary index* : 0.85 ± 0.02.

D. Cross section

Type of cross section : circular; *Medulla size in cross section* : large.

Key for identification of the species based on characteristics of primary guard hair

Dorsal

1. Medulla : Wide aeriform lattice ..... A, B, C

A. Cross section types : Oblong, large size medulla 1, 2

B. Cross section types : Circular with medium sized medulla 3, 4

C. Cross section types : Concavoconvex with large medulla 5

1 Cuticular pattern : regular wave, with rippled margin, near throughout hair length ... . *Paradoxurus hermaphroditus* (Pallas)

2. Cuticular pattern : at mid regular wave, smooth, near;proximal and distal irregular wave, rippled, near ..... *Viverra zibetha* Linnaeus

3. Cuticular pattern : at mid irregular wave, rippled, near; proximal and distal : regular wave, smooth, near ..... *Paradoxurus jerdoni* Blanford

4. Cuticular pattern : Irregular wave, rippled, near .... *Paguma larvata* (Hamilton-Smith)

5. Cuticular pattern : irregular wave, rippled, near ..... *Arctictis binturong* (Raffles)

Ventral

A. Medulla : Wide aeriform lattice, Medulla large size 1, 2

1 Cross section : Concavoconvex 3

2. Cross section : Oblong 4, 5, 6, 7, 8

3. M/T 0.94 ± 0.1, Medulla divided, Cuticular at mid SP regular wave, SM rippled, DS near; at proximal and distal SP regular wave, SM smooth, DS near .... *Arctictis binturong* (Raffles)

4. M/T 0.86 ± 0.0, Cuticular at mid,distal and proximal SP irregular wave, SM rippled, DS near ..... *Paguma larvata* (Hamilton smith)

5. M/T 0.33 ± 0.0, medium medulla; Cuticular : at mid, proximal and distal SP irregular wave, SM rippled, DS near ..... *Paradoxurus jerdoni* Blandford

6. M/T 0.25 ± 0.0, medium medulla, Cuticular : at mid, proximal and distal SP regular wave, SM rippled, DS near ..... *Paradoxurus hermaphroditus* (Pallas)

7. M/T 0.60 ± 0.0, medium medulla; Cuticular at mid, distal and proximal SP irregular wave, SM rippled, DS close ..... *Viverra indica* Desmarest

8. M/T 0.67 ± 0.0, Cuticular at mid SP regular wave, SM rippled, DS near; at proximal & distal SP regular wave, SM smooth, DS near .... *Viverra zibetha* Linnaeus

Head

A. Medulla : Wide aeriform lattice ..... B

B. Cross section : Circular/oblong/concavoconvex/reniform 1, 2, 3, 4, 5, 6

1. M/T 0.96 ± 0.0, large medulla, Cuticular at mid : distal and proximal SP irregular wave, SM rippled, DS near ..... *Arctictis binturong* (Raffles)

2. M/T 0.56 ± 0.0, medium medulla, Cuticular : at mid : SP regular wave, SM sooth/less rippled, DS near; proximal : SP transitional/regular wave, SM smooth, DS near (transitional) and distal : SP regular wave, SM smooth, DS near .... *Paguma larvata* (Hamilton smith)

3. M/T 0.66 ± 0.0, medium medulla, Cuticular : at mid, proximal, distal, SP regular wave, SM rippled, DS near ..... *Paradoxurus jerdoni* Blanford

4. M/T 0.90 ± 0.0, large medulla; Cuticular : SP regular wave, SM rippled, DS near throughout ..... *Paradoxurus hermaphroditus* (Pallas)

5. M/T 0.71±0.0, Cuticular at mid : SP Irregular wave, SM rippled DS near; proximal SP transitional/regular wave, SM smooth, DS near and distal : SP : regular wave, SM rippled, DS near ..... *Viverra indica* Desmarest

6. Medulla large, M/T 0.74 ± 0.0; at mid, SP regular wave, SM smooth, DS near; proximal : SP transitional/regular wave, SM rippled, DS near and distal : SP regular wave, SM smooth, DS near (pattern changes to transitional type towards base of hair) ..... *Viverra zibetha* Linnaeus

Tail

A. Medulla : Wide aeriform lattice 1, 2, 3

1 Cross section : Oblong, Concavoconvex, large (with divided medulla) 1a,1b

2. Cross section : Oblong, medium 2a

3. Cross section : Oblong, reniform, medium 3a

4. Cross section : Circular, large 4a, 4b

1a. Medullary index : M/T 0.93 ± 0.02, Cuticular : at mid : SP regular wave, SM less rippled, DS near; at proximal and distal : SP regular wave, SM rippled, DS near .... *Arctictis binturong* (Raffles)

1b. Medullary index M/T 0.80 ± 0.0, Cuticular : at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP regular wave, SM rippled, DS near and distal : SP regular wave, SM rippled, DS near ..... *Paradoxurus hermaphroditus* (Pallas)

2a. Medullary index M/T 0.50 ± 0.0, CS also of concavoconvex type, Cuticular : at mid: SP Irregular wave, SM slightly rippled, DS near; at proximal : SP regular wave, SM smooth, DS near and distal : SP regular wave, SM smooth, DS near .... *Paguma larvata* (Hamilton smith)

3a. Medullary index M/T 0.50 ± 0.0, Cuticular : at mid : SP regular wave, SM smooth, DS near; at proximal : SP regular wave, SM rippled, DS near and distal : SP regular wave, SM less rippled, DS near ..... *Paradoxurus jerdoni* Blandford

4a. Medullary index M/T 0.51 ± 0.0, Cuticular : at mid : SP regular wave, SM rippled, DS near; at proximal : SP regular wave, SM rippled, DS near and distal, SP : regular wave, SM rippled, DS near ..... *Viverra indica* Desmarest

4b. Medullary index M/T 0.85 ± 0.0, Cuticular : at mid : SP regular wave, SM rippled, DS near; at proximal : SP regular wave, SM rippled, DS near and distal : SP regular wave, SM rippled, DS near ..... *Viverra zibetha* Linnaeus

Family MUSTELIDAE Fischer, 1817

Mustelids are the group comprising badgers, otters, weasels and martens. They are characterized by unique dentition i.e. loss of fourth upper molar and no carnassial notch on the upper pre-molar) and an enlarged anal sac They differ from wild cats in having non-retractile claws. The presence of anal glands and a well developed first digit on the forefeet distinguishes them from canids. They have long cylindrical body and short limb. There are three sub families of mustelids present in India : Melinae, Mustelinae and Lutrinae. The sub family Melinae or badgers and ferret badgers are the largest of the mustelids. The sub family Lutrinae or otters are adapted to an aquatic or semi–aquatic existence and to a piscivorous diet. They have thick waterproof fur. The broad, paddle shaped tail and partially webbed feet are an adaptations for aquatic or semi aquatic habitat. Most mustelids live solitary or in pair while otters live in close-knit families. The sub family Mustelinae comprised of weasels, martens and polecats, which are terrestrial and partly have arboreal life. Martens are large in size with thick bushy tail and well separated pointed ears. Weasels and polecats have round ears that do not protrude above the head (Menon, 2003).

Genus ***Lutra*** Brunnich, 1771

1771. *Lutra* Brunnich, *Zool. Fundamenta*, : p. 34, 42.

Lutra lutra (Linnaeus 1758)
Common otter

1758. *Mustela lutra* Linnaeus, *Syst. Nat.*, 10th *ed.*,**1** : 45.

Status : IPWA Schedule II; CITES : Appendix I; DD (Globally).

Dorsal Plate 35a

A. **Physical characteristics**

Profile and colour : thin straight, with light and dark brown bands; *Total thickness (T)* : 140.0 ± 0.0 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : At mid : SP Irregular wave, SM rippled, DS close; at proximal : SP diamond petal, SM smooth, DS distant and distal : SP Irregular wave, SM rippled, DS near.

Scale index : 4.0 ± 0.01 at mid, 5.3 ± 0.0 at distal

C. **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 69.8 ± 0.04 µm; *Medullar index* : 0.50 ± 0.01

D. **Cross section**

Type of cross section circular and elliptical; *Medulla size in cross section* : medium sized.

Ventral Plate 35b

A. **Physical characteristics**

Profile and colour : small, straight and thick, beige; *Total thickness (T)* : 117.3 ± 0.4 µm.

B. **Surface structure** scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; proximal and distal : SP Irregular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 50.7 ± 0.11 µm; *Medullar index* 0.43 ± 0.01

D. **Cross section**

Type of cross section : circular and elliptical; *Medulla size in cross section* : medium.

Head Plate 35c

A. **Physical characteristics**

Profile and colour : very small, thin with light and dark brown bands; *Total thickness (T)* : 99.9 ± 0.03.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : At mid, SP regular wave, SM rippled, DS distant; at proximal and distal, SP : regular wave, SM rippled, DS distant.

C. **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 49.8 ± 0.06 μm; *Medullar index* : 0.49 ± 0.02.

D. **Cross section**

Type of cross section : circular and ellipical; *Medulla size in cross section* : medium.

Tail Plate 35d

A. **Physical characteristics**

Profile and colour : banded with yellow and black bands; *Total thickness (T)* : 159.4 ± 0.09 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : At mid : SP regular wave, SM rippled, DS distant; at proximal and distal : SP regular wave, SM rippled, DS distant.

C. **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* 79.1 ± 0.46 μm; *Medullar index* : 0.49 ± 0.03.

D. **Cross section**

Type of cross section : circular and elliptical; *Medulla size in cross section* : medium.

Lutrogale perspicillata (I. Geoffrey Saint Hillaire, 1826)

1826. *Lutra perspicillata* I. Geoffroy Saint-Hillaire, In : *Bory de Saint-Vincent, Dict.Class. Hist. Nat. Paris,* **9** : 519.

Status IPWA : Schedule II, Part II; CITES :Appendix II; CAMP : NE

Dorsal Plate 36a

A. **Physical characteristics**

Profile and colour : small, light brown; *Total thickness (T)* : 89.7 ± 0.06 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near; distal : SP regular wave, SM smooth, DS near.

Scale index : 7.0 ± 0.01 at mid, 4.0 ± 0.0 at proximal, 3.3 ± 0.0 at distal

C. **Medulla**

Medullary configuration : wide aeriform lattice; *Medulla thickness* : 50.0 ± 0.0 μm; Medullary index : 0.55 ± 0.02.

D. **Cross section**

Type of cross section : circular; *Medulla size in cross section* : medium sized.

Ventral Plate 36b

A. **Physical characteristics**

Profile and colour : small, light brown; *Total thickness (T)* : 108.5 ± 0.47 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM slightly rippled/smooth, DS near; proximal and distal : SP Irregular wave, SM rippled, DS close.

C. **Medulla**

Medulla configuration : narrow medulla lattice; *Medulla thickness* : 69.6 ± 0.06 μm; *Medullar index* : 0.64 ± 0.03.

D. **Cross section**

Type of cross section : circular; *Medulla size in cross section* : large.

Head Plate 36c

A. **Physical characteristics**

Profile and colour : small, brown; *Total thickness (T)* : 99.7 ± 3.5 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near; distal : SP regular wave, SM smooth, DS near.

C. **Medulla**

Medulla configuration Narrow medulla lattice; *Medulla thickness* : 59.9 ± 0.03 μm; *Medullar index* : 0.60 ± 0.02.

D. Cross section

Type of cross section : oblong; *Medulla size in cross section* : medium.

Tail Plate 36d

A. Physical characteristics

Profile and colour : small, beige; *Total thickness (T)* : 113.0 ± 0.48 µm.

B. Surface structure

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; proximal : SP transitional, SM smooth, DS near and distal : SP regular wave, SM smooth, DS near.

C. Medulla

Medullary configuration : Narrow medulla lattice; *Medulla thickness* : 72.0 ± 0.42 µm; *Medullary index* : 0.64 ± 0.03.

D. Cross section

Type of cross section : circular; *Medulla size in cross section* : large.

Genus ***Arctonyx*** Cuvier, 1825

Arctonyx collaris Cuvier, 1852

Hog badger

1825. *Arctonyx collaris* Cuvier., In : E. Geoffroy Saint-Hillaire and F.G. Cuvier, *Hist. Nat. Mammiferes*, pt. 3, 5(51), 'Bali-Saur" 2pp

Status : IPWA : Schedule I, Partt I; CAMP : DD (Nationally), DD (Globally).

Dorsal plate 37

A. Physical characteristics

Profile and colour : long, light and dark brown bands; *Total thickness (T)* : 158.7 ± 0.16 µm.

B. Surface structure

Scale pattern (SP), scale margin(SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; proximal : SP transitional SM smooth DS near and distal : SP Irregular wave, SM rippled, DS near.

Scale index : 3.8 ± 0.0 at mid

C. Medulla

Medullary configuration : Narrow medulla lattice; *Medulla thickness* : 80.0 ± 0.04 µm; *Medullar index* : 0.5 ± 0.0.

D. **Cross section**

Type of cross section : Circular and elliptical; *Medulla size in cross section* : medium sized.

Ventral

A. **Physical characteristics**

Profile and colour : long brown hair; *Total thickness (T)* : 149.8 ± 0.11 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; proximal SP transitional SM smooth DS near and distal : SP Irregular wave, SM rippled, DS near.

C **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 20.0 ± 0.0 µm; *Medullar index* : 0.13 ± 0.01

D. **Cross section**

Type of cross section : circular; *Medulla size in cross section* : small.

Head

A. **Physical characteristics**

Profile and colour : long, banded with light brown and dark brown bands; *Total thickness (T)* : 118.5 ± 0.1 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; proximal : SP transitional SM smooth DS near and distal : SP Irregular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 40.0 ± 0.0 µm; *Medullar index* : 0.34 ± 0.0.

D. **Cross section**

Type of cross section : circular and elliptical; *Medulla size in cross section* : medium.

Tail

A. **Physical characteristics**

Profile and colour : long, beige; *Total thickness (T)* : 148.7 ± 0.14 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; proximal : SP transitional SM smooth DS near and distal : SP Irregular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 60.1 ± 0.03 μm; *Medullar index* : 0.40 ± 0.01

D. **Cross section**

Type of cross section : circular and elliptical; *Medulla size in cross section* : medium.

Genus ***Millivora*** Storr, 1780

1780 *Mellivora* Storr, *Prodr. Meth. Mamm.*, p. 34, Table A

Mellivora capensis Schreber, 1776

1776. *Viverra capensis* Schreber, *Die Saugthiere*, **3**(18) : Pl. **125**(1776) : text, **3**(26) : **450**(1771)

Dorsal Plate 38

A. **Physical characteristics**

Profile and colour : long, thin, black, beige; *Total thickness (T)* : 119.6 ± 0.09 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS close; at proximal : SP transitional/regular wave SM smooth DS near and distal : SP Irregular wave, SM rippled, DS near.

Scale index 7.0 ± 0.01 at mid, 1.0 ± 0.0 at proximal and 2.0 ±0.0 at distal

C. **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 60.0 ± 0.0 μm; *Medullar index* : 0.50 ± 0.0.

D. **Cross section**

Type of cross section : Circular and elliptical; *Medulla size in cross section* : medium sized.

Ventral

A. **Physical characteristics**

Profile and colour : long, dark brown; *Total thickness (T)* : 98.9 ± 0.13 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS close; at proximal : SP transitional /regular wave SM smooth DS near and distal : SP Irregular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 60.0 ± 0.0 μm; *Medullar index* : 0.60 ± 0.01

D. **Cross section**

Type of cross section : Circular and elliptical; *Medulla size in cross section* : medium.

Head

A. **Physical characteristics**

Profile and colour : long, beige; *Total thickness (T)* : 92.0 ± 0.42 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS close; proximal : SP transitional/regular wave SM smooth DS near and distal : SP Irregular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 30.2 ± 0.06 µm; *Medullar index* : 0.33 ± 0.02.

D. **Cross section**

Type of cross section : Circular; *Medulla size in cross section* : small.

Tail

A. **Physical characteristics**

Profile and colour : long, black; *Total thickness (T)* : 168.7 ± 0.31 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS close; proximal : SP transitional/regular wave SM smooth DS near and distal : SP Irregular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : Narow medulla lattice; *Medulla thickness* : 80.2 ± 0.06 µm; *Medullar index* : 0.47 ± 0.02.

D. **Cross section**

Type of cross section circular and elliptical; *Medulla size in cross section* : medium.

Genus ***Amblonyx*** Rafinesque, 1832

Amblonyx cinereus (Illiger,1815)

Small clawed otter

1815 *Lutra cinereus* Illiger, *Abh. Phys. Klasse K. Preuss. Akad. Wiss.*, 1804-1811 : **99**

Status : CITES : Appendix II; CAMP : NE (Nationally), DD (Globally).

Dorsal Plate 39

A. **Physical characteristics**

Profile and colour : Thin, straight and beige; *Total thickness (T)* : 109 .6 ± 0.08 µm.

B. Surface structure

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS distant and distal : SP regular wave, SM rippled, DS near.

Scale index : 7.0 ± 0.0 at mid, 13.0 ± 0.01

C. Medulla

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 59.8 ± 0.04 μm; *Medullar index* : 0.55 ± 0.0.

D. Cross section

Type of cross section : Circular and elliptical; *Medulla size in cross section* medium sized.

Ventral

A. Physical characteristics

Profile and colour : straight, small, light brown; *Total thickness (T)* : 79.8 ± 0.04 μm.

B. Surface structure

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional SM smooth DS near and distal : SP Irregular wave, SM rippled, DS near

C. Medulla

Medullary configuration : narrow medulla lattice; *Medulla thickness* : 69.8 ± 0.06 μm; *Medullary index* : 0.87 ± 0.0.

D. Cross section

Type of cross section : circular and elliptical; *Medulla size in cross section* : large.

Head

A. Physical characteristics

Profile and colour : dark brown and light brown bands, small; *Total thickness (T)* : 123.0 ± 0.48 μm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; proximal : SP transitional SM smooth DS near and distal : SP Irregular wave, SM rippled, DS near.

C. Medulla

Medullary configuration : Narrow medulla lattice; *Medulla thickness* : 80.6 ± 0.10 μm; *Medullary index* : 0.65 ± 0.0.

D. **Cross section**

Type of cross section : Circular and elliptical; *Medulla size in cross section* : large

Genus ***Mastela*** Linnaeus, 1758

Mastela sibrica hodgsoni Pallas, 1773.

1773. *Mustela sibrica* Pallas, *Revise Prov. Russ. Reichs.*, **2** : 701

Status : IPWA : Schedule II, Part II; CITES : Appendix III; CAMP : LRnt (Nationally), DD Globally).

Dorsal Plate 40a

A. **Physical characteristics**

Profile and colour : thin, light brown; *Total thickness (T)* : 139.8 ± 0.04 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional SM smooth,DS near and distal : SP regular wave, SM smooth, DS near.

Scale index : 2.83 ± 0.02 at mid, 1.0 ± 0.0 at proximal (transitional), 6.25 ± 0.0 at distal

C. **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 99.9 ± 0.03 μm; *Medullar index* : 0.71 ± 0.02.

D. **Cross section**

Type of cross section : circular, elliptical; *Medulla size in cross section* : large sized.

Ventral Plate 40b

A. **Physical characteristics**

Profile and colour : thin, light brown; *Total thickness (T)* : 78.0 ± 1.54 μm.

B. **Surface structure**

Scale pattern (SP), scale margin(SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional/regular wave SM less rippled DS near and distal : SP regular wave, SM smooth, DS near.

C. **Medulla**

Medullary configuration : Narrow medulla lattice; *Medulla thickness* : 58.0 ± 1.5 μm; *Medullary index* : 0.74 ± 0.1

D. **Cross section**

Type of cross section : circular and elliptical; *Medulla size in cross section* : large.

Head Plate 40c

A. **Physical characteristics**

Profile and colour : small, light brown; *Total thickness (T)* : 119.9 ± 0.03 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional/regular wave, SM less rippled, DS near and distal : SP Irregular wave, SM rippled, DS near.

C. **Medulla**

Medullary configuration : Narrow medulla lattice; *Medulla thickness* : 68.0 ± 1.6 µm; *Medullary index* : 0.57 ± 0.0.

D. **Cross section**

Type of cross section : circular; *Medulla size in cross section* : medium.

Tail Plate 40d

A. **Physical characteristics**

Profile and colour : long, light brown; *Total thickness (T)* : 80.0 ± 0.0 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near and distal : SP regular wave, SM smooth, DS near.

C. **Medulla**

Medullary configuration : wide aeriform lattice; *Medulla thickness* : 60.0 ± 0.0 µm; *Medullary index* : 0.75 ± 0.0.

D. **Cross section**

Type of cross section : Circular, elliptical; *Medulla size in cross section* : large.

Mustela altaica Pallas, 1811

1811. *Mastela altaica* Pallas., *Zoogr. Rosso-Asiat.*, **1** : 98.

Dorsal

A. **Physical characteristics**

Total thickness (T) : 90.0 ± 0.0 µm; *Shape and Nature* Straight and thin.

B. **Surface structure**

Scale pattern (SP), scale margin(SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; proximal : SP transitional, SM smooth, DS near and distal : SP Irregular wave, SM rippled, DS near.

C. **Medulla**

Medullary configuration : Narrow medulla lattice; *Medulla thickness* : 69.7 ± 0.06 µm; *Medullar index* : 0.77 ± 0.02.

D. **Cross section**

Type of cross section : circular; *Medulla size in cross section* : large.

Ventral

A. **Physical characteristics**

Total thickness (T) : 69.6 ± 0.08 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), scale margin(SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; proximal : SP transitional, SM smooth, DS near and distal : SP Irregular wave, SM rippled, DS near.

C. **Medulla**

Medullary configuration : Narrow medulla lattice; *Medulla thickness* : 49.0 ± 0.1 µm; *Medullar index* : 0.70 ± 0.0.

D. **Cross section**

Type of cross section : circular; *Medulla size in cross section* : large.

Head

A. **Physical characteristics**

Shape and Nature : Straight and thin; *Total thickness (T)* : 70.0 ± 0.0 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near and at distal : SP Irregular wave, SM rippled, DS near

C. **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 50.0 ± 0.0 µm; *Medullar index* : 0.71 ± 0.01

D. **Cross section**

Type of cross section : circular; *Medulla size in cross section* large.

Tail

A. **Physical characteristics**

Profile and colour : long, light brown; *Total thickness (T)* : 60.0 ± 0.0 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near and at distal : SP Irregular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 50.3 ± 0.06 μm; *Medullar index* : 0.83 ± 0.0.

D. **Cross section**

Type of cross section : circular, elliptical; *Medulla size in cross section* : large.

Genus ***Martes*** Pinel, 1792

1792. *Martes* Pinel, *Actes Soc. Hist. Nat.*, Pais, 1 : 55.

Martes flavigula (Boddaert, 1785)
Yellow throated Marten

1785. *Martela flavigula* Boddaert, *Elnch. Anim.*, 1 : 88.

Status : IWPA : Schedule II, PartII; CITES : Appendix III; CAMP : LRlc (Nationally) D (Globally).

Dorsal Plate 41a

A. **Physical characteristics**

Profile and colour : long, thin; black; *Total thickness (T)* : 109.7 ± 0.06 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; proximal : SP transitional, SM smooth, DS near and distal : SP Irregular wave, SM rippled, DS near.

Scale index : at mid 7.2 ± 0.0, at proximal1.42 ± 0.0at transitional cuticular pattern, at distal 10.0 ± 0.0.

C. **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 70.2 ± 0.06 μm; *Medullar index* : 0.64 ± 0.03.

D. **Cross section**

Type of cross section circular, elliptical; *Medulla size in cross section* : large sized.

Ventral Plate 41b

A. **Physical characteristics**

Profile and colour : thin, long, beige; *Total thickness (T)* : 89.8 ± 0.04 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal and distal : SP regular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 70.0 ± 0.0 μm; *Medullar index* : 0.78 ± 0.0.

D. **Cross section**

Type of cross section : circular and elliptical; *Medulla size in cross section* : large.

Head Plate 41c

A. **Physical characteristics**

Profile and colour : long, beige; *Total thickness (T)* : 110.2 ± 0.1 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP regular wave, SM rippled, DS near; proximal and distal : SP regular wave, SM rippled, DS near.

C. **Medulla**

Medullary configuration : Narrow medulla lattice; *Medulla thickness* : 89.8 ± 0.04 μm; *Medullary index* : 0.81 ± 0.01

D. **Cross section**

Type of cross section : circular and elliptical; *Medulla size in cross section* : large.

Tail Plate 41d

A. **Physical characteristics**

Profile and colour : long, black; *Total thickness (T)* : 69.2 ± 0.09 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; proximal and distal : SP Irregular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : Narrow medulla lattice; *Medulla thickness* : 50.2 ± 0.06 μm; *Medullar index* : 0.72 ± 0.02.

D. **Cross section**

Type of cross section : circular and elliptical; *Medulla size in cross section* : large.

Martes foina (Erxleben, 1777)
Stone marten, Beach marten

1777. *Mastela foina* Erxleben, *Syst. Regni Anim.*, **1** : 458

Status : IW (P) A : Schedule II.

Dorsal Plate 42a

A. **Physical characteristics**

Nature : Straight and thin

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near and at distal : SP regular wave, SM rippled, DS near.

Scale index : 4.0 ± 0.01 at mid, 1.9 ± 0.0 at proximal.

C. **Medulla**

Medullary configuration : Narrow medulla lattice.

D. **Cross section**

Type of cross section : Circular, oblong.

Medulla size in cross section : medium sized.

Ventral Plate 42b

A. **Physical characteristics**

Nature : Straight and thin.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; at proximal and distal : SP regular wave, SM rippled, DS near.

C. **Medulla**

Medullary configuration : Narrow medulla lattice.

D. **Cross section**

Type of cross section : Circular, oblong; *Medulla size in cross section* : medium.

Head Plate 42c

A. **Physical characteristics**

Shape and Nature : thin and straight.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; at proximal and distal : SP regular wave, SM rippled, DS near.

C. **Medulla**

Medullary configuration : Narrow medulla lattice.

D. **Cross section**

Type of cross section : Circular, oblong; *Medulla size in cross section* : medium.

Tail Plate 42d

A. **Physical characteristics**

Shape and Nature : thin and straight.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) at mid : SP Irregular wave, SM rippled, DS near; at proximal and distal : SP regular wave, SM rippled, DS near.

C. **Medulla**

Medullary configuration : Narrow medulla lattice.

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : medium.

All fur hair in species of family mustelidae examined in present study have regular wave scale pattern with dentate margin and distance between scales near.

Key to the species of family Mustelidae from charactristics of primary guard hair of dorsal,ventral, head and tail

Dorsal

I. Medulla type Narrow medulla lattice, Cross section : Circular & elliptical ..... a, b

a. Medium medulla 1, 2, 3, 4, 5

b. Large medulla 6, 7, 8, 9

1 Medullary index M/T 0.50 ± 0.0, Cuticular : at mid : SP Irregular wave, SM rippled, DS close; at proximal : SP diamond petal, SM smooth, DS distant and distal : SP :Irregular wave, SM rippled, DS near. *Scale index* : 4.0 ± 0.01 at mid, 5.3 ± 0.0 at distal ..... *Lutra lutra* (Linnaeus)

2. M/T 0.55 ± 0.0; cuticular : at mid : SP irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near; distal : SP regular wave, SM smooth, DS near; *Scale index* : 7.0 ± 0.0 at mid, 4.0 ± 0.0 at proximal, distal 3.3 ± 0.0..... ..... *Lutrogale perspicillata* (I. Geaffry Saint Hillaire)

3. Medullary index M/T 0.5 ± 0.0, Cuticular : At mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near and distal : SP Irregular wave, SM rippled, DS near. *Scale index* : 3.8 ±.0.0 at mid ..... *Arctonys collaris* Cuvier

4. Medullary index M/T 0.50 ± 0.0, Cuticular : At mid : SP Irregular wave, SM rippled, DS close; at proximal : SP transitional/regular wave SM smooth DS near and distal : SP Irregular wave, SM rippled, DS near.*Scale index* 7.0 ± 0.01 at mid, 1.0 ± 0.0 at proximal and 2.0 ± 0.0 at distal ..... *Mellivora capensis*

5. Medullary index M/T 0.55 ± 0.0, Cuticular :at mid, SP Irregular wave, SM rippled, DS near; at proximal SP transitional, SM smooth, DS distant and distal : SP regular wave, SM rippled, DS near. *Scale index* : 7.0 ± 0.0 at mid, 13.0 ± 0.01 at proximal ..... *Ambonyx cinereus* (Illiger)

6. Medullary index M/T 0.71 ± 0.0; Cuticular : at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near and distal : SP regular wave, SM smooth, DS near. *Scale index* : 2.83 ± 0.02 at mid, 1.0 ± 0.0 at proximal (transitional), 6.25 ± 0.0 at distal ..... *Mustela sibrica hodgsoni* Pallas

7 Medullary index M/T 0.77 ± 0.0; Cuticular at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near and at distal : SP Irregular wave, SM rippled, DS near ..... *Mustela altaica* Pallas

8 Medullary index M/T 0.64 ± 0.03; Cuticular at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near and at distal : SP Irregular wave, SM rippled, DS near; *Scale index* : at mid 7.2, at proximal 1.42 at transitional cuticular pattern, at distal 10.0 ..... *Martes flavigula* (Boddaert)

9. Medullary index :M/T 0.77 ± 0.0, Cuticular at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near and at distal : SP regular wave, SM rippled, DS near *Scale index* : 4.0 ± 0.01 at mid, 1.9 ± 0.0 at proximal ..... *Martes foina* (Erxleben)

Ventral

A. Medulla : Narrow medulla lattice, Cross section : Circular, elliptical .....I, II, III

I. Medulla : Small 3

II. Medulla : medium 1

III. Medulla : large 2, 4, 5, 6, 7, 8

1 Medullary index : M/T 0.43 ± 0.01, Cuticular : At mid : SP Irregular wave, SM rippled, DS close; at proximal : SP diamond petal, SM smooth, DS distant and distal : SP Irregular wave, SM rippled, DS near. *Scale index* : 4.0 ± 0.01 at mid, 5.3 ± 0.0 at distal ..... *Lutra lutra* (Linnaeus)

2. Medullary index M/T 0.64 ± 0.0; Cuticular At mid SP Irregular wave, SM slightly rippled/smooth, DS near; at proximal and distal : SP Irregular wave, SM rippled, DS close ..... *Lutra perspicillata* I. Geoffroy Saint-Hillaire

3. Medullary index : M/T 0.13 ± 0.0, Cuticular : At mid : SP Irregular wave, SM rippled, DS near; at proximal SP transitional, SM smooth, DS near and distal : SP Irregular wave, SM rippled, DS near ..... *Arctonyx collaris* Cuvier

4. Medullary index : M/T 0.60 ± 0.0 , Cuticular : At mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near and distal : SP Irregular wave, SM rippled, DS near ..... *Mellivora capensis* Schreber

5. Medullary index M/T 0.87 ± 0.0, Cuticular : At mid SP Irregular wave, SM rippled, DS near; at proximal SP transitional, SM smooth, DS near and distal : SP Irregular wave, SM rippled, DS near ..... *Amblonyx cinereus* (Illiger)-

6. Medullary index : M/T 0.74 ± 0.1; Cuticular At mid : SP Irregular wave, SM rippled, DS near; at proximal SP transitional/regular wave SM less rippled DS near and distal : SP regular wave, SM smooth, DS near ..... *Mastela sibrica hodgsoni* Pallas

7. Medullary index : M/T 0.70 ± 0.0, Cuticular : At mid SP Irregular wave, SM rippled, DS near; at proximal SP : transitional, SM smooth, DS near and at distal : SP Irregular wave, SM rippled, DS near ..... *Mastela altaica* Pallas

8. Medullary index : M/T 0.78 ± 0.0, Cuticular : At mid SP regular wave, SM rippled, DS near; at proximal and distal : SP regular wave, SM rippled, DS near .... *Martes flavigula* (Boddaert)

9. Cuticular At mid, SP Irregular wave, SM rippled, DS near; at proximal and distal : SP regular wave, SM rippled, DS near ..... *Martes foina* (Erxleben)

Head

A. Narrow medulla lattice, Cross section Circular, elliptical and medium medulla .... 1, 2, 3, 4, 5, 6, 7, 8.

1 Medullary index M/T 0.49 ± 0.0, Cuticular At mid, SP regular wave, SM rippled, DS distant; at proximal and distal SP regular wave, SM rippled, DS distant .... *Lutra lutra* (Linnaeus).

2. Medullary index M/T 0.60 ± 0.0; Cuticular : At mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near; distal : SP regular wave, SM smooth, DS near ..... *Lutrogale perspicillata* (I. Geoffrey Saint Hillaire)

3. Medullary index M/T : 0.34 ± 0.0; Cuticular : At mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional SM smooth DS near and distal : SP Irregular wave, SM rippled, DS near ..... *Arctonyx collaris* Cuvier

4. Medullary index : 0.33 ± 0.02; Cuticular : At mid : SP Irregular wave, SM rippled, DS close; at proximal : SP transitional/regular wave, SM smooth DS near and distal : SP : Irregular wave, SM rippled, DS near ..... *Mellivora capensis* Schreber

5. Medullary index : 0.65 ± 0.0; Cuticular : At mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional SM smooth DS near and distal : SP Irregular wave, SM rippled, DS near ..... *Amblonyx cinereus* (Illiger)

6. Medullary index : 0.57 ± 0.0; Cuticular : At mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional/regular wave, SM less rippled, DS near and distal : SP Irregular wave, SM rippled, DS near ..... *Mastela sibrica hodgsoni Pallas*

7. Medullary index : 0.71 ± 0.01; Cuticular : At mid, SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near and at distal : SP Irregular wave, SM rippled, DS near ..... *Mastela altaica* Pallas

8. Medullary index : 0.81 ± 0.01; Cuticular : At mid : proximal and distal : SP regular wave, SM rippled, DS near ..... *Martes flavigula* (Boddaert)

Tail

A. Medulla : Narrow medulla lattice, Cross section : Circular, elliptical ..... I, II

I. Medulla : medium 1b, 2b, 3b, 4b, 5b

II. Medulla : large 1c, 2c,3c

1b Medullary index : 0.49 ± 0.03; Cuticular : At mid : SP regular wave, SM rippled, DS distant; at proximal and distal : SP regular wave, SM rippled, DS distant .... *Lutra lutra* (Linnaeus)

2b. Medullary index : 0.64 ± 0.03; Cuticular : At mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near and distal : SP regular wave, SM smooth, DS near ..... *Lutrogale perspicillata* (I. Geoffrey Saint Hillaire)

3b. Medullary index : 0.40 ± 0.01; Cuticular : At mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near and distal : SP Irregular wave, SM rippled, DS near ..... *Arctonyx collaris* Cuvier

4b. Medullary index : 0.47 ± 0.02; Cuticular : At mid, SP Irregular wave, SM rippled, DS close; at proximal : SP transitional/regular wave, SM smooth, DS near and distal : SP Irregular wave, SM rippled, DS near ..... *Mellivora capensis* Schreber

5b. Medulla medium, Cuticular : At mid : SP Irregular wave, SM rippled, DS near; at proximal and distal : SP regular wave, SM rippled, DS near ..... *Martes foina* (Erxleben)

1c. Medullary index : 0.75 ± 0.0; Cuticular : At mid : SP regular wave, SM rippled, DS near; at proximal : SP transitional SM smooth DS near and distal : SP regular wave, SM smooth, DS near ..... *Mastela sibrica hodgsoni* Pallas

2c. Medullary index : 0.83 ± 0.0; Cuticular : At mid : SP Irregular wave, SM rippled, DS near; at proximal : SP transitional, SM smooth, DS near and at distal : SP Irregular wave, SM rippled, DS near ..... *Mastela altaica* Pallas

3c Medullary index : 0.72 ± 0.02; Cuticular : At mid : SP Irregular wave, SM rippled, DS near; at proximal and distal : SP Irregular wave, SM rippled, DS near ..... *Martes flavigula* (Boddaert)

Family HERPESTIDAE Bonaparte, 1845

The Family Herpestidae comprises of seven species of mongoose. Major threats to the species are poaching and habitat loss. Brushes prepared from mongoose hair have been received in forensic laboratories in India. They are short limbed, predatory creatures and partly fossorial in nature. They are carnivorous, insectivorous and diurnal.

Genus ***Herpestes*** Illiger, 1811

1811. *Herpestes* Illiger, *Prodr. Syst. Mamm. Avium*, p. 135,

26. ***Herpestes palustris*** Ghose, 1965
Marsh mangoose

1965. *Herpestes palustris* Ghose, *Proc. Zool. Soc.* Calcutta, **18** : 174.

Status : IWPA : Schedule II; CAMP : EN.

Dorsal Plate 43a

A. **Physical characteristics**

Profile and colour : banded Buff and brown; *Total thickness (T)* : 119.7 ± 0.06 µm.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : at mid : SP Irregular wave, SM crenate, DS near; proximal : SP Irregular wave, SM crenate, DS near; distal : SP Irregular wave, SM crenate, DS near.

C. **Medulla**

Medullary configuration : wide medulla lattice; *Medulla thickness* : 99.8 ± 0.04 µm; *Medullry index* : 0.833 ± 0.02.

D. Cross section

Type of cross section : oblong; *Medulla size in cross section* : large sized.

Ventral Plate 43b

Medulla : wide medulla lattice.

Cuticular : Scale pattern (SP), Scale margin (SM), distance between scales DS : At mid : SP Irregular wave, SM crenate, DS near; at proximal : SP Irregular wave, SM crenate, DS near; At distal : SP Irregular wave, SM crenate, DS near.

Cross section : *Type of cross section* : oblong. *Medulla size* : medium.

Head Plate 43c

A. Physical characteristics

Profile of hair : banded 4 small; *Total thickness* : 150 ± 0.01 μm; *Medulla thickness* : 110 ± 0.02 μm; *Medullary index* : 0.73 ± 0.01

Medulla : wide medulla lattice

Cuticular : Scale pattern (SP), Scale margin (SM), distance between scales DS : at mid : SP Irregular wave SM crenate, DS near; proximal, SP Irregular wave SM crenate, DS near; distal : SP Irregular wave SM crenate, DS near.

Cross section : Circular,large medulla

Tail Plate 43d

A. Physical characteristics

Profile : banded; *Total thickness (T)* : 70.0 ± 0.0 μm; *Shape and Nature* Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales DS : at mid : SP Irregular wave, SM crenate, DS near; at proximal : SP Irregular wave, SM crenate, DS near; At distal : SP Irregular wave, SM crenate, DS near

C. Medulla

Medullary configuration : simple medulla; *Medulla thickness* : 50.0 ± 0.0 μm; *Medullary index* : 0.71 ± 0.0

D. Cross section

Type of cross section : circular, oblong; *Medulla size in cross section* : large.

Herpestes edwardsii (E.Geoffrey Saint-Hilaire,1818)

1818. *Ichneumon edwardsii* E. Geoffroy Saint-Hilaire, *Descrip de L'Egypte*, **2** : 139

Status : IWPA : Schedule II; CITES : Appendix III; CAMP : LRlc (Nationally), DD (Globally)

Dorsal Plate 44a

A. **Physical characteristics**

Profile : banded; *Total thickness (T)* : 139.8 ± 0.04 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : At mid : SP Irregular wave, SM slightly crenate/smooth, DS near; at proximal : SP Regular wave SM smooth, DS near; At distal : SP Irregular wave SM slightly crenate, DS close.

C. **Medulla**

Medullary configuration : wide medulla lattice; *Medulla thickness* : 99.9 ± 0.03 µm; *Medullary index* : 0.71 ± 0.0.

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : large sized.

Ventral Plate 44b

A. **Physical characteristics**

Profile and colour : banded; *Total thickness (T)* : 78.0 ± 0.01 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : At mid : SP Irregular wave, SM crenate, DS near; at proximal : SP transitional, SM smooth (slightly crenate), DS near; At distal : SP Irregular wave, SM smooth, DS close.

C. **Medulla**

Medullary configuration : simple medulla; *Medulla thickness* : 58.0 ± 0.05 µm; *Medullary index* : 0.74 ± 0.01

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : large.

Head Plate 44c

A. **Physical characteristics**

Profile : banded; *Total thickness (T)* : 119.9 ± 0.03 µm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales DS : At mid : SP Irregular wave, SM crenate, DS close; at proximal : SP Irregular wave, SM crenate, DS close; At distal : SP Irregular wave, SM crenate, DS close.

C. Medulla

Medullar configuration : wide medulla lattice; *Medulla thickness* : 68.0 ± 0.02 μm; *Medullar index* : 0.56 ± 0.01.

D. Cross section

Type of cross section : reniform, oblong; *Medulla size in cross section* : medium.

Tail Plate 44d

A. Physical characteristics

Profile : banded; *Total thickness (T)* : 80.0 ± 0.0 μm; *Shape and Nature* : Straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales DS : at mid : SP Irregular wave, SM crenate, DS close; proximal : SP Irregular wave, SM crenate, DS close; distal : SP Irregular wave, SM crenate, DS close.

C. Medulla

Medullary configuration : wide medulla lattice; *Medulla thickness* : 60.0 ± 0.0 μm; *Medullary index* : 0.75 ± 0.0.

D. Cross section

Type of cross section : reniform, oblong; *Medulla size in cross section* : large.

Herpestes javanicus (E. Geoffroy Saint–Hillaire 1818)
Small Indian mongoose

1818 *Ichneumon javanicus* E. Geoffroy Saint–Hillaire, Descrip. De L/Egypte, **2** : 138

Status : IW(P)A : Schedule II.

Dorsal Plate 45a

A. Physical characteristics

Profile : banded Banded with brown and light brown tips; *Total thickness (T)* : 90.0 ± 0.06 μm; *Shape and Nature* : straight and thin.

B. Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales DS : At mid : SP Irregular wave, SM crenate, DS near; at proximal : SP Irregular wave, SM crenate, DS near; At distal : SP Irregular wave, SM crenate, DS near.

C. **Medulla**

Medullary configuration : wide medulla lattice; *Medulla thickness* : 70.9 ± 0.03 µm; *Medullar index* : 0.79 ± 0.02.

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : large.

Ventral Plate 45b

A. **Physical characteristics**

Profile : Banded; *Total thickness (T)* : 110 .0 ± 0.0 µm; *Shape and Nature* : straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : at mid : SP Irregular wave, SM crenate, DS near; proximal : SP Irregular wave, SM crenate, DS near; distal : SP Irregular wave, SM crenate, DS near

C. **Medulla**

Medulla configuration : wide medulla lattice; *Medulla thickness* 80.0 ± 0.0 µm; *Medullar index* : 0.72 ± 0.0.

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : large.

Head Plate 45c

A. **Physical characteristics**

Profile : banded; *Total thickness (T)* : 110 ± 0.0 µm; *Shape and Nature* : straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : at mid : SP regular wave SM smooth, DS near; proximal : SP regular wave, SM smooth, DS near; distal : SP regular wave, SM Smooth, DS near.

C. **Medulla**

Medulla configuration : wide medulla lattice; *Medulla thickness* : 89.8 ± 0.0 µm; *Medullar index* : 0.82 ± 0.0.

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : large.

Tail Plate 45d

A. **Physical characteristics**

Profile : banded; *Total thickness (T)* : 130 ± 0.06 μm; *Shape and Nature* : straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : at mid : At mid : SP Irregular wave, SM crenate, DS near; proximal : SP Irregular wave, SM crenate, DS near; distal : SP Irregular wave, SM crenate, DS near

C. **Medulla**

Medullary configuration : wide medulla lattice; *Medulla thickness* : 109 .0 ± 0.20 μm; *Medullary index* : 0.84 ± 0.0.

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : large.

Herpestes urva (Hodgson, 1836)
Crab eating mongoose

1836. Gulo urva Hodgson, *J. Asiat. Soc. Bengal*, **5** : 238.

Status : IWPA : Schedule II; CITES : Appendix III; CAMP : VU (Nationally), DD (Globally)

Dorsal Plate 46a

A. **Physical characteristics**

Profile and colour : Banded with light yellow and gray; *Total thickness (T)* : 119.9 ± 0.03 μm; *Shape and Nature* : Straighht and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : at mid : SP Irregular wave, SM crenate, DS near; proximal : SP Irregular wave, SM crenate, DS near; distal : SP Irregular wave SM crenate, DS near.

C. **Medulla**

Medullary configuration : wide medulla lattice, vacuolated; *Medulla thickness* : 100.0 ± 0.0 μm; *Medullary index* : 0.83 ± 0.0.

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : large.

Ventral Plate 46b

A. **Physical characteristics**

Profile and colour : banded; *Total thickness (T)* : 139.4 ± 0.09 µm; *Shape and Nature* : Straighht and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : at mid : SP Irregular wave, SM crenate, DS near; proximal : SP Irregular wave SM crenate, DS near; distal : SP Irregular wave SM crenate, DS near

C. **Medulla**

Medullary configuration : wide medulla lattice, vacuolated; *Medulla thickness* : 119.8 ± 0.04 µm; *Medullary index* : 0.86 ± 0.02.

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : large sized.

Head Plate 46c

A. **Physical characteristics**

Profile : banded; *Total thickness (T)* : 89.9 ± 0.03 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : at mid : SP Irregular wave, SM crenate, DS near; proximal : SP Irregular wave, SM crenate, DS near; distal : SP Irregular wave SM crenate, DS near.

C. **Medulla**

Medulla configuration : simple medulla, vacuolated; *Medulla thickness* : 49.9 ± 0.03 µm; *Medullar index* : 0.55 ± 0.03

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : medium sized.

Tail Plate 46d

A. **Physical characteristics**

Profile : banded; *Total thickness (T)* : 179.8 ± 0.06 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : at mid : SP Irregular wave, SM crenate, DS near; proximal : SP Irregular wave, SM crenate, DS near; distal : SP Irregular wave SM crenate, DS near.

C. **Medulla**

Medulla configuration : wide medulla lattice, vacuolated; *Medulla thickness* : 99.9 ± 0.03 μm; *Medullar index* : 0.55 ± 0.02.

D. **Cross section**

Type of cross section : circular; *Medulla size in cross section* : medium sized.

Herpestes smithi Gray, 1837
Indian Ruddy mongoose

1837. Herpestes smithi Gray, *Mag. Hat. Hist.*, (Charlesworth's) **1** : 578.

Status : IWPA Schedule II; CITES : Appendix 111; CAMP : VU (Nationally), DD lobally).

Dorsal Plate 47a

A. **Physical characteristics**

Profile and colour : banded, cream and brown bands, tip dark; *Total thickness (T)* : 152± 0.04 μm; *Shape and Nature* : straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : at mid : SP Irregular wave, SM crenate, DS near; proximal : SP Irregular wave, SM crenate, DS near; distal : SP Irregular wave, SM crenate, DS near.

C. **Medulla**

Medullary configuration : wide medulla lattice; *Medulla thickness* : 102.7 ± 0.04 μm; *Medullary index* : 0.67 ± 0.01.

D. **Cross section**

Type of cross section : circular; *Medulla size in cross section* : large.

Ventral Plate 47b

A. **Physical characteristics**

Profile : banded; *Total thickness (T)* : 100.18 ± 0.06 μm; *Shape and Nature* : straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : at mid : SP Irregular wave, SM crenate, DS near; proximal : SP Irregular wave, SM crenate, DS near; distal : SP Irregular wave SM crenate, DS near

C. **Medulla**

Medullary configuration : Wide medulla lattice; *Medulla thickness* : 60.1 ± 0.06 μm; *Medullary index* 0.60 ± 0.03.

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : medium sized.

Head Plate 47c

A. **Physical characteristics**

Profile of hair : banded 4. black and beige, small; *Total thickness* : 150 ± 0.0; *Medulla thickness* : 110 ± 0.01; *Medullary index* : 0.73 ± 0.01

B. **Medulla**

Wide medulla lattice

C. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : At mid : SP Irregular wave, SM crenate, DS near; at proximal : SP Irregular wave, SM crenate, DS near; At distal : SP Irregular wave, SM crenate, DS near

D. **Cross section**

Type of cross section : Circular, oblong; *Medulla size in cross section* : large sized.

Tail Plate 47d

Profile of hair : banded 9 , dark brown and beige,long

Toal thickness : 130 ± 0.0

Medulla thickness : 100 ± 0.01

Medullary index : .077 ± 0.01

Medulla : Wide medulla lattice

Surface structure

Scale pattern (SP), Scale margin (SM), distance between scales DS : At mid : SP Irregular wave, SM crenate, DS close; at proximal : SP Irregular wave, SM crenate, DS close; At distal : SP Irregular wave SM crenate, DS close

Cross section : *Type of cross section* : oblong

Medulla size in cross section large sized

Herpestes vitticolis Bennett, 1835
Striped naked mongoose

1835: *Herpestes vitticollis* Bennett, *Proc. zool. Soc.*, London **1835** : 67

Status : IWPA : Schedule II; CAMP : LRnt (Nationally)

Dorsal Plate 48a

A. **Physical characteristics**

Profile : banded; *Total thickness (T)* : 110.1 ± 0.07 μm.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : At mid : SP Irregular wave, SM crenate, DS near; at proximal : SP Irregular wave, SM crenate, DS near; At distal : SP Irregular wave SM crenate, DS near

C. **Medulla**

Medullary configuration : wide medulla lattice; *Medulla thickness* : 70.1 ± 0.07 μm; *Medullary index* : 0.63 ± 0.01.

D. **Cross section**

Type of cross section : Circular, Oblong; *Medulla size in cross section* : Large.

Ventral Plate 48b

A. **Physical characteristics**

Profile : banded; *Total thickness (T)* : 99.4 ± 0.08 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : At mid : SP Irregular wave, SM crenate, DS near; at proximal : SP Irregular wave, SM crenate, DS near; At distal : SP Irregular wave, SM crenate, DS near

C. **Medulla**

Medullary configuration : wide medulla lattice; *Medulla thickness* : 40.2 ± 0.06 μm; *Medullary index* : 0.40 ± 0.03.

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : medium.

Head Plate 48c

A. **Physical characteristics**

Profile : banded; *Total thickness (T)* : 90.0 ± 0.0 μm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : At mid : SP Irregular wave, SM crenate, DS near; at proximal : SP Irregular wave, SM crenate, DS near; At distal : SP Irregular wave, SM crenate, DS near

C. **Medulla**

Medullary configuration : wide medulla lattice; *Medulla thickness* : 50.0 ± 0.0 µm; *Medullary index* : 0.55 ± 0.0.

D. **Cross section**

Type of cross section : Circular, oblong

Tail Plate 48d

A. **Physical characteristics**

Profile : banded; *Total thickness (T)* : 120.2 ± 0.06 µm; *Shape and Nature* : Straight and thin.

B. **Surface structure**

Scale pattern (SP), Scale margin (SM), distance between scales DS : At mid : SP Irregular wave, SM crenate, DS near; at proximal : SP Irregular wave, SM crenate, DS near; At distal : SP Irregular wave, SM crenate, DS near

C. **Medulla**

Medullary configuration : wide medulla lattice; *Medulla thickness* : 80.2 ± 0.06 µm; *Medullary index* : 0.67 ± 0.06.

D. **Cross section**

Type of cross section : circular, oblong; *Medulla size in cross section* : large sized.

Key to the species of family Herpestidae from charactristics of primary guard hair of dorsal,ventral, head and tail

Dorsal

A. Medulla : Banded, Wide medulla lattice, Cross section : Circular, oblong ..... I, II

I Medulla : large 1, 2, 3, 4

II Medulla : medium 5, 6

1 Medullary index M/T 0.833 ± 0.02, Cuticular : At mid, proximal and distal : SP Irregular wave SM crenate, DS near ..... *Herpestes palustris* Ghose

2. Medullary index :0.71 ± 0.0; Cuticular : At mid : SP Irregular wave SM slightly crenate/smooth, DS near; at proximal : SP Regular wave, SM smooth, DS near; at distal : SP Irregular wave SM slightly crenate, DS close .... *Herpestes edwardsii* (E.Geoffrey Saint-Hilaire)

3. Medullary index : 0.79 ±0.02; Cuticular : At mid : SP Irregular wave SM crenate, DS near; at proximal : SP Irregular wave, SM crenate, DS near; At distal : SP Irregular wave SM crenate, DS near ..... *Herpestes javanicus* (E. Geoffroy Saint–Hillaire)

4. Medullary index : 0.83 ± 0.0; Cuticular : At mid, proximal and distal : SP Irregular wave, SM crenate, DS near ..... *Herpestes urva* (Hodgson)

5. Medullary index : 0.67 ± 0.01; Cuticular : At mid, proximal and distal : SP Irregular wave, SM crenate, DS near ..... *Herpestes smithi* Gray

6. Medullary index : 0.63 ± 0.01; Cuticular : At mid : SP Irregular wave, SM crenate, DS near; at proximal : SP Irregular wave SM crenate, DS near; At distal : SP Irregular wave, SM crenate, DS near ..... *Herpestes vitticolis* Bennett

Ventral

A. Cross section : Circular, Oblong ..... I, II

I. Medulla : Wide medulla lattice 1, 3, 4, 5, 6

II. Medulla : Simple medulla 2

1 Medulla medium; Cuticular : At mid : SP Irregular wave, SM crenate, DS near; at proximal : SP Irregular wave, SM crenate, DS near; at distal : SP Irregular wave SM crenate, DS near ..... *Herpestes palustris* Ghose

2. Medulla large, M/T 0.74 ± 0.0; Cuticular : At mid : SP Irregular wave SM crenate, DS near; at proximal : SP transitional, SM smooth (slightly crenate), DS near; at distal : SP Irregular wave, SM smooth, DS close .... *Herpestes edwardsii* (E.Geoffrey Saint-Hilaire)

3. Medulla large, M/T index : 0.72 ± 0.0; Cuticular : At mid, proximal and distal : SP Irregular wave, SM crenate, DS near .... *Herpestes javanicus* (E. Geoffroy Saint–Hillaire)

4. Medulla large, M/T : 0.86 ± 0.02; Cuticular : At mid, proximal and distal : SP Irregular wave, SM crenate, DS near ..... *Herpestes urva* (Hodgson)

5. Medulla medium, M/T 0.60 ± 0.03; Cuticular : At mid, distal and proximal : SP Irregular wave, SM crenate, DS near ..... *Herpestes smithi* Gray

6. Medullary index: : 0.40 ± 0.03; Cuticular : At mid, proximal and distal : SP Irregular wave, SM crenate, DS near ..... *Herpestes vitticolis* Bennett

Head

A. Wide medulla lattice 1, 2, 3, 5

B. Simple medulla 4

1 Cross section : Circular, Medulla large, Medullary index : 0.73 ± 0.01; Cuticular : At mid, distal and proximal : SP Irregular wave, SM crenate, DS near .... *Herpestes palustris* Ghose

2. Cross section : reniform, oblong, Medullary index : 0.56 ± 0.01; At mid, proximal and distal SP Irregular wave, SM crenate, DS close .... *Herpestes edwardsii* (E.Geoffrey Saint-Hilaire

3. Cross section : Circular oblong, Medulla large, Medullary index : 0.82 ± 0.0; Cuticular At mid proximal and distal SP regular wave, SM smooth, DS near .... *Herpestes javanicus* (E. Geoffroy Saint–Hillaire

4. Cross section : Circular, oblong; Medulla medium, Medullary index : 0.55 ± 0.03; Cuticular : At mid, distal and proximal : SP Irregular wave, SM crenate, DS near.... ..... *Herpestes urva* (Hodgson)

5. Cross section : Circular, oblong; Medulla large,Medullary index : 0.73 ± 0.01; Cuticular : At mid, proximal and distal : SP Irregular wave, SM crenate, DS near .... *Herpestes smithi* Gray

6. Cross section : Circular, oblong; Medulla medium, Medullary index : 0.55 ± 0.0; Cuticular : At mid, distal and proximal : SP Irregular wave, SM crenate, DS near.... ..... *Herpestes vitticolis* Bennett

Tail

A. Cuticular At mid : proximal, distal SP Irregular wave, SM crenate, DS near/close.... ..... I, II

I. Wide medulla lattice 2, 3, 4, 5, 6

II. Simple medulla 1

1 Cross section : Circular, oblong; Medulla large, Medullary index : 0.71 ± 0.0 .... *Herpestes palustris* Ghose

2. Cross section : reniform, oblong, Medulla large, Medullary index : 0.75 ± 0.0; *Medulla size in cross section* : medium .... *Herpestes edwardsii* (E.Geoffrey Saint-Hilaire)

3. Cross section : Circular, oblong, Medulla large, Medullary index : 0.84 ± 0.0; Circular, oblong ..... *Herpestes javanicus* (E. Geoffroy Saint–Hillaire)

4. Cross section : Circular, Medulla medium, Medullary index : 0.55 ± 0.02 .... *Herpestes urva* (Hodgson)

5. Cross section : Oblong, Medulla large; Medullary index : .077 ± 0.01 .... *Herpestes smithi* Gray,

6. Cross section : Circular, oblong, Medulla large, Medullary index : 0.67 ± 0.0 .... *Herpestes vitticolis* Bennett

Order ARTIODACTYLA

Family TRAGULIDAE Milne-Edwards, 1864

Moschiola mamminna (Erxleben, 1777)

Indian spotted chevrotain, Mouse deer

India's smallest deer, the mouse deer is a Schedule I species under Indian Wildlife Protection Act 1972. It is a unique species with three-chambered stomach instead of the four chambered one as in all other ruminants. Its coat is olive brown in colour. Both sexes are without antlers but they have long canines. The body is wedge shaped and has large

hooves. Main conservation threats to the species are poaching and habitat disturbance. This primitive deer has relatives in Southeast Asia and West Africa. In India it is distributed throughout South Asia but best seen at Mudumalai (Tamil Nadu) and Bandipur National Park (Karnatka) (Menon 2003)

Family TRAGULIDAE Milne–Edwards,1864

Genus ***Moschiola*** Hodgson, 1843

1843. *Moschiola* Hodgson, Calcutta. *J. Nat. Hist.*, **4** : 292.

Moschiola mamminna (Erxleben, 1777)
Indian spotted chevrotain, mouse deer

1777. *Moschus memminna* Erxleben, *Syst. Regn. Anim.*, **1** : 322.

Status : CAMP : LRnt (Nationally), DD (Globally), IWPA : Schedule I.

Dorsal Plate 49a

A. **Physical characteristics**

Profile and colour : banded, cream and dark brown bands; *Total thickness (T)* : 109.5 ± 0.08 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM ripled, DS near; proximal : SP Irregular wave, SM smooth (less rippled), DS distant; distal : SP Irregular wave, SM Smooth (less rippled), DS distant

Scale index : 4.0 ± 0.0 at mid, 5.0 ± 0.01xat distal, 3.7 ± 0.0proximal.

C. **Medulla**

Medullary configuration : wide medulla lattice; *Medulla thickness* : 90.0 ± 0.0 µm; *Medullary index* : 0.82 ± 0.0.

D. **Cross section**

Type of cross section : oval, oblong; *Medulla size in cross section* : large.

Ventral Plate 49b

A. **Physical characteristics**

Profile and colour : Creamish thin, slightly wavy; *Total thickness (T)* : 119.7 ± 0.06 µm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM ripled, DS near; proximal : SP Irregular wave, SM smooth (less rippled), DS distant; distal : SP Irregular wave, SM Smooth(less rippled), DS distant.

C. **Medulla**

Medullary configuration : wide medulla lattice; *Medulla thickness* : 100.0 ± 0.0 μm; *Medullary index* : 0.83 ± 0.0.

D. **Cross section**

Type of cross section : oval; *Medulla size in cross section* : large.

Head Plate 49c

A. **Physical characteristics**

Profile and colour : Uniformly black; *Total thickness (T)* : 108.18 ± 0.40 μm.

B. **Surface structure**

Scale pattern (SP), scale margin (SM), distance between scales (DS) : at mid : SP Irregular wave, SM rippled, DS near; at proximal : SP Irregular wave, SM less rippled, DS near; at distal : SP Irregular wave, SM rippled, DS near.

C. **Medulla**

Medulla configuration : wide medulla lattice; *Medulla thickness* : 98.18 ± 0.40 μm; *Medullar index* : 0.90 ± 0.0.

D. **Cross section**

Type of cross section : oval; *Medulla size in cross section* : large.

DISCUSSION

Very little work so far has been done on the trichotaxonomy of the species of small mammals (Bahuguna, 2007), a group largely poached throughout world due to their skin,meat and other wildlife parts and products. The species of the family examined for trichotaxonomy in the present study are known to be data deficient and are facing threats to survival because of poaching and habitat loss (Menon, 2003) Trichotaxonomy is well known for its utility in wildlife forensic (Anon., 1995, Chakraborty and De 1995, De *et al.*, 1998, Bahuguna and Mukherjee 2000) and for ecological study of the animals, hence in wildlife management and conservation (Mathiak, 1938, Nath & Joseph, 1981, Bahuguna, 2007).

Family **SCIURIDAE**

Squirrels of genera *Callosciurus* are oriental squirrels, populating the northern regions of the Indian Penninsula (Himalaya), the Greater and Lesser Sunda Islands, the Molluccas and Philippines. Unfortunately, so far very little is known about their biology. The oriental squirrels are exceptional, being known for their bright colors (yellow, a brilliant gold, orange, brown, black and white and other intermediate shades of these colors), with individual areas often being sharply demarcated against each other. All species live in the humid or only moderately dry to arid tropics and they are predominantly forest tree animals

even though individual groups prefer the forest ground They don't gather food supplies and they don't sleep for winter months.(Krapp1989). The genus has three Indian species *Callosciurus caniceps* (Gray), Golden backed squirrel; Gray bellied squirrel, *Callosciurus erythraeus* (Pallas), Pallas's squirrel and *Callosciurus pygerythrus* (I.Geoffroy Saint Hilarie), Irrawaddy squirrel.

Genus *Callosciurus* : Dorsal PGH : It was observed in the present study that all three species of *Callosciurus* had majority of dorsal guard hair with bands and number of bands and their length were species specific for a given range of *length of hair*. In case of *Callosciurus pygerythrus* band number was 5 and their width, for 9.5 to 11 mm of hair length were **4-3 (b)** : 1.5 (y) : 2(b) : 1(y) : 2(b) whereas in case of *Callosciurus caniceps* (Gray), it was 5 but *Width of bands* for 13 to 15 mm hair length were 5(b) : 2 (y) : 3(b) :2(y) : **2-4 (b)**. However in *Callosciurus erythraeus*(Pallas), the number of bands were different from both the species (*Callosciurus caniceps* (Gray), and *Callosciurus pygerythrus*(I. Geoffroy Saint Hilarie). They were 7 in their width for 16 to 17 mm of hair **6-5 (b)** : 1(y) : 3(b) : 1(y) : 3(b) : 1 (y) : 2(b) {where b and y stands for black and yellow bands and bold letters are for the black band which was noted to be highly variable with the variation in *length of hair*. Medullar configuration : The medulla type in all three species was noted to be of multiserial ladder type (figs. 1, 8, 15, 27, 33, 35, 39, 55, 56, 65, 66, 68, 69). However diameter of hair was reported to be of less taxonomic significance (Hausman 1920, Short 1978, De 1993, Chakraborty *et al.*, 1996), thus medullay index (M/T) were taken to know their significance in the identification of species in the present study. *Medullar index* were found to be species specific and most important in the identification of the dorsal guard hair of the species of genus *Panthera* as reported by Chakraborty *et al* 1996. In the present study it was noted to be large size with M/T ratios : 0.834± 0.04 for *Callosciurus caniceps* (Gray); 0.842 ± 0.014 for *Callosciurus erythraeus* (Pallas), and 0.826 ± 0.014 for *Callosciurus pygerythrus* (I. Geoffroy Saint Hilarie), thus noted to be almost same for all three species. The total thickness of hair was 72.8 ± 1.57 µm and thickness of the medulla was 61 ± 1.06 µm for *Callosciurus caniceps* (Gray), as compared to 69.8 ± 0.42 µm and 59.7± 0.48 µm, total thickness of hair for both *Callosciurus erythraeus* (Pallas), and *Callosciurus pygerythrus* (I. Geoffroy Saint Hilarie), respectively.Since total *Length of hair* can vary with age of the animal thus the ratios between total *length of hair vs* thickness of hair was taken into account as length index and found to be characteristic of the species. The length index was taken into consideration for identification of species in the present study for the first time. It was noted to be 19.74 ± 1.30 for *Callosciurus caniceps* (Gray); 27.67 ± 0.39 for *Callosciurus erythraeus* (Pallas) and 19.71 ± 0.25 for *Callosciurus pygerythrus* (I. Geoffroy Saint Hilarie). Thus the length indices of *Callosciurus caniceps*(Gray) and *Callosciurus pygerythrus* (I. Geoffroy Saint Hilarie) were same in comparison to *Callosciurus erythraeus* (Pallas), the *Length of hair* on an average were noted to be more in *Callosciurus erythraeus* (Pallas). Scale pattern : Scale architecture has been found to be species specific in many of the studies (Bahuguna and Mukherjee 2000). The cuticular pattern in species *Callosciurus caniceps* (Gray), were of regular wave with smooth margin (figs. 1, 4) at mid of hair but the pattern changed to simple coronal with rippled margin at distal and proximal ends of hair (figs 7-9). In case of *Callosciurus*

erythraeus(Pallas), it was noted down to be regular wave with rippled margin at mid and base but towards distal end it was observed to be broad petal to simple coronal with smooth margin (Figs. 12-15). Dorsal hair of *Callosciurus pygerythrus* (I. Geoffroy Saint Hilarie), showed, regular wave pattern with scalloped margin and scale pattern changed to simple coronal type with smooth margin at distal and proximal ends of hair (Figs. 18-20). The mid of hair also showed a change in pattern towards proximal part of hair. It changed to double chevron type. Scale indices of all three species examined at mid of hair (dorsal guard) were 2.7 ± 0.29 for *Callosciurus caniceps* (Gray), 4.73 ± 0.438 for *Callosciurus erythraeus* (Pallas) and 3.14 ± 0.164 for *Callosciurus pygerythrus* (I. Geoffroy Saint Hilarie).Cross-section of hair of all three species showed large medulla inside, however the shape of hair in all three species was of oval and oblong types (Figs. 1, 2, 10, 16). Thus similar for all three species examined.

Ventral PGH : The medulla type and cross section types were same in all three species. Ventral PGH of *Callosciurus caniceps* (Gray) was noted to be banded with yellow and black bands. The numbers of bands were 5 with *Width of bands* : 2(b) : 2(y) : 3(b) : 1(y); 3(b). In case of *Callosciurus erythraeus* (Pallas), the numbers of bands were 7 with *Width of bands* : 7(b) : 2(y) : 5(b) :2(y) : 4.5 (b) :2(y) : 6(b). The cuticular pattern was at mid regular wave, smooth, near; at distal and proximal it was regular wave with rippled margin and the distance between scale was near. In case of *Callosciurus pygerythrus* (I. Geoffroy Saint Hilarie), the ventral guard hair had 2 bands, cuticular pattern at mid : regular wave with smooth margin and distance between scale was near; at distal it was regular mosaic with smooth margin with scales near; at proximal it was coronal with smooth margin and distance between scales was near.

Head PGH : All the species examined of the genus had medulla of multiserial type with shapes of oval with large size medulla. Primary guard hair of *Callosciurus caniceps* (Gray), had 5 bands with *Width of bands* : 2(b) : 1(y) : 3(b) : 1(y); : 1(y). Cuticular pattern was of at mid regular wave with smooth margin and distance between scales was near; at proximal and distal, it was : regular wave with rippled margin and distance between scales was near. Primary guard hair of head of *Callosciurus erythraeus* (Pallas) had : 3 and 4 bands with *Width of bands* : 1.5(b) : 1(y) : 4(b) for length 8mm; 2(b) : 1(y) : 2(b) : 1(y) for length 10 mm. The species had cuticular pattern of type at mid regular wave, rippled and near; at distal single chevron with smooth margin and distance between scale was near; at proximal it was single chevron with smooth margin and the distance between scale was near.Primary guard hair of head of *Callosciurus pygerythrus* (I. Geoffroy Saint Hilarie had *No. of bands* : 3 with *Width of bands* 3(b) : 1(y) : 4(b), with cuticular pattern at mid regular wave with slightly rippled,margin and distance between scale was near and at distal it was double chevron with smooth margin and distance between scale was near; at proximal it was double chevron with smooth margin and distance between scale was near.

Tail PGH : Primary guard hair of tail of *Callosciurus caniceps* (Gray) had number of bands : 7 with *Width of bands* : 3(b) 2(y) 0.5 (b) 2.5 (y) 4 (b) 3 (y) 1(b) with cuticular pattern regular wave with smooth margin and distance between scale was near. Primary

guard hair of tail of *Callosciurus erythraeus* (Pallas) had *No. of bands* : 7 with *Width of bands* : 7(b) : 2(y) : 5(b) : 2(y); 4.5(b) : 2(y) : 6(b) with cuticular pattern at mid : regular wave, with slightly rippled margin and distance between scale was near; at distal it was regular wavec with rippled margin and distance between scale was near and at proximal it was double chevron to regular mosaic with rippled margin and the distance between scale was near

However the present study further, emphasizes the importance of role of hair profile (band number and width of bands and color of hair) in case of family Scuiridae in identification of species as reported its importance in identification of species Red giant flying squirrel, *Petaurista petaurista* (Pallas) and Northern palm squirrel, *Fundabulus pennantii* Wroughton of family : Scuiridae by Bahuguna 2007.

For preparation of the key the length index were not taken into account but they were found to be species specific. However their utility in the identification of species will be determined by incorporating number of samples from large number of specimens.

Genus ***Dremomys*** : In the present study hair characteristics of dorsal, ventral, head and tail regions of species of genus *Dremomys* were described. Six unstriped forest squirrels, genus *Dremomys* Heude, 1898 tribe Callosciurinae of family Sciuridae occurs in North-eastern India. *Dremomys lokriah* (Hodgson) (Orange bellied Himalayan squirrel) has dorsal brown hairs at base, yellow in the middle and black at the tip. The species occupy forested hills and foothills (1,500-2,700 m) in Sikkim (India), Northeast India and also China, Myanmar and Nepal. It has a bright orange throat, chest and belly. *Dremomys pernyi* (Milne-Edwards) (Perny's long nosed squirrel) occur in Assam and Manipur (India), China, Myanmar, Taiwan and Vietnam. This species is morphologically similar to Orange bellied Himalayan squirrel with longer snout. *Dremomys rufigenis* (Blandford) (Asian Red cheeked squirrel) occurs in Assam (India), Laos, Malaysia, Myanmar, Thailand and Vietnam. This species is also morphological similar to Orange bellied squirrel but it has red cheeks (Krapp 1989, Alfred & Sinha, 2002, Menon 2003).

The status of *D. lokriah* (Hodgson) is CAMP : LRnt (Nationally) and DD (Globally), whereas the status of *D. pernyi* (Milne-Edwards) and *D. rufigenis* (Blandford) are unknown (Krapp, 1989; Alfred & Sinha, 2002; Menon, 1003). Among rodents Williams (1938) reported the characteristics of mole and shrew for wildlife management.

Morphological features : Physical features of dorsal, ventral, head and tail were found to be characteristics of each species of genus *Dremomys*. In *D. lokriah* (Hodgson), dorsal primary guard hair had five bands (Table 1) whereas *D. pernyi* (Milne Edwards) and *D. rufigenis* (Blanford) had 3 bands (Table 1). Primary guard hair of ventral region of *D. lokriah* (Hodgson) had black and beige, 2 bands whereas that of *D. pernyi* (Milne Edwards) had 4 bands of similar colors. Unlike *D. lokriah* (Hodgson) and *D. pernyi* (Milne Edwards), *D. rufigenis* (Blanford) had very thin ventral primary guard hair which was of two types, completely beige and completely black. Primary guard hair of head of *D.lokriah* (Hodgson) was black or dark brown and small in size whereas that of *D. pernyi* (Milne Edwards) primary guard hair of head had black-beige-black bands (3). *D. rufigenis* (Blanford) had 3

banded primary guard hair of head. Primary guard hair of tail of *D. lokriah* (Hodgson) were very long with 6 bands of black and beige colors, whereas that of tail of *D. pernyi* (Milne Edwards) they were 5 banded, however that of *D. rufigenis* (Blanford) they were 3 banded (Table 1).

Length index was highest for tail of *D. rufigenis* (Blanford) *i.e* 52.0, whereas it was noted to be 46.1 for tail of *D. pernyi* (Milne Edwards), close to that of length index of tail of *D. lokriah* (Hodgson) (Table 1) and also highest for head of *D. lokriah* (Hodgson) *i.e.* 24.0 compared to 12.2 and 16.6 in case of *D. pernyi* (Milne Edwards) and *D. rufigenis* (Blanford) respectively indicating the *length of hair* was large for head, ventral, dorsal primary guard hair in case of *D. lokriah* (Hodgson), whereas the largest length was found to be that of tail of *D. pernyi* (Milne Edwards).

Biostatistical analysis (Table 1) revealed that there were extremely significant differences in length indices of hair from all body regions between species (comparing hair from same body region) except in tail, where it was non significant among *D. lokriah* (Hodgson) *vs D. pernyi* (Milne Edwards).

Morphological features *i.e.* profile of hair (colour and bands, thickness, straight or wavy) were noted to play an important role in identification of species among families Sciuridae (Bahuguna, 2008) and also in Herpestidae (De *et al.*, 1998), Cervidae (Bahuguna *et al.*, 2008) and Bovidae in case of Tibetan antelope (Bahuguna and Mukherjee, 2000).

Medullary features : *Medullary index (M/T)* was found to be species specific (Chakraborty *et al.*, 1996; Bahuguna 2007; 2008). The medulla type in all three species from all body regions were of multiserial ladder except tail of *D. lokriah* (Hodgson), which were of wide medulla lattice type (Figs. 1-12; Table 2). Medullay index were noted to be highest in case of hair from ventral and head of *D.rufigenesis* (Blanford) *i.e* 0.85 ± 0.25; 0.85 ± 0.2 respectively (Table 1, 2). For rest of other hair examined it was of range 0.7 to 0.8 indicating the presence of large size medulla in all hair examined.

ANOVA applied indicated that there was highly significant to extremely significant differences in medullary indices of hair from dorsal region among species.

Ventral hair examined depicted there was extremely significant to significant differences in medullar indices between species except among *D.lokriah* (Hodgson) *vs D. pernyi* (Milne Edwards) where it was non significant. Significant to highly significant differences was noted from hair from head region between *D. rufigenis* (Blanford) *vs D. pernyi* (Milne Edwards) and *D. lokriah* (Hodgson) vs *D. rufigenesis* (Blanford). However there were non significant differences in medullary indices of hair from tail region among species.

Cuticular pattern : Scale characteristics have been found to be species specific in case of Tibetan antelope, *Pantholops hodgsoni* (Abel), musk deer *Moschus chrysogaster* Hodgson and many more species so far examined (Bahuguna and Mukherjee 2000, Bahuguna *et al.*, 2008, Bahuguna, 2007, Bahuguna, 2008). It was considered an important

feature for identification of the species in the present study. Dorsal primary guard hair of *D. lokriah* (Hodgson) had cuticular characteristics of regular wave with smooth margin and near at mid and at proximal but at distal it had slightly rippled margin. Ventral primary guard hair had cuticular pattern with regular wave, smooth (slightly rippled), near (Figs. 25, 28.33; 26.30.34). Dorsal primary guard hair of *D. rufigenis* (Blanford) were regular wave, rippled and near at mid but it changed to regular mosaic, with smooth margin and near at proximal, however distal end depicted regular wave pattern with smooth margin and they were near (Figs. 49, 53, 57). The ventral primary guard hair of the species showed regular wave scale pattern with smooth (slightly rippled) margin and the distance between scale was near (Figs. 50, 54, 58). Dorsal primary guard hair of *D. pernyi* (Milne Edwards) were observed to be of regular wave, rippled and near at mid of hair but margins were smooth at distal and proximal hair (Figs. 37, 41, 45). Primary guard hair of *D. pernyi* (Milne Edwards) ventral region were regular wave, slightly rippled and near and the pattern changed to single chevron with smooth margin and distance was near at proximal end (Figs 38, 42, 46). Primary guard hair of head of *D. lokriah* (Hodgson) showed regular mosaic scale pattern (at mid and proximal) with smooth margin and near but at distal it is regular wave type (Figs. 27, 31, 35), whereas that of tail also had regular wave scale pattern, with scale margin smooth but the margins were slightly more rippled compared to that of head (Figs. 28, 32, 36). Primary guard hair of head of *D. pernyi* (Milne Edwards) had regular wave with smooth margin throughout (Figs. 39, 43, 47) but that of tail had regular wave scale pattern with rippled margin and distance between scales was near (Figs 40, 44, 48). In case of *D. rufigenis* (Blanford) they had regular wave scale pattern with smooth margin and distance between scales was near for primary guard hair of head region, in case of tail they had rippled scale margin (Figs. 51, 52, 55, 56, 59, 60, Table 3). Scale indices of hair from dorsal region were 7.4 ± 0.11 *D. lokriah* (Hodgson) of, 4.14 ± 0.0 of *D. rufigenis* (Blanford) and 12.12 ± 0.19 of *D. pernyi* (Milne Edwards). ANOVA applied indicated extremely significant differences in scale indices of hair from dorsal region among species (Table 1).

Cross section : Cross section in all species examined had oblong shape however tail of showed circular cross section in the species examined. All of them had large size medulla (Figs. 13-24; Table 4). Cross sections of different types were found to be species specific for various studies done (Bahuguna, 2007, Bahuguna *et al.*, 2007).

Genus *Ratufa* : Oriental giant squirrels (Genus *Ratufa*) belong to subfamily Ratufinae and are found in parts of South and South-east Asia. There are four species of oriental giant squirrels : *Ratufa affinis* (Raffles) (Pale Giant Squirrel), *Ratufa bicolor* (Sparrman) (Malaya Giant Squirrel), *Ratufa indica* (Erxleben) (Indian Giant Squirrel) and *Ratufa macroura* (Pennant) (Grizzled Giant Squirrel). *Ratufa affinis* (Raffles) (Pale Giant Squirrel) is found in Brunei, Indonesia, Malaysia, Singapore and Thailand (Krapp 1998).

The Malayan Giant Squirrel, *Ratufa bicolor* (Sparrman) is at home on the Indian subcontinent, north of the Ganges in Nepal, Sikkim, Bhutan and Assam; farther to the east it lives in Burma, Malaya and upto Southern China and on Java. It is deep dark brown,

almost black on the back and a light beige on the underside. They are very shy and they live exclusively in forest in the highest trees. They are very agile and jump in great leap from tree to tree, over a distance of almost 22 ft (Krapp, 1998). *Ratufa bicolor* (Sparrman) is a Schedule II species under IWPA 1972, and has category Lc IUCN (Kumar and Khanna, 2004).

Ratufa indica (Erxleben), Indian Giant Squirrel has been listed as, VU (IUCN Alacd.Cl ver 2.3, 1994), (CAMP) VU A 2c, 3c, 4c, (IWPA) Schedule II, CITES Appendix II, endemic population (Kumar and Khanna 2006). *Ratufa macroura* (Pennant) Grizzled Giant Squirrel, Sri Lankan Giant squirrel is a large species of squirrel found in Sri Lanka and in the forests of southern India. The species is found in patches of riverine forest along the Kaveri river in south India and in hill forests in peninsular India, and in parts of Sri Lanka. The Sri Lankan race is *R. macroura dandolena* (Menon, 2003).

Coat color is known to vary from juveniles to adults in many mammals. However, it has been reported by Menon (2003), that color of coat varies from different regions of distribution in case of *Ratufa indica* (Erxleben) an endemic squirrel. The dorsal region is a mixture of maroon and black with under parts cream and buff. In the northern Western Ghats this squirrel is brownish-maroon in appearance, with an all brown and white tail. In south it is black and dark maroon with a black and brown tail, whereas in the central and Southeastern Indian forms has brown color coat on the back with black hair on forelegs and have black tail with a pale tip. Malayan or Black Giant squirrel, *Ratufa bicolor* (Sparrman), is deep brown or black on the back and buff beneath. It has large black ears with hairy tufts, a black tail and black marks on its chin. The forelegs are black in front and buff on the back. Grizzled giant squirrel *Ratufa macroura* (Pennant), this endangered squirrel is comparatively smallest and has brownish gray coat with pale hair tips giving it a grizzled look. Its ventral surface is dirty white and tail has white bands. Ears and head are dark brown or black. Thus the color of hair from all body regions of the species of *Ratufa* although noted for the record in the present study but not taken into consideration for the key for identification of species. However, in case of Indian species of *Ratufa*, the banding is not the characteristic feature of the primary guard hair from all regions examined. But, bandwidth was noted to be characteristics of the genus *Callosciurus* of family Sciuridae and has been utilized in development of the key for identification of the species (Bahuguna 2008) as one of the important physical features. Length indices for all three species for primary guard hair from all body regions were : for *Ratufa bicolor* (Sparrman) 30.3±0.0 (for dorsal), 24.5 ± 0.0 (for ventral), 16.80 ± 0.0 (for head) and 51 7± 0.25 (for tail); for *Ratufa indica* (Erxleben) they were 39.2 ± 0.1 (for dorsal), 14.6 ± 0.16 (for ventral), 17.81 ± 0.06 (for head), 57.19 ± 0.25 (for tail). In case of *Ratufa macroura* (Pennant) length indices were 46.04 ± 0.5 (for dorsal), 35.45 ± 0.016 (for ventral), 13.76 ± 0.04 (for head) and 39.4 ± 0.07 (for tail). Length indices were noted to be maximum of *Ratufa macroura* (Pennant) for dorsal hair, of *Ratufa bicolor* (Sparrman) for ventral, of *Ratufa indica* (Erxleben) for head and tail. Length indices were used as an additional physical characteristics of hair (Bahuguna 2008) to know its consistency in identification of the species. In the present study the species of *Ratufa* examined showed the interspecific

variability in length indices as noted in case of Indian species of *Callosciurus* (Bahuguna, 2008).

Medulla characteristics : In all three species examined for hair characteristics of primary guard hair, medulla type was wide aeriform lattice (figs. 1, 6, 11, 17, 28, 33, 38, 43, 53, 58) from all body regions except simple medulla type in ventral guard hair of *Ratufa macroura* (Pennant) and dorsal guard hair of *R. indica* (Erxleben) (figs. 23, 49,). Medulla type was also noted to be characteristics of the orders of mammals so far examined with only few variations (Bahuguna *et al* 2007). Medullary indices of the species examined were : for *Ratufa bicolor* (Sparrman) 0.70 ± 0.6 (dorsal), 0.59 ± 0.0 (for ventral), 0.51 ± 0.25 (for head), 0.89 ± 0.01 (for tail); for *Ratufa indica* (Erxleben), 0.76 ± 0.01 (for dorsal), 0.52 ± 0.01 (for ventral), 0.70 ± 0.02 (for head), 0.76 ± 0.01 (for tail); for *Ratufa macroura* (Pennant) 0.86 ± 0.01 (for dorsal), 0.66± 0.0 (for ventral), 0.77 ± 0.01 (for head), 0.84 ± 0.01 (for tail). The medullary indices, thus recorded were the characteristics of the species for hair of all body regions, hence considered an important characteristic of hair for the identification of species of Genus *Ratufa*.

Cross-section types in all hair examined were oblong with large sized medulla (figs. 3, 8, 14, 21, 25, 30, 36, 40, 44, 49, 54, 59) except in case of hair from ventral region, which was medium sized for all the species examined.

Cuticular characteristics : In case of *Ratufa macroura* (Pennant) (figs. 45-47, 50-52, 55-57, 60, 61), the pattern was regular wave with rippled margin and near in all dorsal, ventral and head. But in tail region pattern is regular wave with smooth margin and distant.

In case of *Ratufa indica* (Erxleben), the cuticular pattern was regular wave, with rippled margin and near in case of hair from all body regions (figs 23, 24, 26, 27, 29, 31, 32, 34, 35, 37, 39, 41, 42). The cuticular pattern of *Ratufa bicolor* (Sparrman), was regular wave, with rippled margin and near in case of primary guard hair of dorsal, ventral but in tail regions it is irregular wave with rippled margin and near at proximal and mid but at distal it was with smooth margin (figs 2-5,7,9,10,12-15). However hairs from head showed regular wave pattern with scalloped margin and distance between scales were near (figs. 18-20, 22). Cuticular characteristics are known to be species specific in many studies (Chakraborty and De, 1995, De *et al.*, 1998, Bahuguna and Mukherjee 2000, Pradhan *et al.*, 2005, Bahuguna, 2007). Scale indices of dorsal primary guard hair of *R. indica* and *R. bicolor* were noted to be almost same but in *R. macroura* it was noted to be 6.24 ± 0.32 in all species examined for dorsal primary guard hair. However they were noted to be different in case of primary guard hair from other body regions. *Scale index* of the guard hair of ventral region of *R. bicolor* was noted to be 5.3 ± 0.01 and of *R. indica* was 6.5 ± 0.01 and that of *R. macroura* was 6.3 ± 0.0. *Scale index* of primary guard hair of head of *R. bicolor* was 4.17 ±0.0 and of *R indica* was 7.3 ±0.0 and of *R. macroura* was 4.4± 0.0. *Scale index* of tail of *R. bicolor* was 2.86 ± 0.01 *R. indica* 6.5 ± 0.01 and of *R. macroura* was 4.25 ± 0.01 .Same type of results have been obtained by the SEM, so far cuticular pattern, scale margin etc. are concerned.

Dorsal guard hair has been utilized since the history of trichotaxonomy for identification of species and development of key for identification because of the consistency in hair characteristics as reported by Mayer (1952), Appleyard (1960), Brunner and Coman (1974), Chakraborty and De 1995, Pradhan *et al.* (2005). However it has been realized that hair characteristics of primary guard hair from other body regions are equally important and should also be recorded.Since it is difficult to collect hair samples from large number of specimens, (especially for threatened and endangered species), thus it is recommended to have the record of hair characteristics from all body regions for further comparisons from other samples. This is required for dealing with wildlife forensic cases.

Genus *Petauriata* The status of Red flying squirrel or Common Giant Squirrel or Red Giant flying Squirrel *Petarusta petaurista* (Pallas) is unknown. The species is now known to have two subspecies. *i.e. albiventor* and *phillipensis* They are widely sympatric. Corbett and Hill (1992) recognized *phillipensis* as distinct species. Karyotype variation was reported by Young and Dhaliwal (1976) and also reviewed by Day (1988)

Five stripped squirrel (*Funabulus pennantii* Wroughton 1905) or Northern Palm Squirrel has been listed under Schedule IV, in IWPA; CAMP ; LR11C (Nationally), DD (Globally)

Hair profile of the Five stripped squirrel differs from that of Red giant flying squirrel being banded in appearance Cuticular pattern were same in both but the margins of scales were smooth on scales in the hair studied from different regions of Red flying giant squirrel. Hair from head, and ventral regions in case of Five stripped squirrel showed single chevron type of scale pattern with scalloped margin towards the tip of hair whereas the rest hair features were same (Figs. 2, 3, 4). Cross section indicated oblong cross section with large medulla in Five stripped squirrel and it was noted to be oblong and reniform in case of Red giant flying squirrel (Figs. 5,12,13). M/T ratios of all of them were same i.e. near to 0.8, small variations were observed in case of tail & head hair. SEM analysis indicated clear differences in Scale margins The scale margins were much smoother from most of the regions examined in case of Red Giant Squirrel compared to that of hair features of Five stripped squirrel (Figs. 6-8, 14-20).

Present study revealed some differences in hair features of Red giant flying squirrel and Northern palm squirrel, which has taxonomic importance. Cuticular pattern of Northern palm squirrel showed single chevron type of scale pattern with scalloped margin towards the tip of hair but in rest of the hair the features were same i.e. regular wave, slightly rippled margin and scales were near. In case of Red giant flying squirrel the margins of the scales were found to be smooth with regular wave scale pattern and scales were placed near. It was observed that to calculate *Scale index* in the present study, was of no use because the pattern changes and shape of scale was turning at an angle (Figs. 18,19). Cross section study of hair however, showed the presence of oblong shape with large medulla in both species. Although reniform shapes were also observed in Red giant flying squirrel in hair from all region, it was because of depression on hair surface (Figs. 15,16), in case of Red Giant flying squirrel. M/T ratios and medulla type was found to be same in both the species (Table 1).

According to Chakraborty and De (1995) cuticular scale features and measurements were found to be species-specific characteristics of the marbeled cat. Venkataraman *et al.* (1994) examined 17 species of carnivores using electron micrographs only. Williams (1938) provided a key to the identification of hair of moles and shrew and emphasized the hair features are of strong taxonomic value. Very few studies have so far has been done on trichotaxonomy of Indian rodents, however the present study on two species of family Scuiridae indicated that combination of various features of hair including hair *Profile and colour* provide species specific key of identification even in small mammals.

Family **VIVERRIDAE**

The poaching of civets is known to be done for food and they are tortured and killed for secretions of civet glands, which is used in perfumes. Consumption of civet cats, long favoured as a vital ingredient by Chinese herbalists and diners who enjoy their meat, has fallen since the arrival of the fatal respiratory disease Sars. Although the fears of Sars shrink China's appetite for wild delicacies, but they are still facing threats to their survival due to habitat loss and poaching (Williams 1938, Associated press 2006, http :www.msnbc.msn.com/id/12371160/). Anatomical study of hair revealed that the medulla type in all the examined species of family viverridae had wide aeriform lattice (figs. 1-20). However various types i.e. oblong, circular, reniform and concavoconvex with large, medium and divided medulla (figs. 21-24) were observed in case of cross section types.. In case of *Paradoxurus hermaphroditus* (Pallas), it was noted to be oblong type with large medulla in primary guard hair of head, ventral and dorsal but it was with medium sized medulla in primary guard hair of ventral region (Table 1).

Primary guard hair of *Viverra zibetha* Linnaeus showed cross section types of oblong with large medulla in case of head, ventral and dorsal region but in case of tail it was circular, with large medulla. *Paradoxurus jerdoni caniscus* Blanford had variations in types of cross section, in primary guard hair of different regions (Table 1). In case of head it was oblong with medium sized medulla, whereas in case of ventral it was oblong with large sized medulla. The primary guard hair of tail had reniform type with medium sized medulla and dorsal had circular size with medium sized medulla. Primary guard hair of head and ventral of *Paguma larvata* (Hamilton-Smith) had oblong size with medium medulla whereas in case of tail it was oblong with large medulla. The dorsal hair had circular size with medium sized medulla (Table 1). Primary guard hair of head of *Arctictis binturong* (Raffles) showed circular, oblong, concavoconvex shapes with medium sized medulla. Primary guard hair of tail, ventral were observed to have oblong, concavoconvex and divided medulla, the ventral hair had concavo convex shape with large and divided medulla (Table 1).

Cuticular architecture : Cuticular pattern of *Paradoxurus hermaphroditus* (Pallas) (Figs. 41-52) revealed regular wave scale pattern with rippled margin and the scales were near, throughout in case of all types of hair examined (Table 2) but it was noted to be irregular wave, rippled in tail hair at mid region (Table 2).

Viverra zibetha Linnaeus had regular wave scale pattern with rippled margin and distance between scales was near in tail hair, at mid of ventral hair but at tip of head it

was transitional type with smooth margin (fig. 99) and at mid it was regular wave, smooth and near. Base and tip of ventral hair had regular wave, smooth and near cuticular architecture. At dorsal it was regular wave with smooth margin and near at mid (fig. 59, Table 1). The base and tip of ventral hair had regular wave pattern with smooth margin and near (fig. 64).

Arctictis binturong (Raffles) had cuticular pattern of primary guard hair of regular wave, rippled and near in all primary guard hair types examined (Table 2) except at dorsal which was irregular wave, rippled and near. The primary guard hair of *Paradoxurus jerdoni caniscus* Blanford had cuticular pattern of regular wave, with smooth margin and distance between scales was near which changed to rippled margin at tip and base. In case of primary guard hair of head it was transitional type towards base (fig. 97) which changed to regular wave, smooth, near at tip and to rippled at mid (figs. 89, 93).

Paguma larvata (Hamilton-Smith) had irregular wave, rippled and near cuticular pattern in primary guard hair of head region, tail, ventral and dorsal region throughout except scales were placed close at head region and smooth and regular wave at tip of tail hair.

Secondary guard hair were also examined in some species i.e *Viverra zibetha* Linnaeus and *Paguma larvata* (Hamilton-Smith) (figs. 64, 87) and fur hair (fig. 88). There scale architecture was characteristics of carnivores.

Based on various anatomical features of hair it was noted that the medulla type was similar in all the species examined for family Viverridae. However cuticular architecture and cross section types were variable among species and can be used in preparation of key from various regions. Cross section types i.e. oblong, circular and concavoconvex were noted to be characteristics of the species and their characteristics from head, tail, ventral and dorsal regions made the unique combinations of the species (table1). As far as scale architecture was concerned it was also noted to be having the pattern which was species specific (table 2). Transitional type hair feature was also noted in case of *Paradoxurus jerdoni caniscus* Blanford and *Viverra zibetha* Linnaeus (fig. 97) in head region and at dorsal hair of *Viverra zibetha* Linnaeus (fig. 53). These characteristics with broad petal type of scales were noted to be chatacteristics of family Viverridae (Bahuguna *et al.*, 2010). Short (1978) reported that the pattern of cuticular scales on the hair surface is sufficient for identification of different mammalian species. Similar findings were reported for carnivores by Chakraborty and De (1995) in case of Marbled cat *Felis marmorate charltoni* Gray and De *et al.*, 1998 in case of five Indian species of mongoose, who noted that no single character can be utilized in the identification of the species through dorsal guard hair. The present study depicted the variations in structure of cuticle as well as in cross section types with medulla size.

Koppikar and Sabnis (1975) and Nath and Joseph (1981) gave the descriptive study of hair of some Indian mammals. A reference guide for identification of selected species of Indian mammals representing the features of primary guard hair (dorsal) of 57 species, useful for solving the wildlife forensic cases has been prepared by Bahuguna *et al.*, 2010.

The study of hair was found to be useful in identification of small mammals (Bahuguna. 2007; Bahuguna, 2008).

Earlier studies also revealed that the structure of hair has definite taxonomic values in different systematic categories for some groups of mammals including felids (Chakraborty *et al.*, 1996, Chakraborty *et al.*, 2001; Chakraborty and De, 2002; Day, 1966; Debort *et al.*, 1982; Teerink, 1991 and Wallis, 1993). Appleyard (1960); Lyne and McMohan (1951); Mathiak (1938); Wildman (1940) and Mayer (1952), described various characteristic features of hair of mammals. The technique has been found to be useful in studies of prey–predator relationship, hence in wildlife management for conservation areas (Nath and Joseph, 1981)

Family **MUSTELIDAE**

The characteristics features of PGH of the species of family Mustelidae were noted to be narrow medulla lattice and most of them had circular,elliptical shapes of medulla in cross section with medium medulla.

The cuticular pattern however found to vary within species in case of dorsal PGH. In case of *Lutra lutra* Linn. Cuticular pattern at mid, distal was irregular wave with rippled margin and distance between scales was close but at proximal it was diamond petal with smooth margin and scales were distant (*Scale index* at mid 4.0 ± 0.0; at distal 5.3± 0.0). In case of *Lutrogale perspicilata* (I. Geoffrey Saint Hillaire) the dorsal PGH had medulla of type wide aeriform lattice.The cuticular pattern was irregular wave, rippled and near and at distal it was regular wave, smooth, near (*Scale index* was at mid 1.0 ± 0.0, at proximal 4.0 ± 0.0, at distal 3.3 ± 0.0). Dorsal primary guard hair of *Arctonyx collaris* Cuvier had cuticular pattern at mid, distal irregular wave with rippled margin and distance between scales was near and at proximal it was transitional type with smooth margin and scales were near. In case of *Mellivora capensis* Schreber, cuticular pattern at mid, distall was irregular wave, with rippled margin and distance between scales was close whereas at proximal it was transitional/ regular wave with smooth margin and they were placed near (*Scale index* 7.0 ± 0.0 at mid; 1.0 ± 0.0, at proximal and 22.0 ± 0.0 at distal). *Amblonyx cinereus* (Illiger), at mid the cuticular pattern was irregular wave with rippled margin and distance between scales was near; at proximal it was transitional with smooth margin and the scales were placed at distant and at distal it was regular wave with rippled margin and distance between scales was near (*Scale index* was 7.0 ± 0.0 at mid; 13.0 ± 0.0 at proximal).In case of *Amlonyx cinereus* (Illiger), at mid the cuticular pattern was irregular wave, with rippled margin and distance between scales was near; at proximal it was transitional with smooth margin and distance between scales was distant. At distal cuticular pattern was regular wave with rippled margin and distance between scales was near (*Scale index* 7.0±0.0 at mid, 13.0±0.0 at proximal). In *Mastela sibrica hodgsoni*, the medulla was large in size (M/T 0.71 ± 0.0). Cuticular pattern was similar to that of *Amblonyx cinereus* however *Scale index* vary it was 2,83±0.0 at mid, 1.0 ±0.0 at proximal (transitional), 6.25±0.0 at distal.In case of *Mastela altaica* Pallas, dorsal PGH had large medulla. Cuticular pattern was irregular wave with rippled margin and distance between scales was near at

mid and distal, whereas at proximal it was transitional with smooth margin and distance between scales was near. The same cuticular pattern was present in *Martes flavigula* (Boddaert) but the scale indices vary (at mid it was 7.2 ± 0.0, at proximal 1.42 ± 0.0 and at distal it was 10.0 ± 0.0). In *Martes foina* (Erxleben) the cuticular pattern at mid was irregular wave with rippled margin and distance between scales was near whereas at proximal it was transitioanal with smooth margin and distance between scales was near, whereas at distal it was regular wave with rippled margin and distance between scales was near.

Ventral PGH : Most of the species examined of this family had medulla with narrow medulla lattice and shapes of medulla in cross sections were circular, elliptical with medium medulla.

The cuticular pattern of ventral PGH of *Lutra lutra* (Linn.) revealed cuticular scale pattern of type of irregular wave with rippled margin and distance between scales was near. *Lutrogale perspicillata* (I. Geoffrey Saint Hillaire) had cuticular patten at mid irregular wave with rippled margin and distance between scales was near, at proximal and distal it was irregular wave with rippled margin and the distance between scales was close. *Arctonyx collaris* Cuvier had cuticular pattern at mid and distal of irregular wave type with rippled margin and the distance between scales was near and at proximal it was transitional with smooth margin and the disatance between scales was near. The PGH (ventral) of *Mellivora capensis* Schreber had cuticular pattern of irregular wave type with rippled margin and distance between scales was close at mid and near at distal. The proximal region had transitional/regular wave pattern with smooth margin. *Amblonyx cinereus* (Illiger) had cuticular pattern at mid and distal irregular wave type with rippled margin and distance between scales was near whereas at proximal it was transitional with smooth margin and distance between scale was near. The size of medulla was large.

Head PGH : All the species examined had narrow medulla lattice and in cross sections the shapes were circular, elliptical and medulla size is medium. The differences were noted to be in cuticular pattern. In case of *Lutra lutra* (Linn) cuticular pattern was regular wave with rippled margin and the distance between scales was distant. PGH from head of *Lutrogale perspicillata* (I. Geoffrey Saint Hillaire) had cuticular pattern of irregular wave with rippled margin and distance between scales was near at mid and at distal it was regular wave with smooth margin and distance between scales was near, but at proximal it was transitional with smooth margin and distance between scale was near. The cuticular pattern of PGH of head of *Arctonyx collaris* Cuvier was irregular wave with rippled margin and distance between scales was near whereas at proximal it was transitional with smooth margin and distance between scales was near. In *Mellivora capensis* Schreber, PGH of head region had different cuticlar pattern at all three regions i.e mid,distal and proximal (at distal and mid it was irregular wave with rippled margin but the distance between scales was close at mid but near at distal; the proximal had transitional /regular wave scale pattern with smooth margin and distance between scales was near). In *Lutra cinereus* Illiger the cuticular pattern was irregular wave with rippled margin and distance between scale was

near whereas at proximal it was transitional with smooth margin and distance between scale was near. In *Mastela sibrica hodgsoni* Pallas and in *Mastela altaica* Pallas the cuticular pattern was similar to that of *Arctonyx collaris* Cuvier. In *Martes flavigula* (Boddaert) the cuticular pattern at mid, proximal and distal it was regular wave with rippled margin and distance between scale was near. In *Martes foina* (Erxleben) the PGH of head region had cuticular pattern at mid irregular wave with rippled margin and distance between scale was near and at distal it was regular wave with rippled margin and distance between scale was near whereas at proximal it was transitional with smooth margin and the distance between scale was near.

Tail PGH : *Lutra lutra* (Linn.) The cuticular pattern at mid, proximal and distal was regular wave with rippled margin and distance between scales was distant. In case of *Lutrogale perspicillata* (I. Geoffrey Saint Hillaire) the cuticular pattern was irregular wave with rippled margin and the distance between scale was near at mid, it was regular wave with smooth margin and the distance between scale was near at distal and it was transitional with smooth margin and the distance between scale was near. *Arctonyx collaris* Cuvier had cuticular pattern at mid and distal irregular wave with rippled margin and the distance between scale was near and at proximal it was transitional with smooth margin and the distance between scale was near. *Mellivora capensis* Schreber had cuticular pattern irregular wave with rippld margin and distance between scale was close/near and at proximal it was transitional/ regular wave with smooth margin and the distance between scale was near. The medulla of *Mastela sibrica hodgsoni* (Pallas) was wide aeriform lattice. The cuticular pattern was regular wave with rippled margin and the distance between scale was near at mid and at distal it was regular wave with smooth margin and the distance between scale was near and at proximal it was transitional with smooth margin and distance between scale was near. *Mastela altaica* Pallas had cuticular pattern irregular wave with rippled margin and the distance between scale was near. In case of *Martes flavigula* (Boddaert) the medulla was large and the cuticular pattern was irregular wave with rippled margin and the distance between scale was near at mid,distal and proximal. *Martes foina* (Erxleben) had cuticular pattern irregular wave with rippled margin and the distance between scale was near at mid and at proximal and distal it was regular wave with rippled margin and the scales were placed near.

Family **HERPESTIDAE**

All the species examined had banded profile of PGH from dorsal,ventral,head and tail.In case of dorsal PGH the medulla was of wide medulla lattice type. Cross sections types were of oblong, circular types in all species with large size medulla. Cuticular pattern of *Herpestes palustris* Ghose were of irregular wave type, with crenate margin and the distance between scales were near. The cuticular pattern of dorsal PGH of *Herpestes edwardsii* (E. Geoffrey Saint-Hilaire) was at mid SP irregular wave, SM slightly crenate/ smooth, DS near; at proximal : SP regular wave, SM smooth, DS near; at distal : SP irregular wave, SM slightly crenate, DS close. *Herpestes javanicus* (E. Geoffroy Saint-Hillaire), *Herpestes urva* (Hodgson) and *Herpestes vitticollis* Bennett had cuticular pattern

of SP Irregular wave, SM crenate, DS near at mid, proximal and distal *Herpestes smithi* Gray had cuticular pattern of type irregular wave with crenate margin and distance between scales were near. It was noted that these three species were difficult to differentiate on the basis of morphological hair features. However scale indices was found to be useful along with profile of hair

Features of ventral PGH of all the species examined were of medulla type of Wide medulla lattice with crenate margin, however *Herpestes edwardsii* (E. Geoffrey Saint-Hilaire) had simple medulla type. As far as cuticualr pattern is concerned it was found to be of irregular wave type, with crenate margin and distance between scales were near in all species. The size of medulla in cross sections were different for different species , in case of *Herpestes urva* (Hodgson) and *Herpestes javanicus* (E. Geoffroy Saint–Hillaire) it was large but in rest of the species it was of medium sized. The profile of hair along with medulla size with *Medullar index* can be used effectively in differentiating the species.

Primary guard hair of head of the species examined had medulla type of wide medulla lattice and all were banded. Sizes of the medulla as well as cuticular pattern vary in different species examined. In case of *Herpestes palustris* Ghose, the size of medulla was large (M/T : 0.73 ± 0.01).and cuticular pattern was irregular wave, crenate and near at mid, distal and proximal. *Herpestes edwardsii* (E. Geoffrey Saint-Hilaire) had scale pattern, irregular wave with crenate margin and distance between scales were close, cross section types were reniform, oblong with medium medulla (M/T 0.56 ± 0.01). *Herpestes javanicus* (E. Geoffroy Saint–Hillaire) had cuticular pattern of regular wave with smooth margin and distance between scales were near.Cross section types were circular,oblong with large medulla. *Herpestes urva* (Hodgson) had simple medulla type with circular,oblong shape in cross section and had medium medulla (M/T 0.55 ± 0.03). The cuticular pattern of the species was irregular wave with crenate margin and distance between scales were near. *Herpestes smithi* Gray, PGH of head had large sized medulla,with cuticular pattern of irregular wave, with crenate margin and distance between scales were near. In case of *Herpestes vitticolis* Bennett the hair features of PGH were similar to that of *Herpestes smithi* Gray, except the medulla size is medium.

Primary guard hair of tail of all species examined had wide medulla lattice except in *Herpestes palustris* Ghose, where it was simple medulla type. Shapes of medulla in all species examined were of circular, oblong types. The medulla size however varied from large to small. Cuticular pattern of tail PGH was of irregular wave with crenate margin and distances between scales were near in case of *Herpestes palustris* Ghose and the size of the medulla was large with circular, oblong shapes whereas in case of *Herpestes edwardsii* (E. Geoffrey Saint-Hilaire) it was reniform and oblong with large medulla. Cuticular pattern was similar to *Herpestes palustris* Ghose, except the distance between scales was close. In case of *Herpestes javanicus* (E. Geoffroy Saint–Hillaire),the medulla was of wide medulla lattice with large size and circular oblong shapes and cuticular pattern was similar to *Herpestes palustris* Ghose, *Herpestes javanicus* (E. Geoffroy Saint–Hillaire). *Herpestes urva* (Hodgson), had wide medulla lattice with medium medulla, shapes of the medulla was circular. and cuticular pattern was of irregular wave, with crenate margin and distance

between scales were near. PGH of tail of *Herpestes smithi* Gray had wide medulla lattice with large size and oblong shaped medulla. Cuticular pattern was of irregular wave type, with crenate margin and distance between scales was close. *Herpestes vitticolis* Bennett had medium sized medulla with wide medulla lattice and shape in cross section was of circular, oblong type. The cuticular pattern was of irregular wave with crenate margin and distance between scales was near.

The study of PGH of the species of Herpestidae revealed that the hair features of head were of more significance in differentiating the species rather than of dorsal, ventral and tail PGH. However the combinations of characters of PGH from all four regions (dorsal, ventral, head and tail) provide very useful key for identification of species of family Herpestidae. De *et al.*, 1998, found the similar results in case of dorsal PGH and inferred that no single character was found to be species specific. However from the combination of characterlike banding pattern,scale cont, scale pattern, scale margin, *Medullar index* PGH of the species of family can be identified.

Family **TRAGULIDAE**

The species of family Tragulidae, *Moschiola mammina* (Erxleben) has been examined in the present study. All PGH examined in the present study had wide medulla lattice. The cross section of the medulla had oval, oblong shapes with large medulla. The cuticular pattern as well as the profile of hair was noted to vary in all the hair examined. The cuticular pattern of dorsal PGH was at mid irregular wave with rippled margin and at proximal and distal it was irregular wave with smooth margin and distance between scale was distant. The similar pattern was observed in ventral primary guard hair.The primary guard hair of head region had cuticular pattern of irregular wve with rippled margin and distance between scale was near.

SUMMARY

Trichotaxonomy is known for its utility in wildlife forensic, for ecological study, wildlife management and conservation. The present study described the characteristic features of Sciuridae, Viverridae, Mustelidae, Herpestidae and Tragulidae. The species examined are data deficient and are facing threats due to poaching and habitat destruction. The analysis of primary guard hair was done from all body regions i.e. dorsal, ventral, head and tail. Hair features like medulla type, cuticular pattern, scale index, medullar index, length index, cross sections and longitudinal sections were applied to develop the key for identification of the species. The study revealed that trichotaxonomy can be applied effectively for the identification of the species of small mammals

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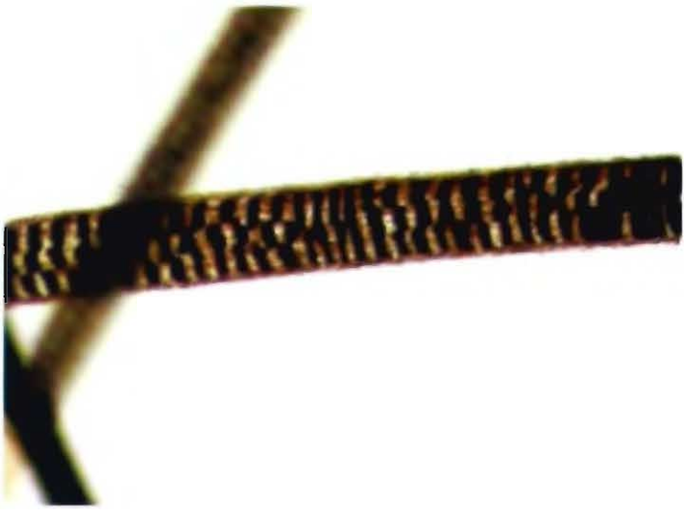
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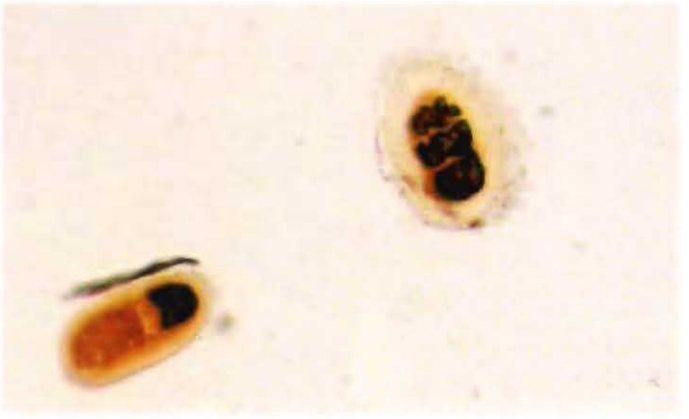
Family - Sciuridae, Plate 1a. Dorsal *Callosciurus caniceps* (Gray, 1842)
Photomicrographs (Figs. 1-4, mag 200x, 100x)



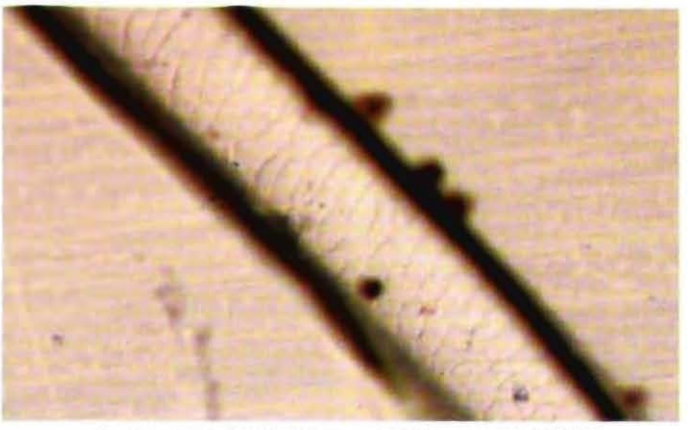
1. L.S. of Medulla : Multiserial ladder type 100x



2. Cross section Oval shaped 200x

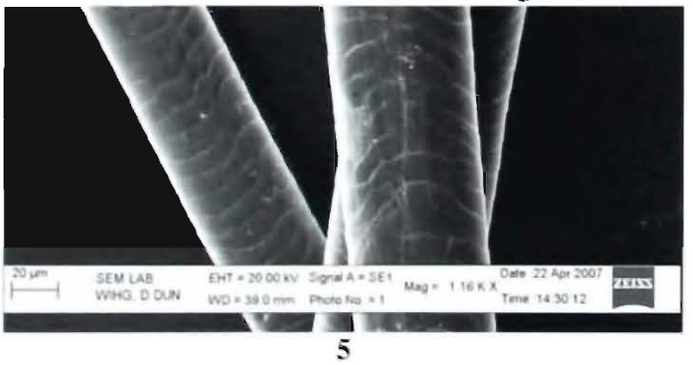


3. Cross section : oblong 100x

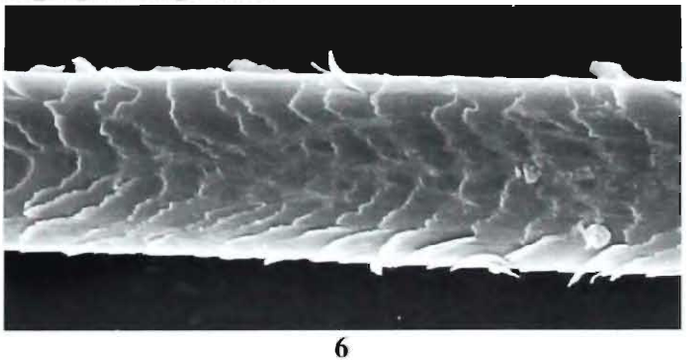


4. At mid Cuticular : regular wave 100x

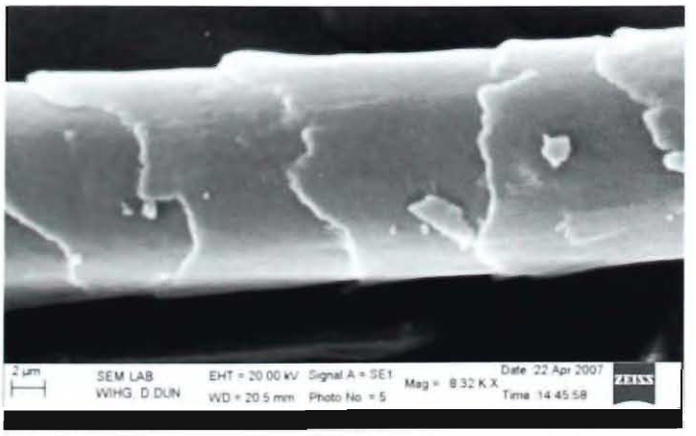
Scanning Electron Micrographs (Figs. 5-7)



5



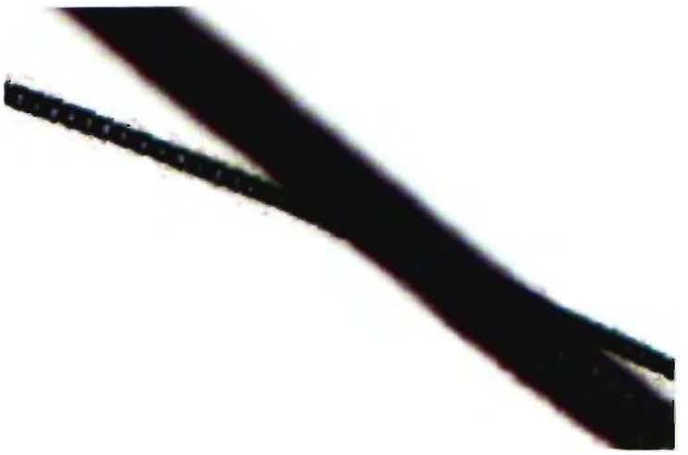
6



7

Figs. 5, 6. At mid of hair : Cuticular type SP Regular wave, SM rippled margin, DS near
Fig. 7. Distal end hair, Cuticular pattern : Simple coronal with rippled scale margin, DS near

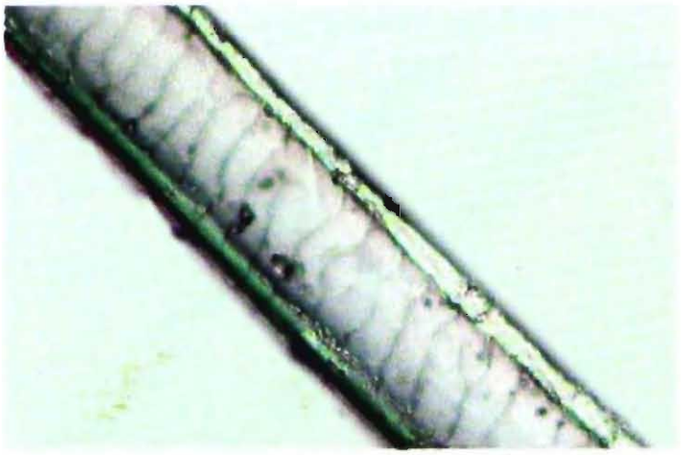
Plate 1b. Ventral *Callosciurus caniceps* (Gray, 1842)
Photo micrographs (Figs. 8-11, mag. 200x)



8. Medulla type : multiserial ladder 100x



9. Cross section : oval, oblong 200x

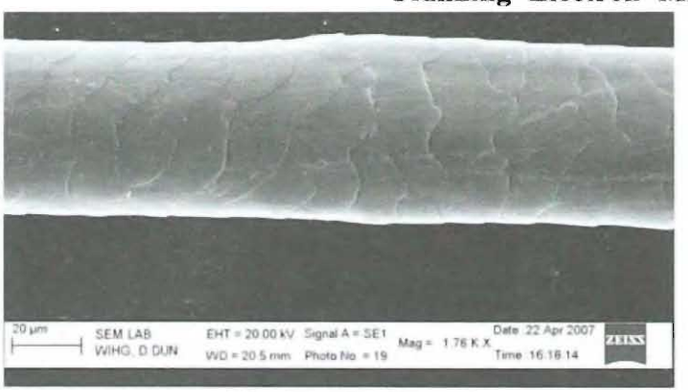


10. At mid : cuticular pattern 200x

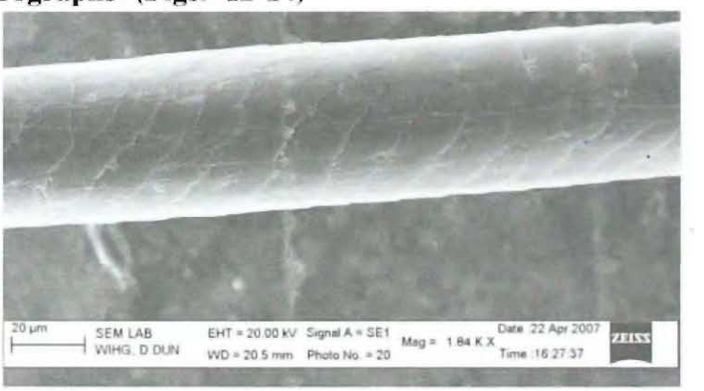


11. Follicle type 200x

Scanning Electron Micrographs (Figs. 12-14)



12. At mid cuticular pattern



13. At proximal Cuticular pattern

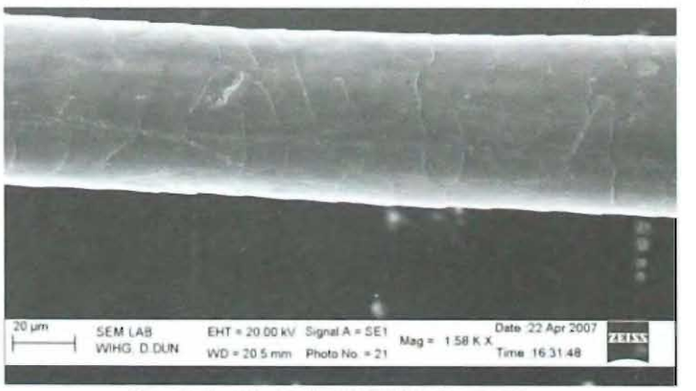
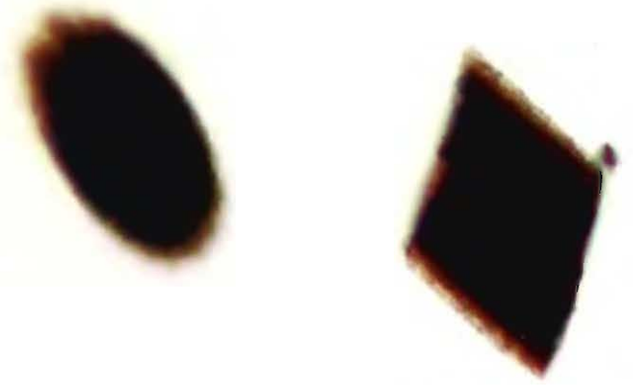
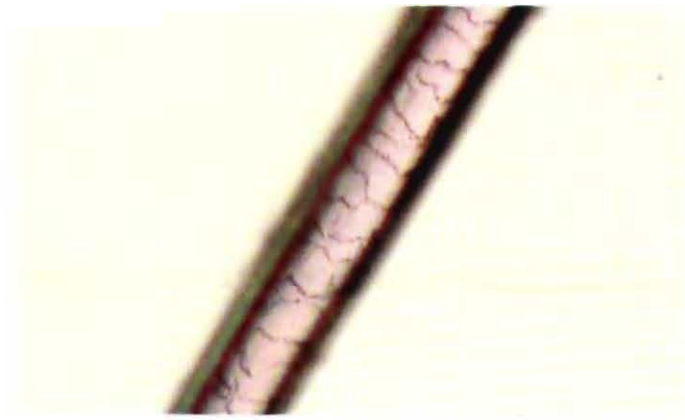


Fig. 14. At distal Cuticular pattern

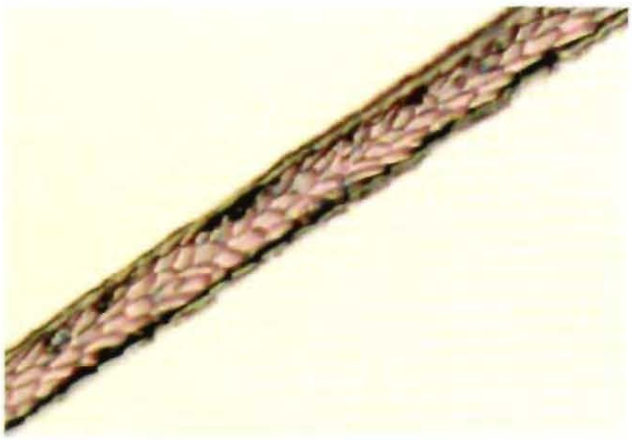
Plate 1 c. Head *Callosciurus caniceps* (Gray, 1842)
Phototmicrographs (15-17, mag 200x)



15. C.S and L.S. of hair 200x

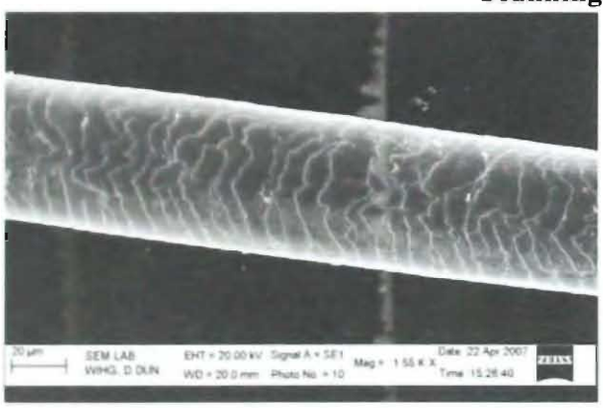


16. At mid Cuticular pattern : regular wave, smooth, near 200x

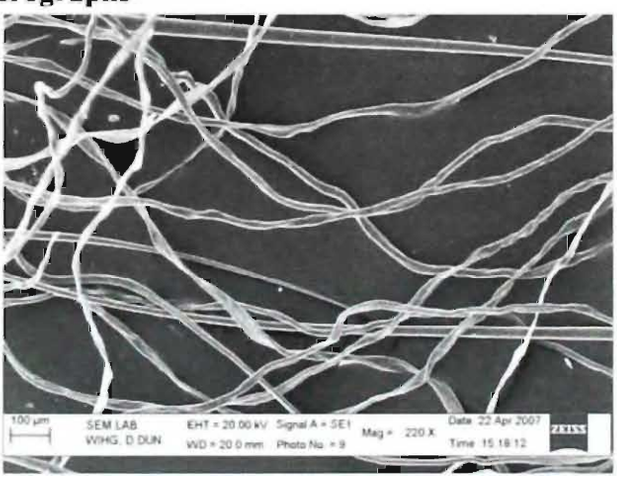


17. Fur hair Cuticular pattern 200 x

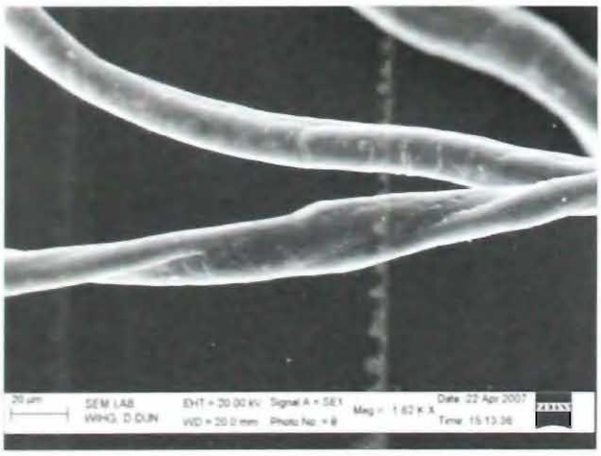
Scanning Electron Micrographs



18



19

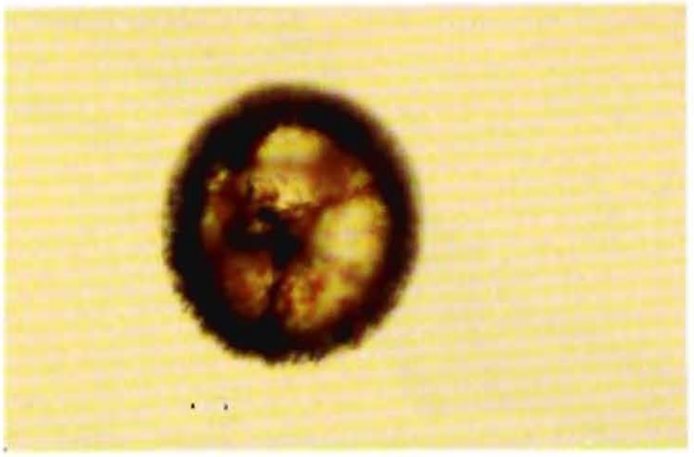


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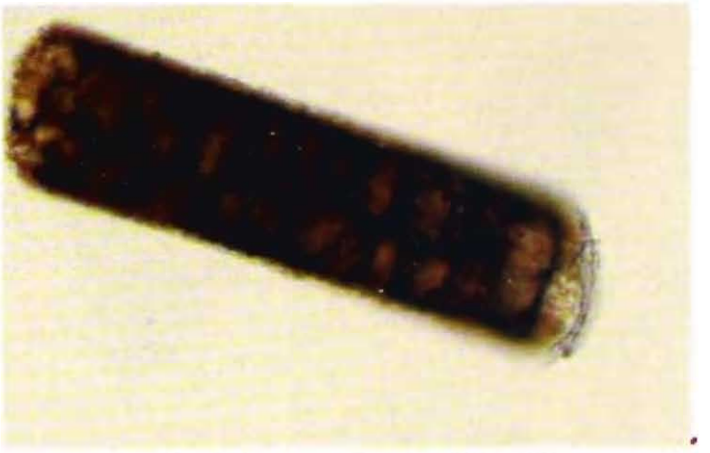
Cuticular pattern

Fig. 18 : At distal : regular wave, rippled, near
Fig. 19 : A group of fur hair
Fig. 20 : Fur hair

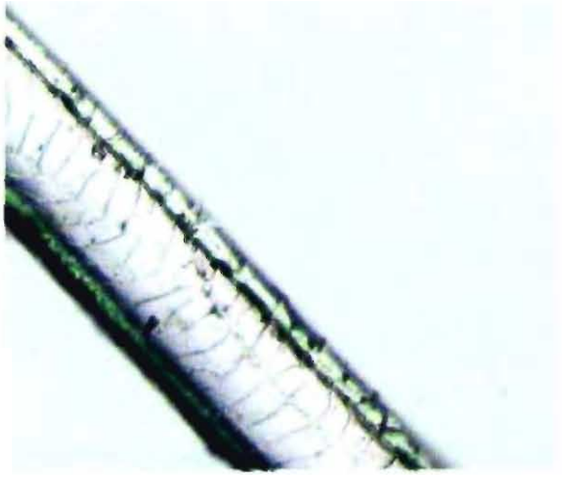
Plate 1d. Tail *Callosciurus caniceps* (Gray, 1842)
Photomicrographs (Figs. 21-24, mag 200x)



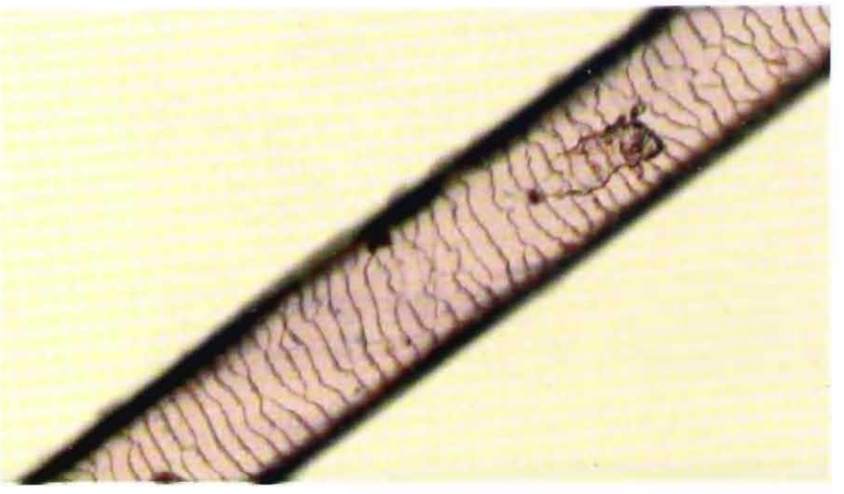
21. Cross section type : Circular



22. Medulla type Multiserial ladder

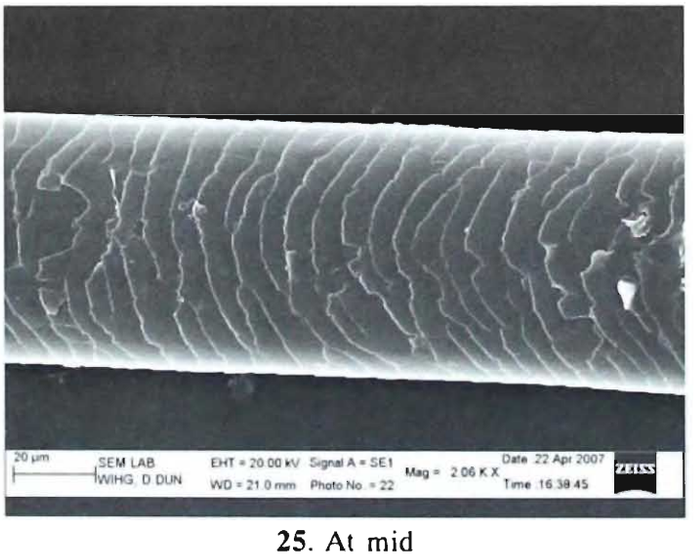


23. Cuticular pattern at mid : regular wave, smooth, near

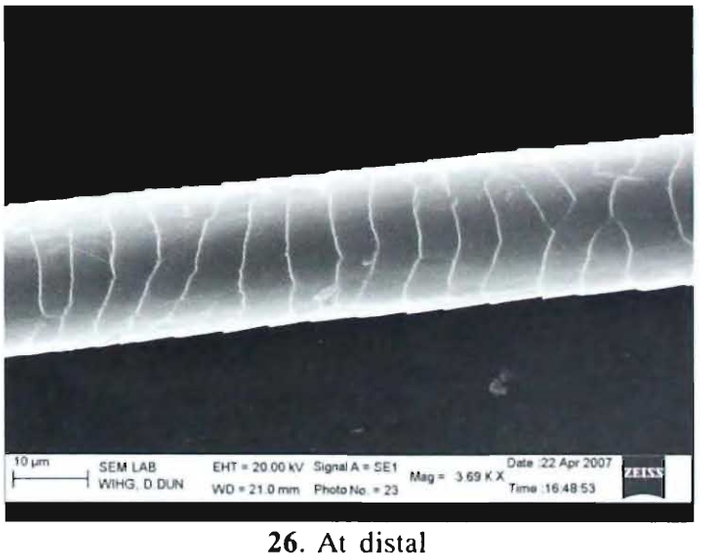


24. Cuticular pattern at distal

Scanning Electron Micrographs

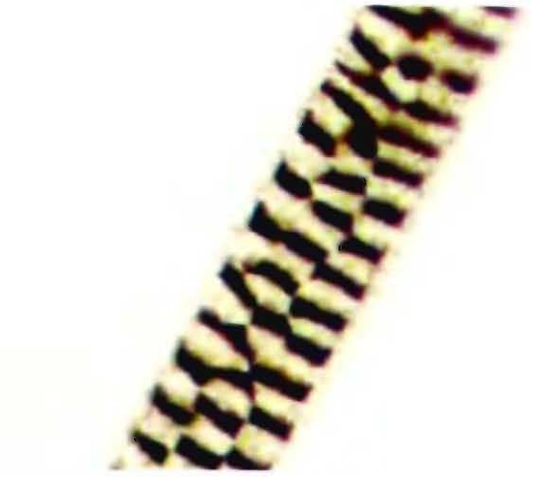


25. At mid



26. At distal

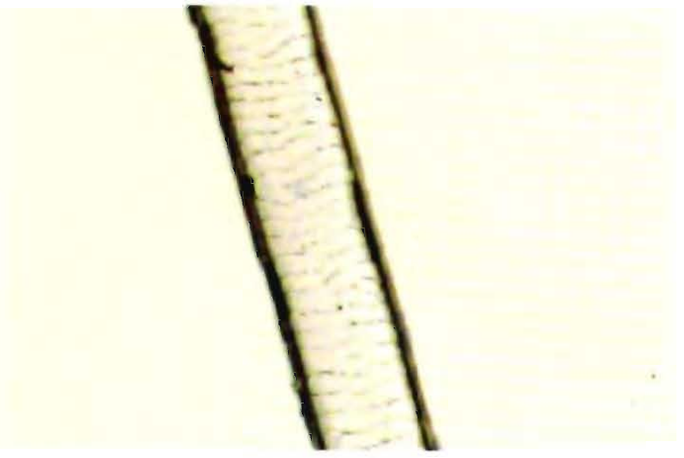
Plate 2a. Dorsal *Callosciurus erythraeus* (Pallas, 1779)
Photomicrographs (Figs. 27-29, mag 200x)



27. L.S. of Medulla : Multiserial type

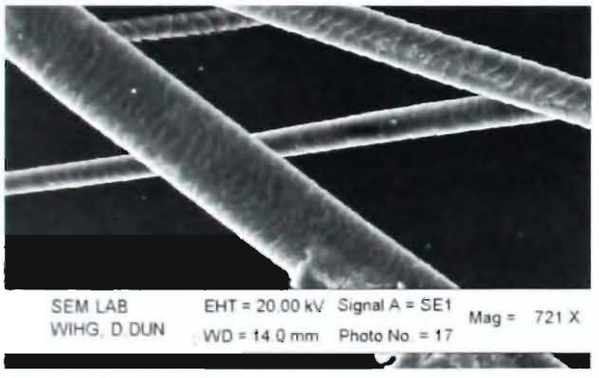


28. Cross section type oblong shaped with large medulla

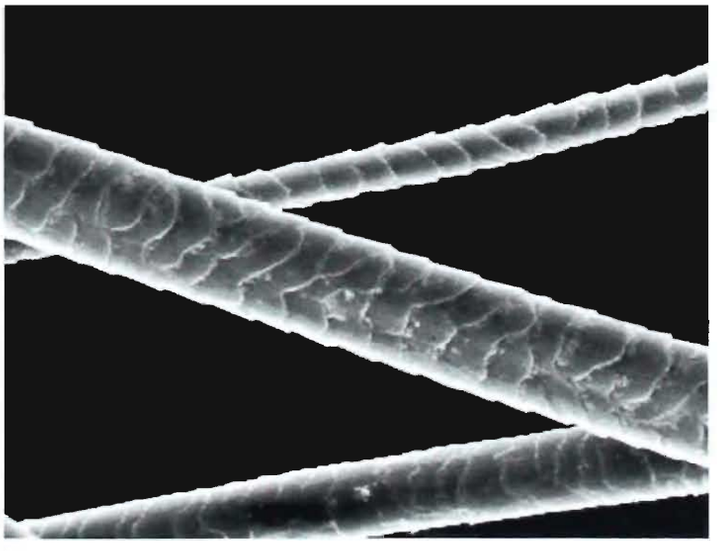


29. Cuticular pattern : at mid of hair (SP : Regular wave, SM : rippled margin, DS near)

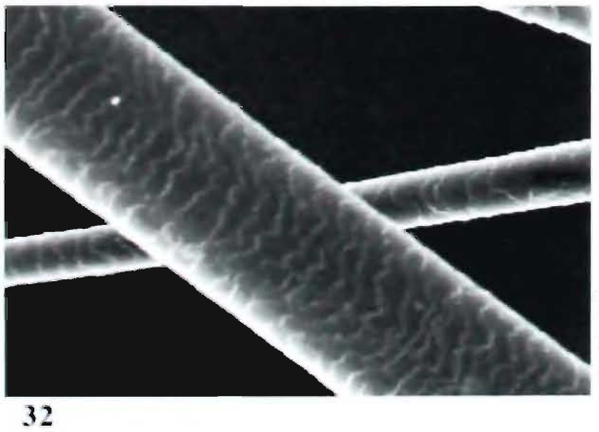
Scanning Electron Micrographs



30



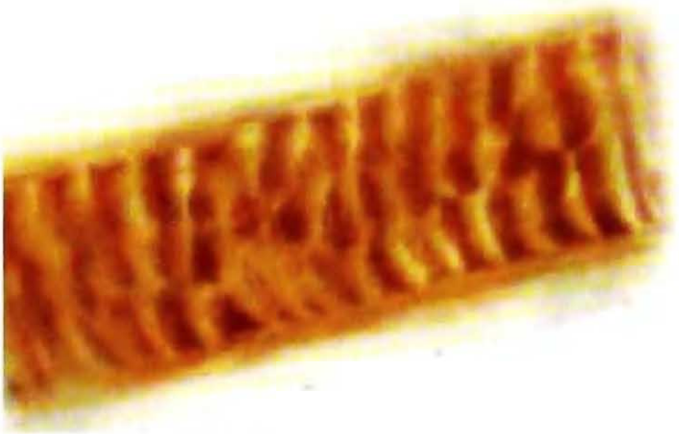
31



32

Figs. 30-32. Cuticular pattern at mid, base (regular wave with rippled margin, near) (Figs. 30, 32) and tip (broad petal with smooth margin) of hair (Fig. 31)

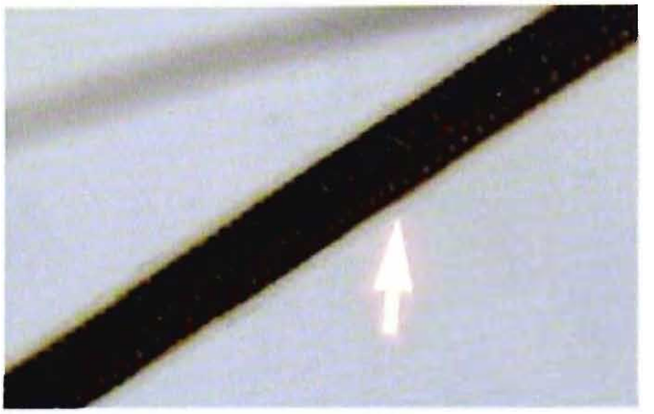
Plate 2b. Ventral *Callosciurus erythraeus* (Pallas, 1779)
Photomicrographs (Figs. 33-35, mag x200, x400) :



33. L.S. of Medulla, multiserial ladder x400

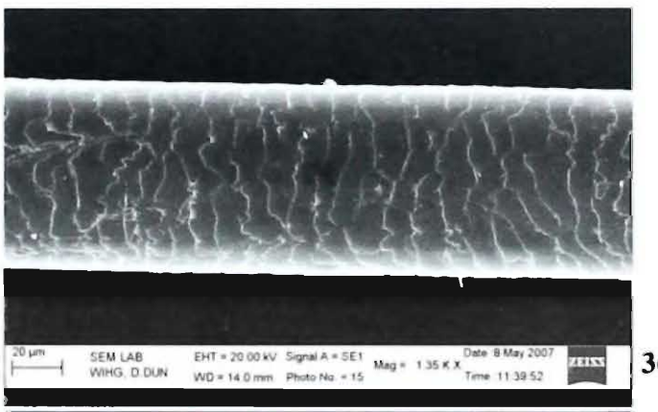


34. Cross section : Oval, oblong

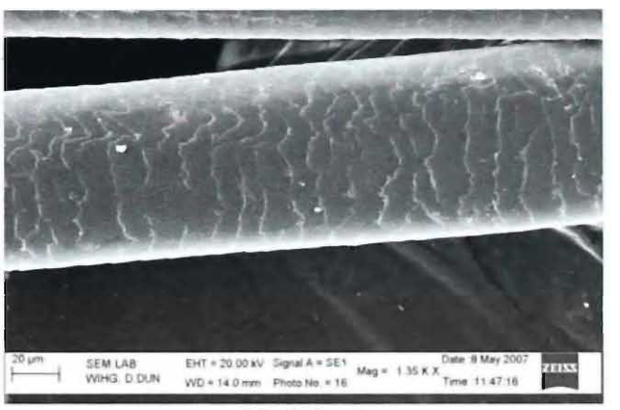


35. Medulla, multiserial ladder x200

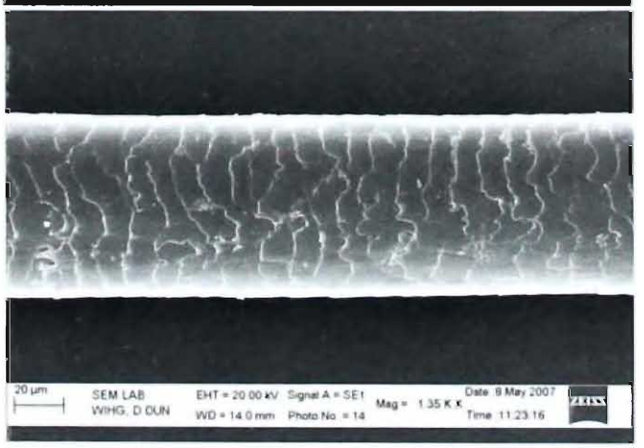
Scanning Electron Micrographs (Figs. 36-38 Cuticular pattern : regular wave, rippled, near)



36. Mid



37. Distal



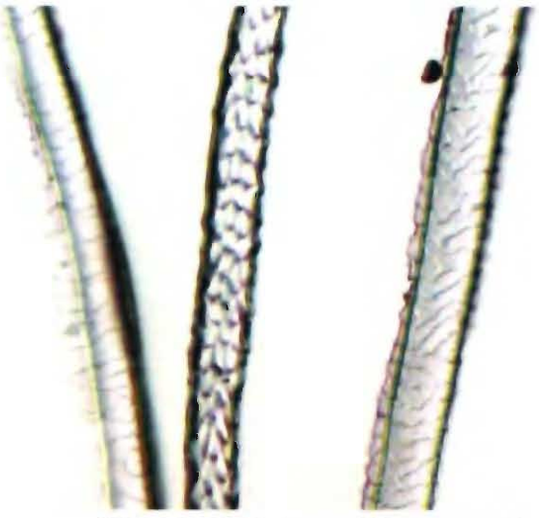
38. Proximal



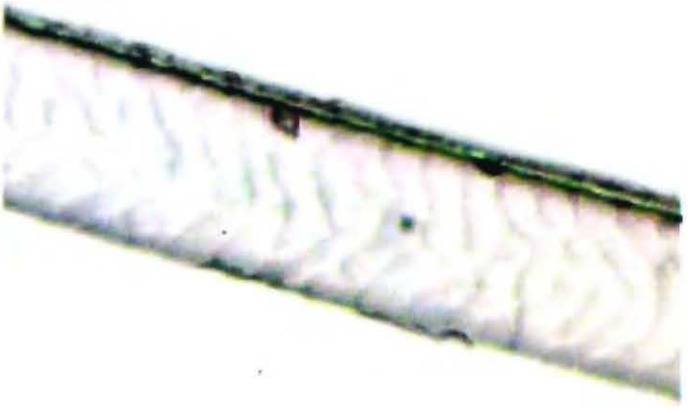
39. Medulla type Multiserial ladder



40. Cross section Oval



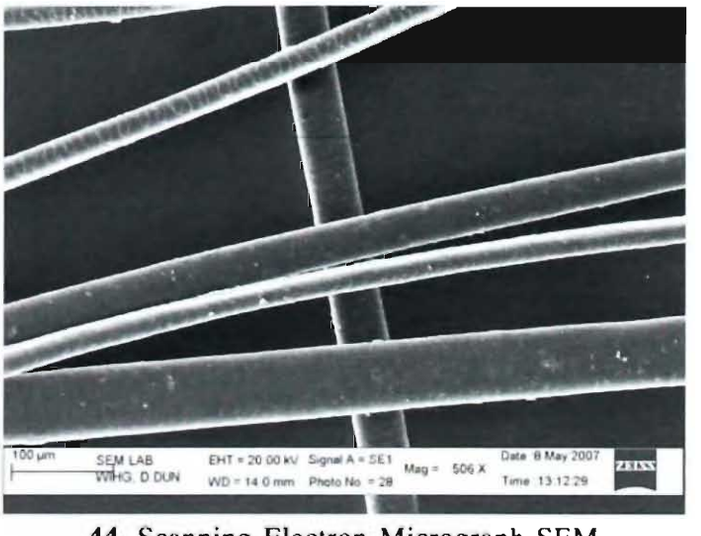
41. Cuticular pattern at different regions



42. At distal



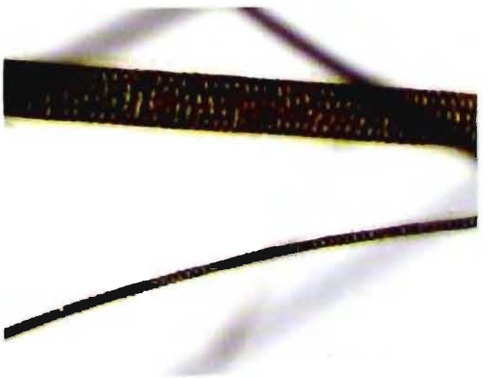
43. At mid : Cuticular structure



44. Scanning Electron Micrograph SEM

SEM : Fig. 44 : Group of hair depicting mid, proximal, distal cuticular pattern

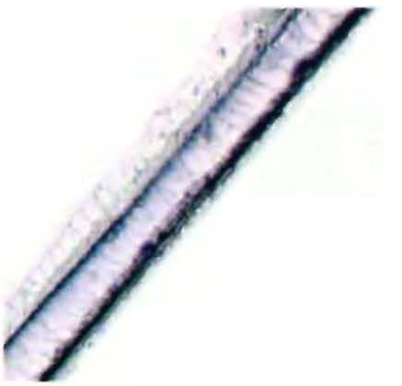
Plate 2d. Tail *Callosciurus erythraeus* (Pallas, 1779)
Photomicrographs (Figs. 45-47, x200)



45. Medulla type x200

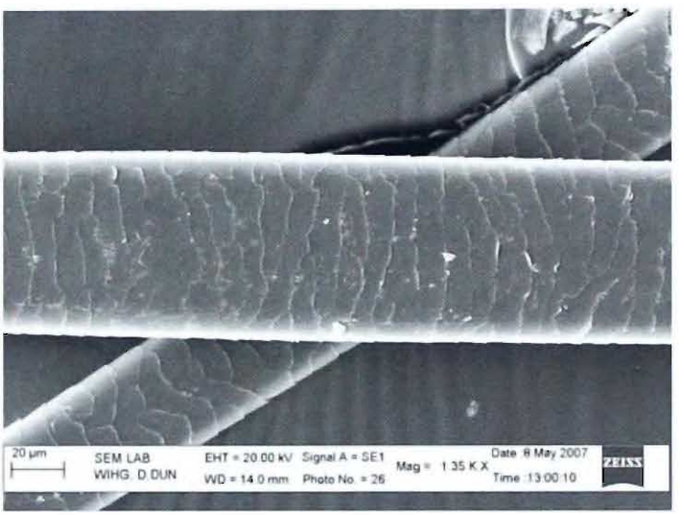


46. Cross section types

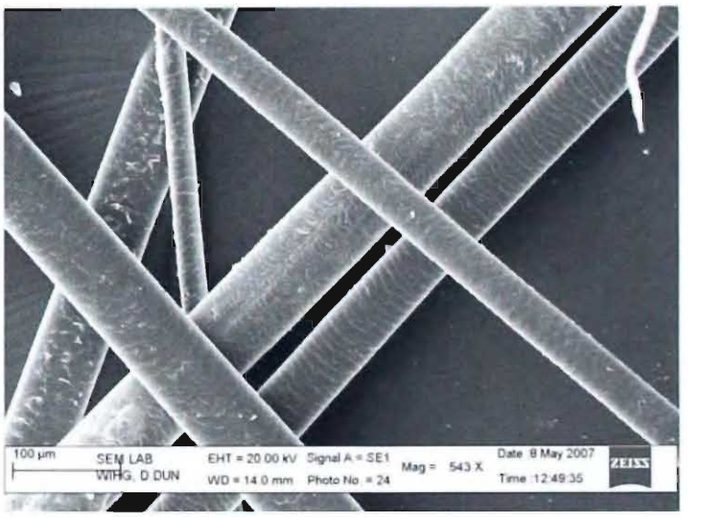


47. Cuticular (at mid)

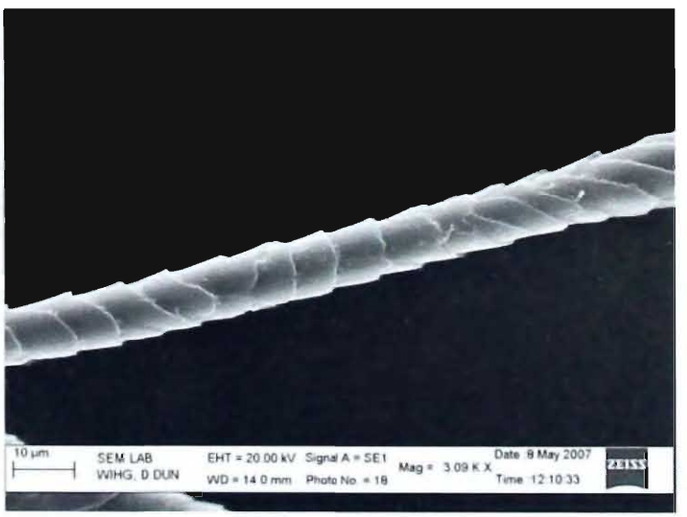
Scanning Electron Micrographs



48. Cuticular at mid, at proximal



49. Cuticular pattern at mid, distal and proximal



50. Cuticular architect at distal
(simple coronal, smooth, near)



51. Fur hair with dentate margins

Plate 3a : Hair (dorsal) characteristics of
Callosciurus pygerythrus (I. Geoffroy Saint Hilarie), Irrawaddy squirrel

Dorsal – Photomicrographs (Figs. 52-55, mag 200x)



52. Cross section type : Oval

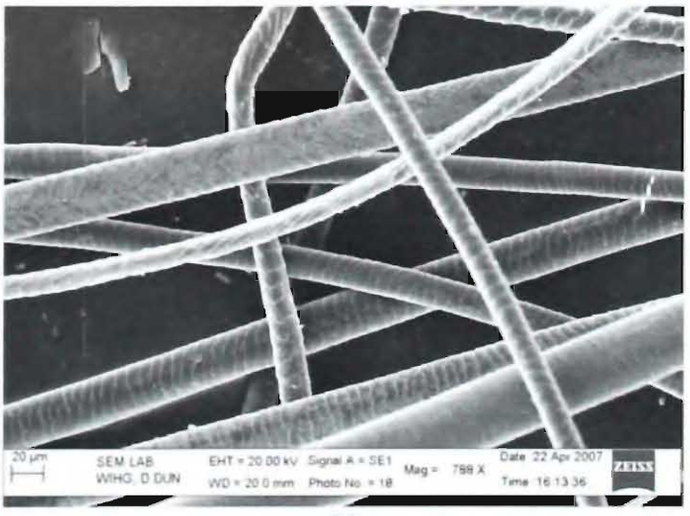


53. Medulla : Multiserial type



54. Cuticular pattern at mid with regular wave and scalloped margin

Scanning Electron Micrographs



55

Fig. 55. Cuticular pattern : Regular wave, scalloped margin (at mid of hair) changing to double chevron type towards base, simple coronal with smooth margin (at tip and base of hair)

Plate 3b. Hair (Ventral) characteristics of
Callosciurus pygerythrus (I. Geoffroy Saint Hilarie), Irrawaddy squirrel

Ventral – Photomicrographs (Figs. 56-61, mag 200x)



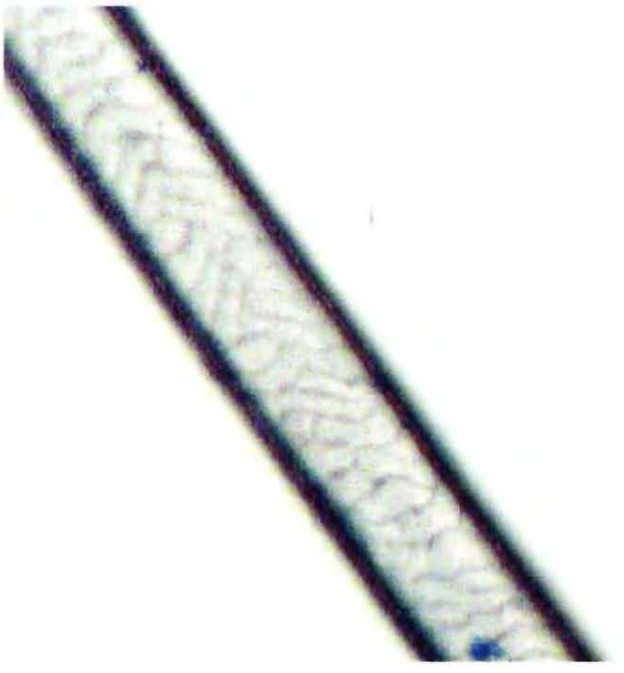
56. Medulla type : multiserial ladder



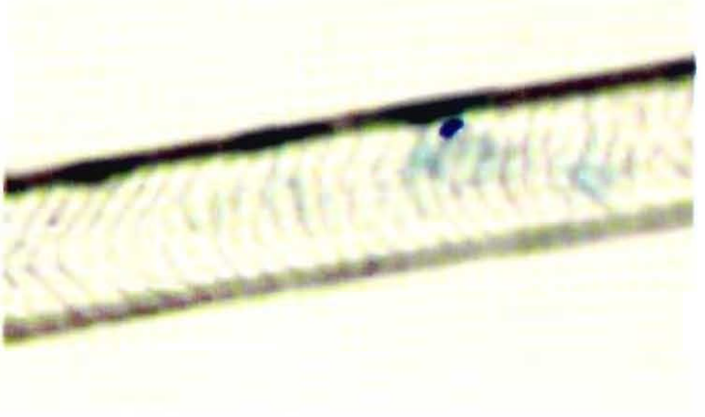
57. Cross section : oval, large medulla



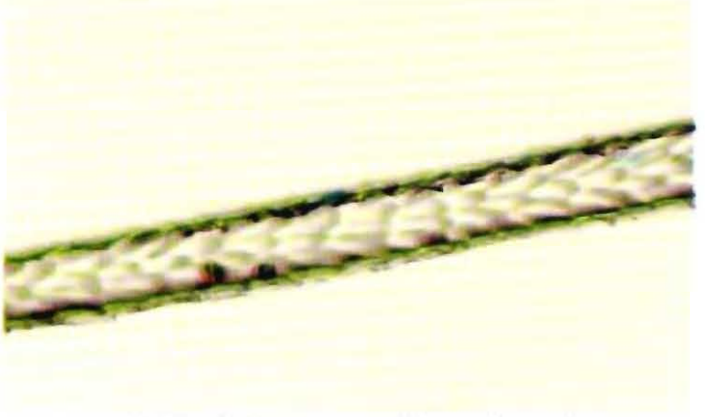
58. Cuticular : at proximal



59. Cuticular at distal

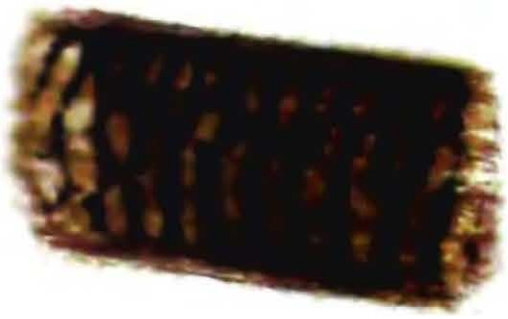


60. Cuticular structure at mid



61. Fur hair (narrow diamond petal)

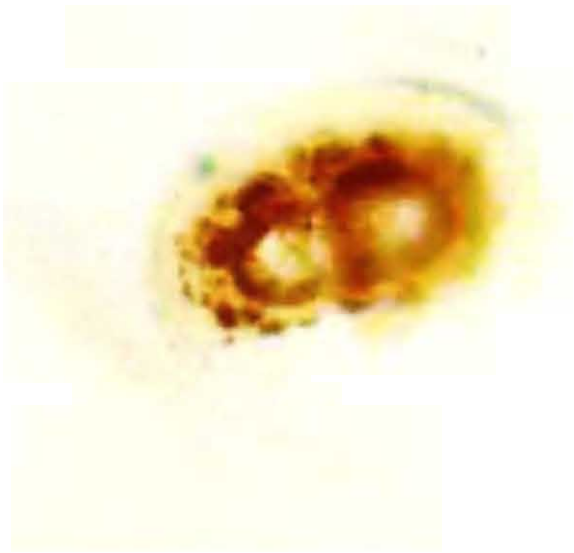
Head



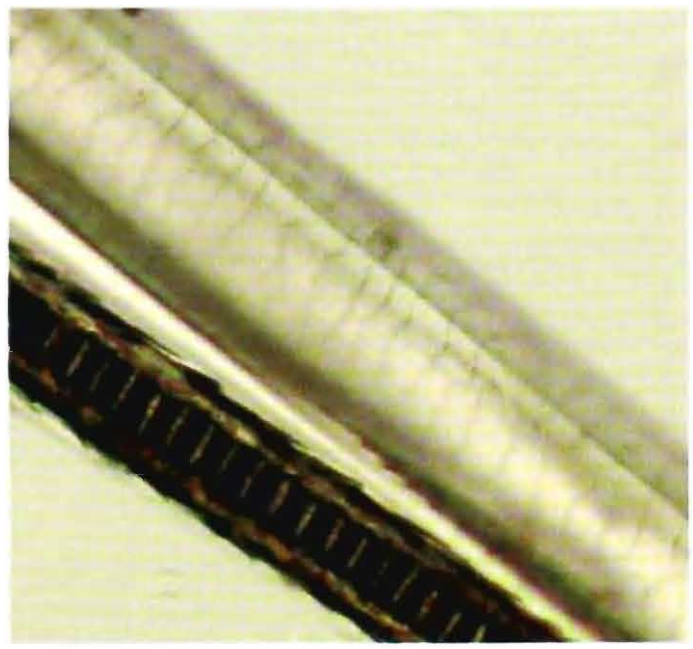
62. LS medulla, multiserial ladder 200x



63. Medulla and Cross section of fur hair 200x



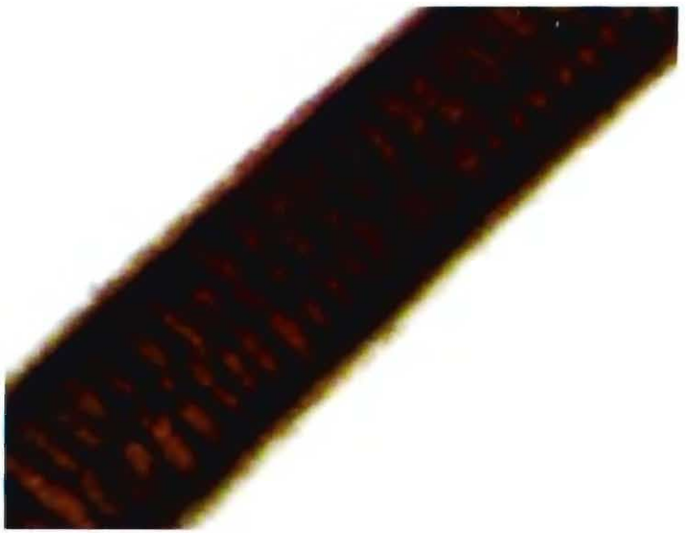
64. Cross section 200x



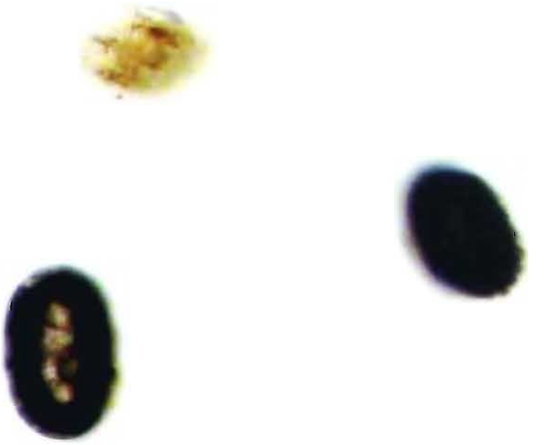
65. Medulla type of fur and cuticular pattern of primary guard hair at mid 200x

Plate 3d Hair (Tail) characteristics of
Callosciurus pygerythrus (I. Geoffroy Saint Hilarie), Irrawaddy squirrel

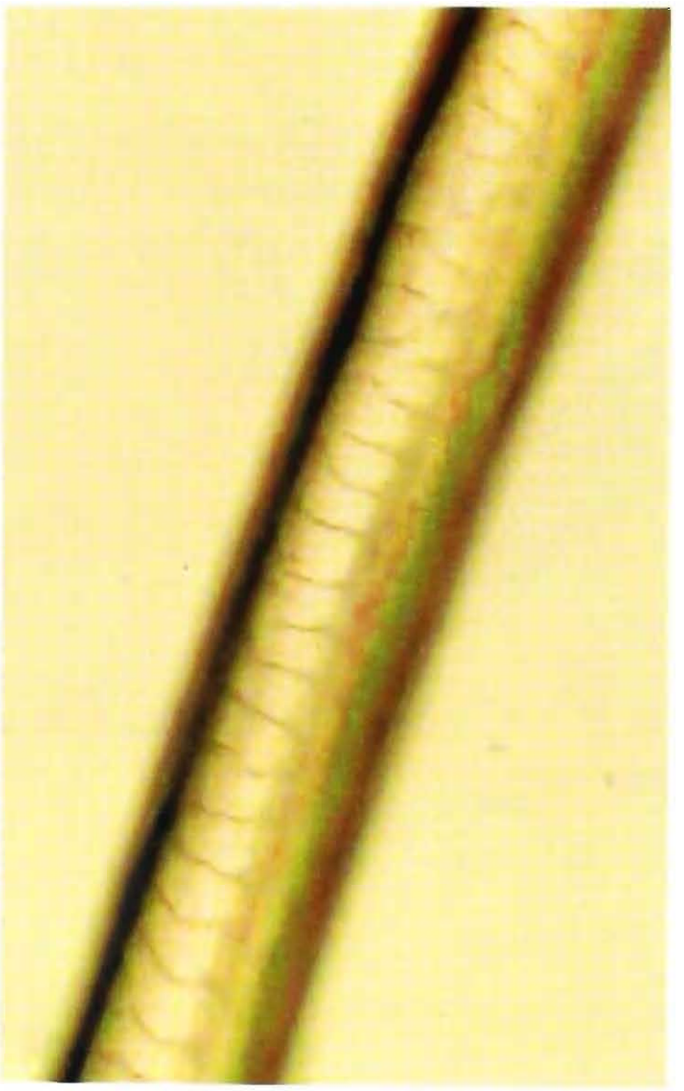
Tail Photomicrographs



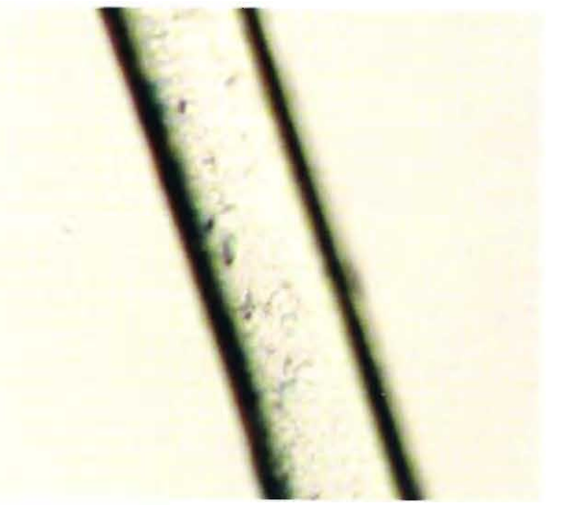
66. Medulla at mid of hair 100x



67. Cross section of hair 100x



68. Cuticular pattern at mid of hair 100x



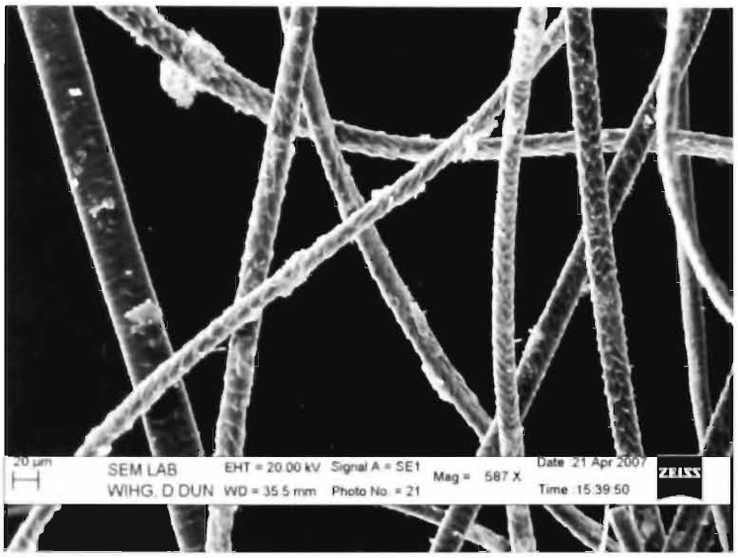
69. Cuticular pattern at distal part of hair 200x



70. Cuticular pattern at proximal portion of hair 100x

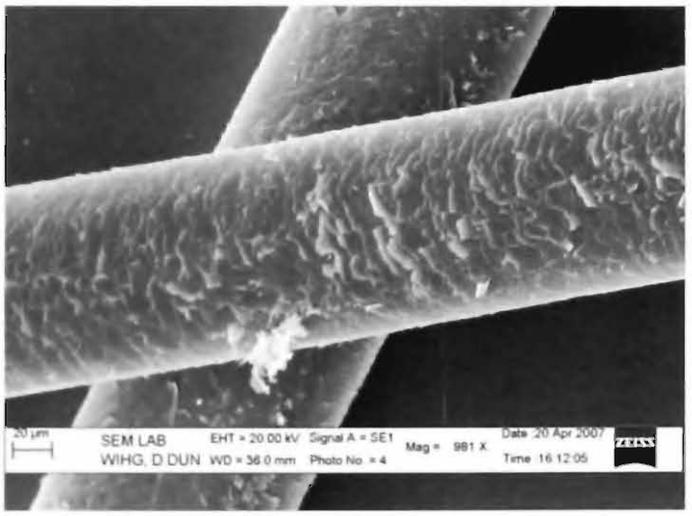
Scanning Electron Micrographs of
Callosciurus pygerythrus (I. Geoffroy Saint Hilarie), Irrawaddy squirrel

Ventral

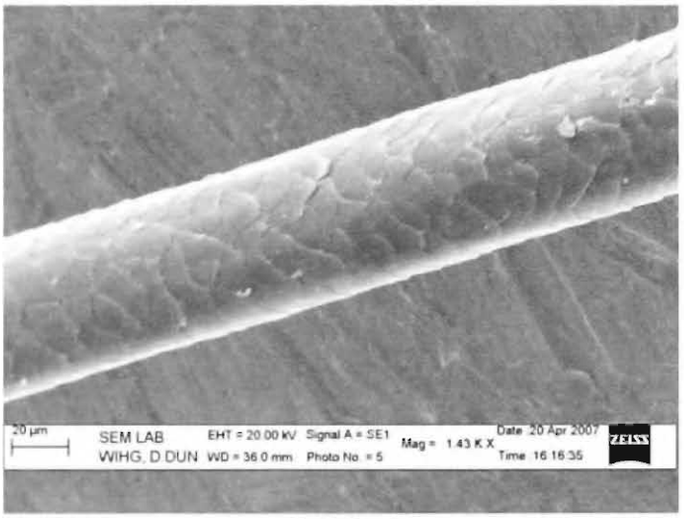


71. At mid, distal and proximal

Head

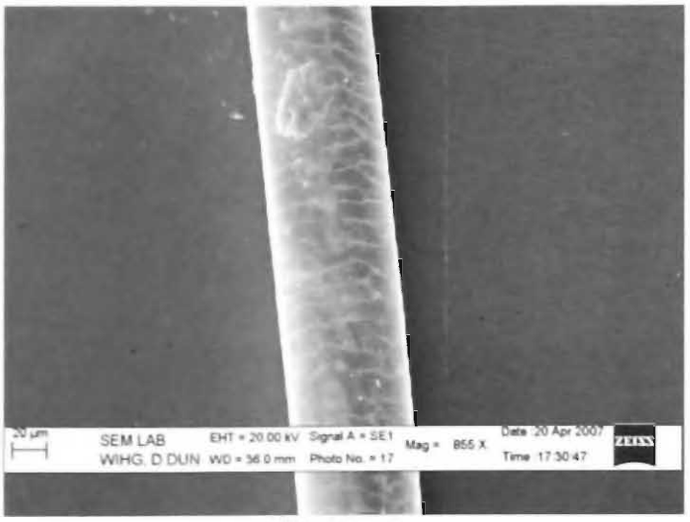


72. At mid

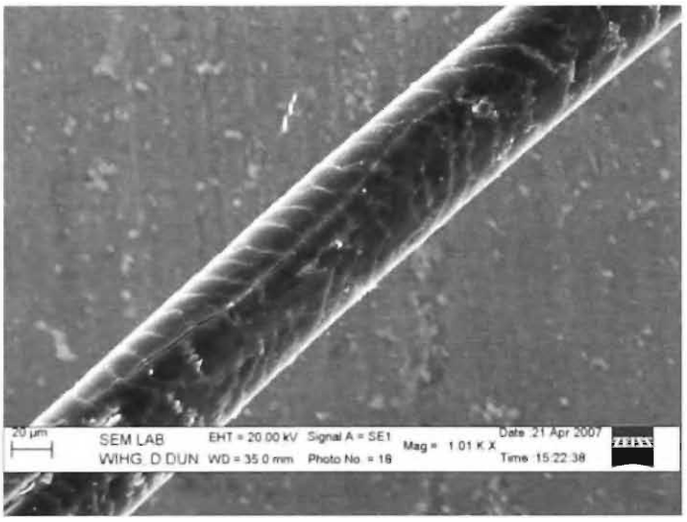


73. Distal

Tail



74. At mid



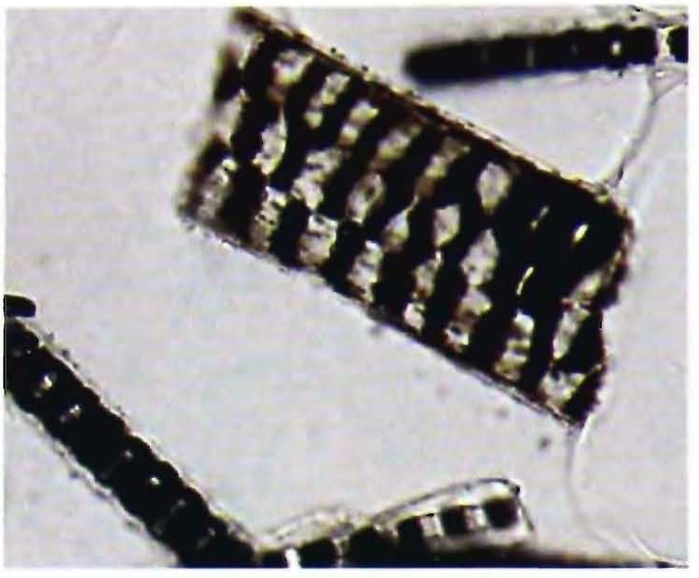
75. At distal

Plate 4a. ***Dremomys lokriah*** (Hodgson, 1836)

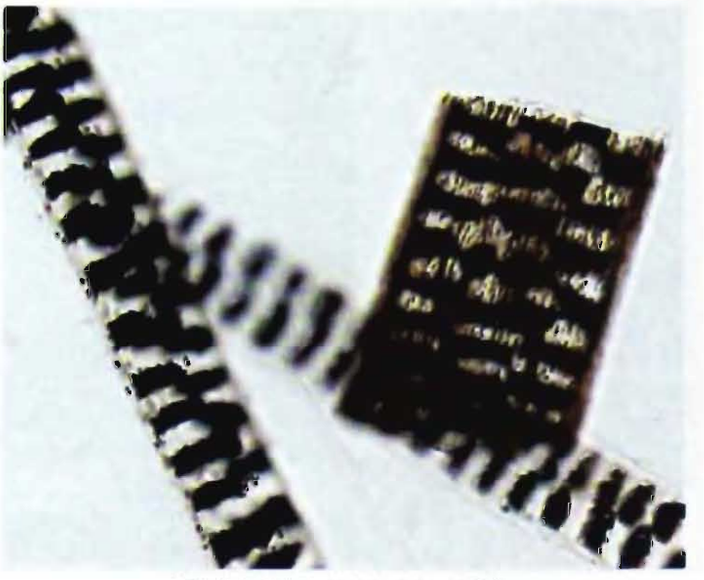
(Orange bellied Himalayan squirrel)

Dorsal

Photomicrographs (Figs. 76-81, mag 400x, 200x)



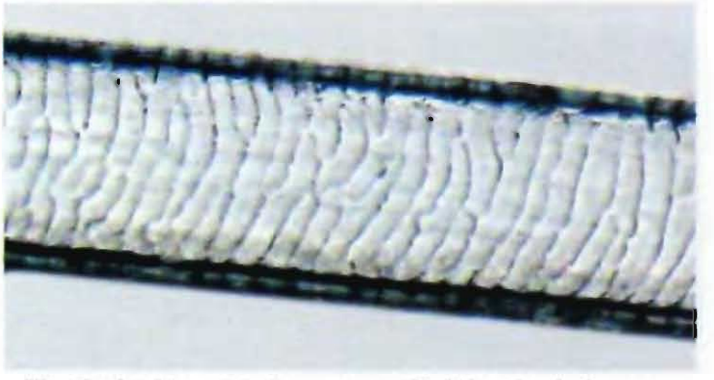
76. Multiserial ladder 400x



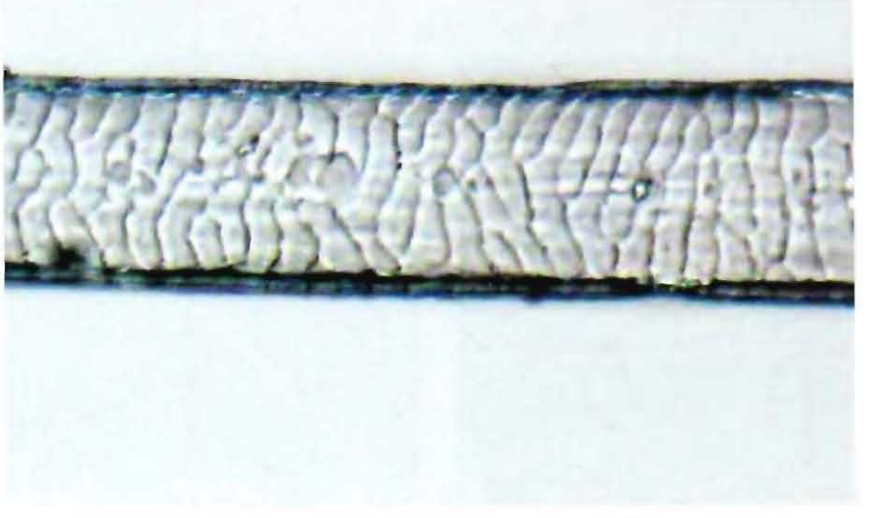
77. Multiserial ladder 200x



78. Cross section : Oblong, large 200x



79. Cuticular : regular wave, slightly rippled, near, 200x

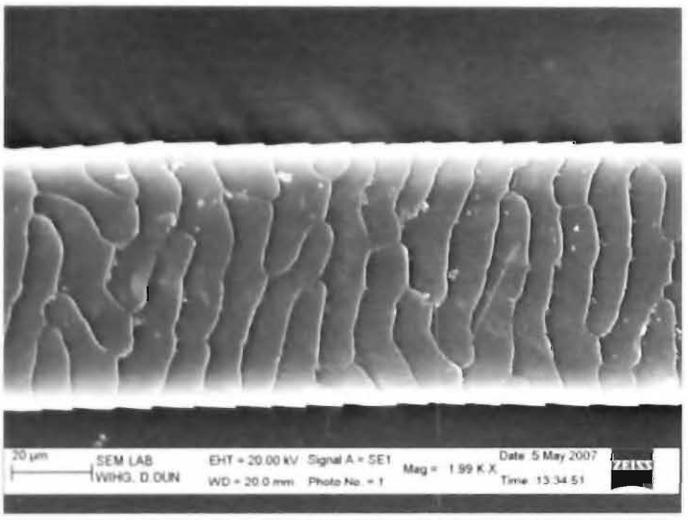


80. Cuticular : regular wave, slightly rippled, near, 200x

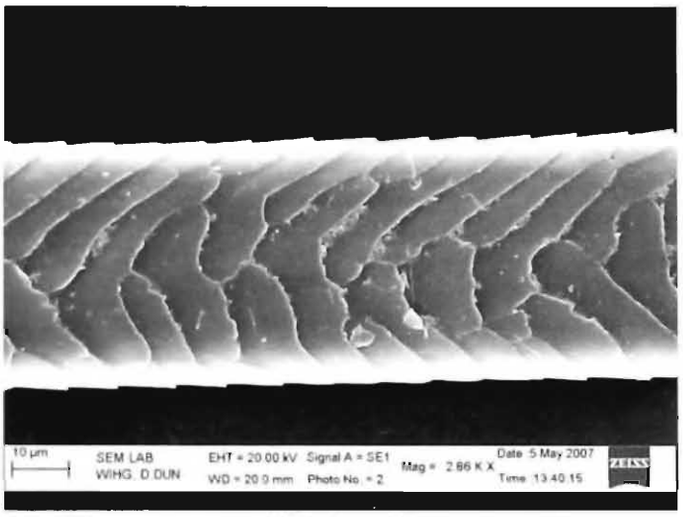
Scanning Electron Micrographs

(Cuticular architecture)

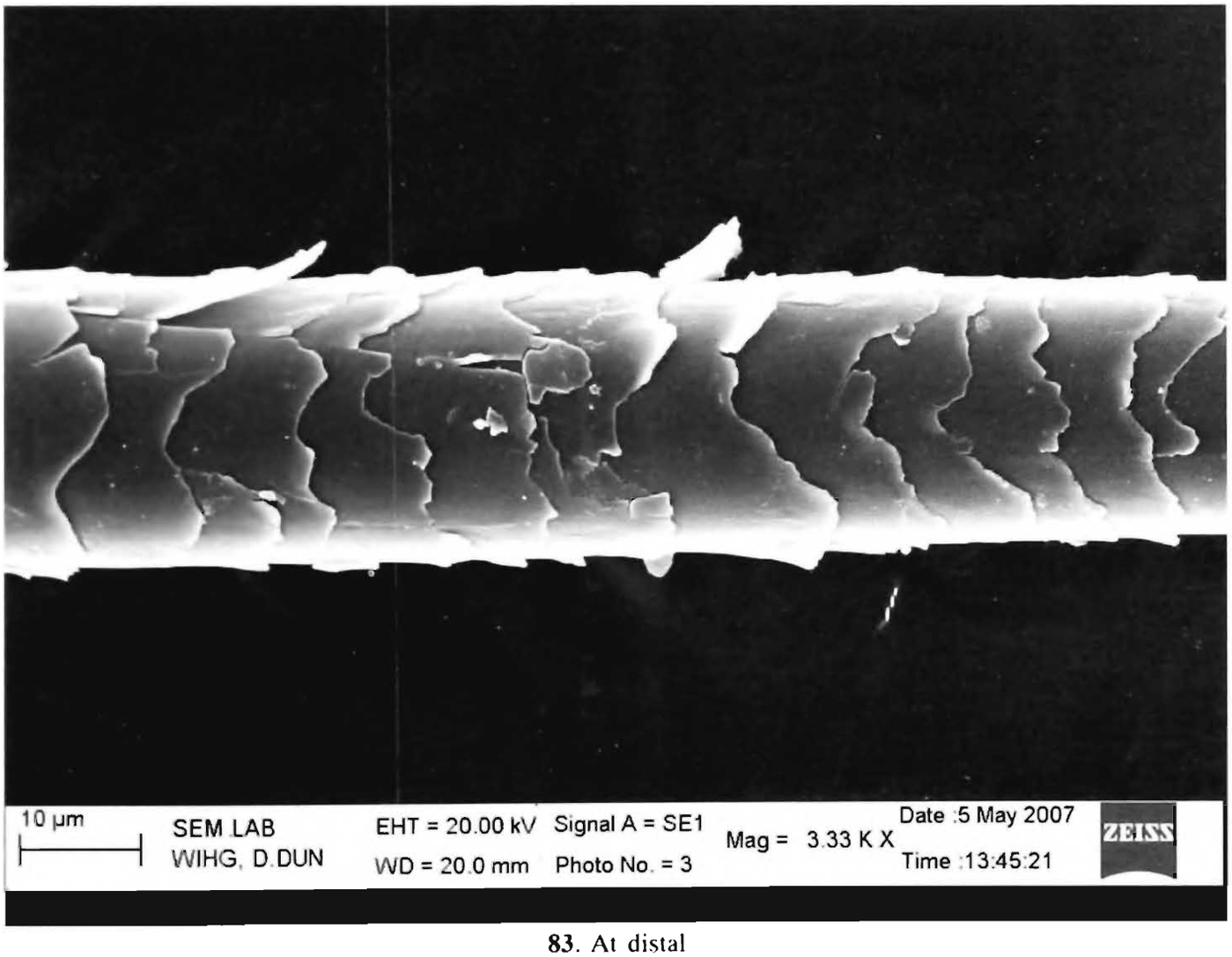
Dorsal



81. Towards tip



82. At mid

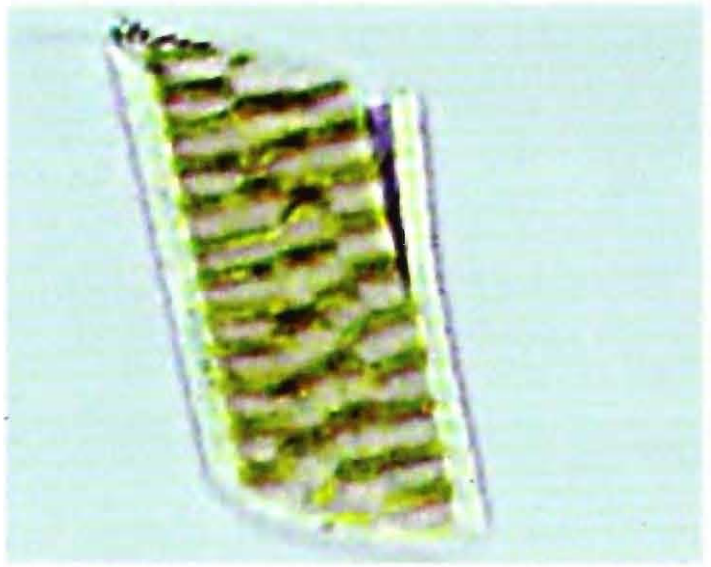


83. At distal

Plate 4b. ***Dremomys lokriah*** (Hodgson, 1836), (Orange bellied Himalayan squirrel)

Ventral

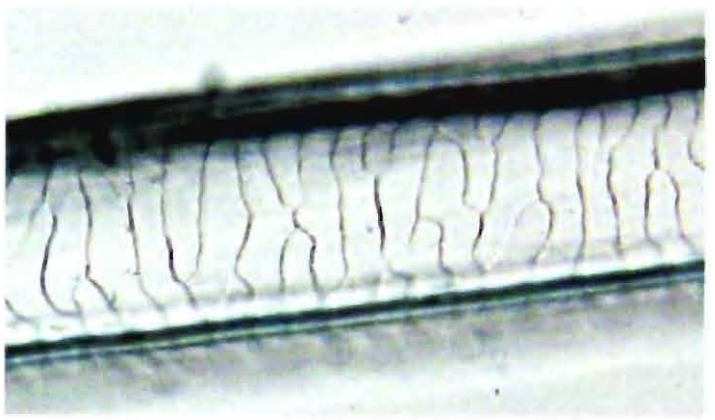
Photomicrographs (Figs. : 84-88, mag 200x)



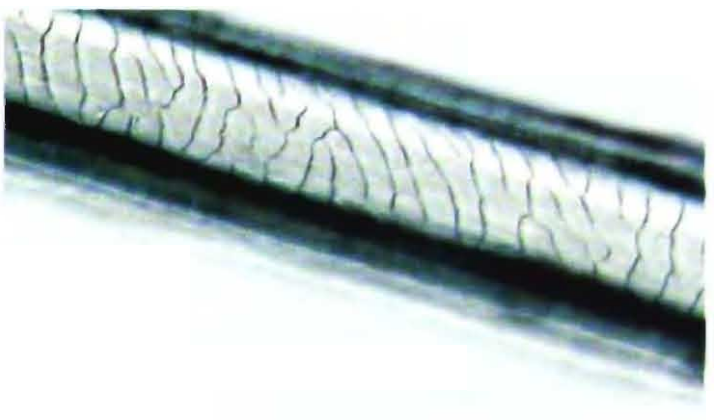
84. Medulla type : multiserial ladder



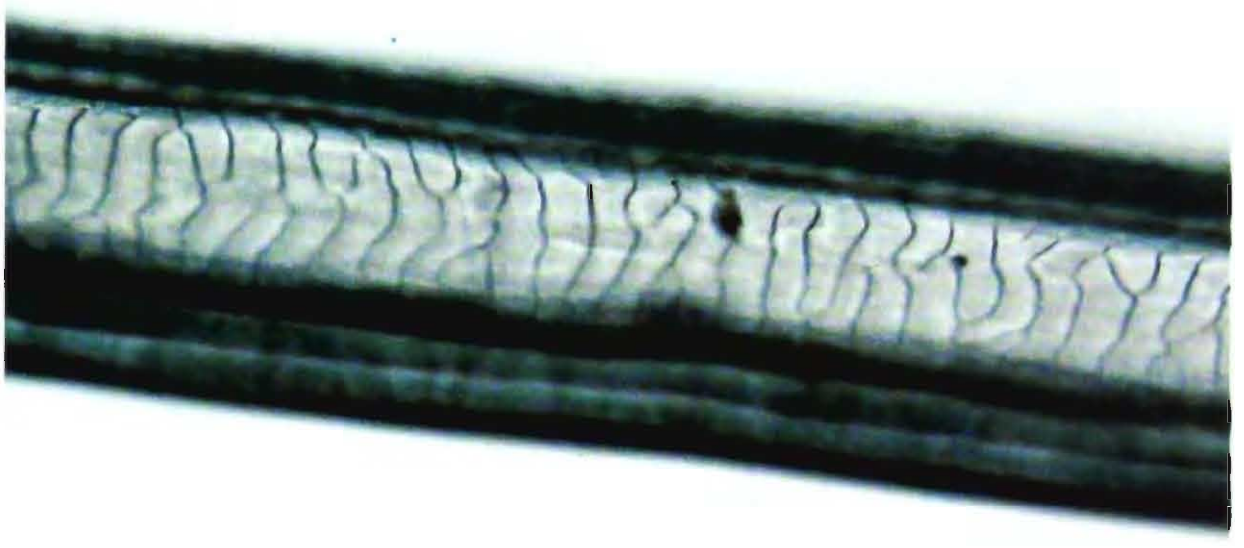
85. Cross section : Oblong, large divided medulla



86. Cuticular : at proximal



87. Cuticular : at distal

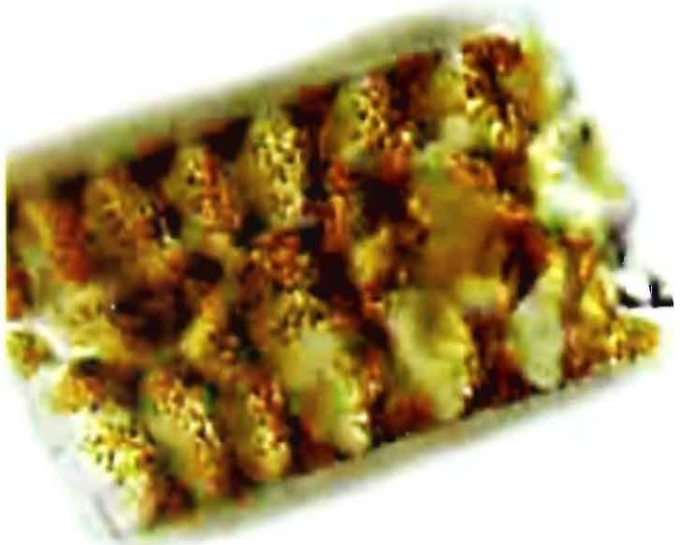


88. Cuticular : at mid

Plate 4c. ***Dremomys lokriah*** (Hodgson, 1836) (Orange bellied Himalayan squirrel)

Head

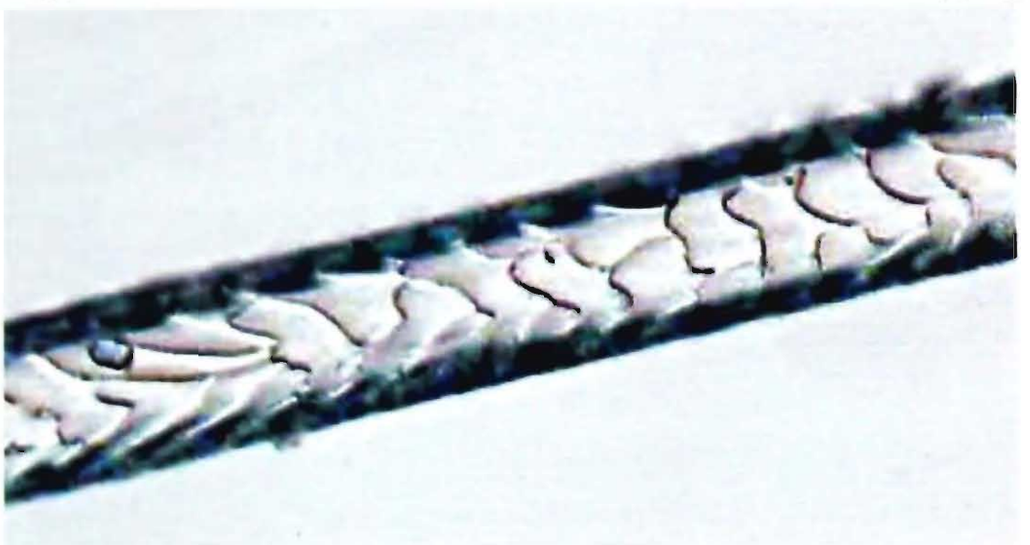
Photomicrographs (Figs. 89-92, mag 400x, 200x)



89. Medulla type : Wide medulla lattice 400x



90. Cross section : Oblong, large 400x



91. Cuticular (at mid) : regular wave, rippled, near 200x

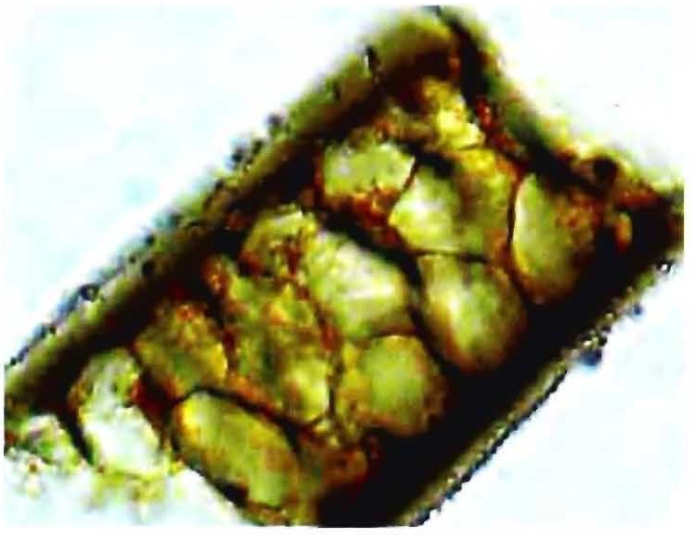


92. Cuticular at proximal 200x

Plate 4d. ***Dremomys lokriah*** (Hodgson, 1836), (Orange bellied Himalayan squirrel)

Tail

Photomicrographs (Figs. 93-100, mag 200x, 400x)



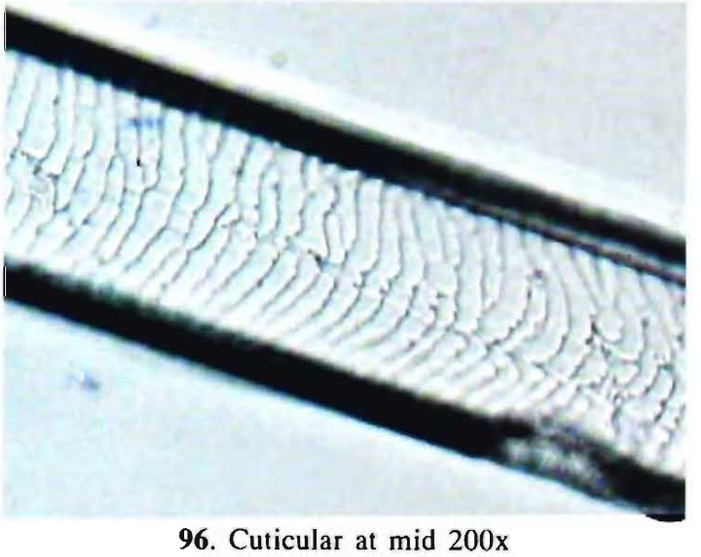
93. Medulla type : Wide aeriform lattice 200x



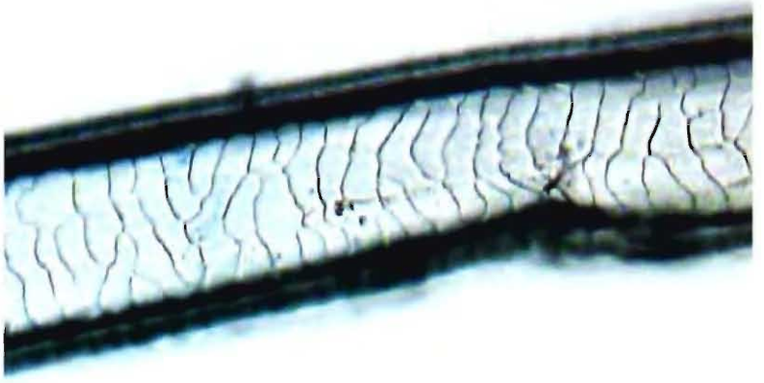
94. Cross section : Oblong, large 200x



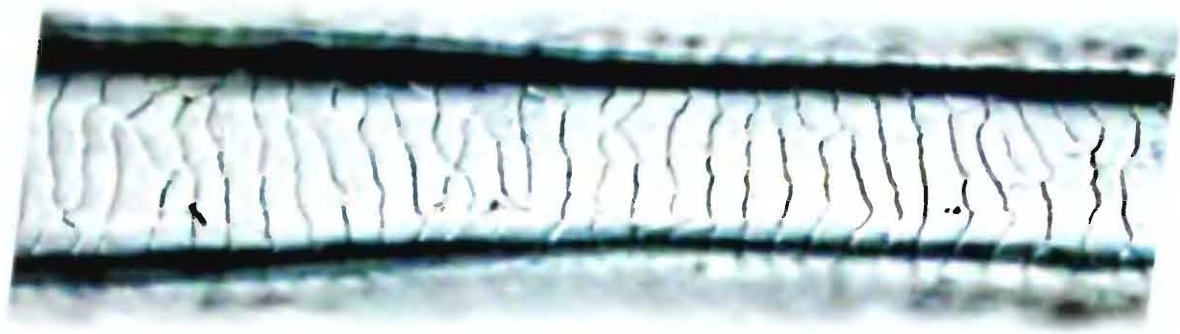
95. Cross section : Circular, large 200x



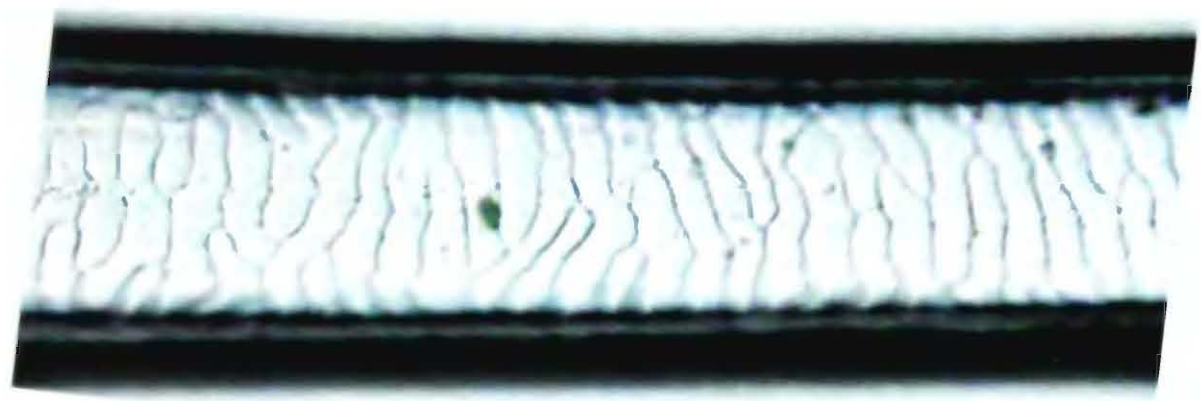
96. Cuticular at mid 200x



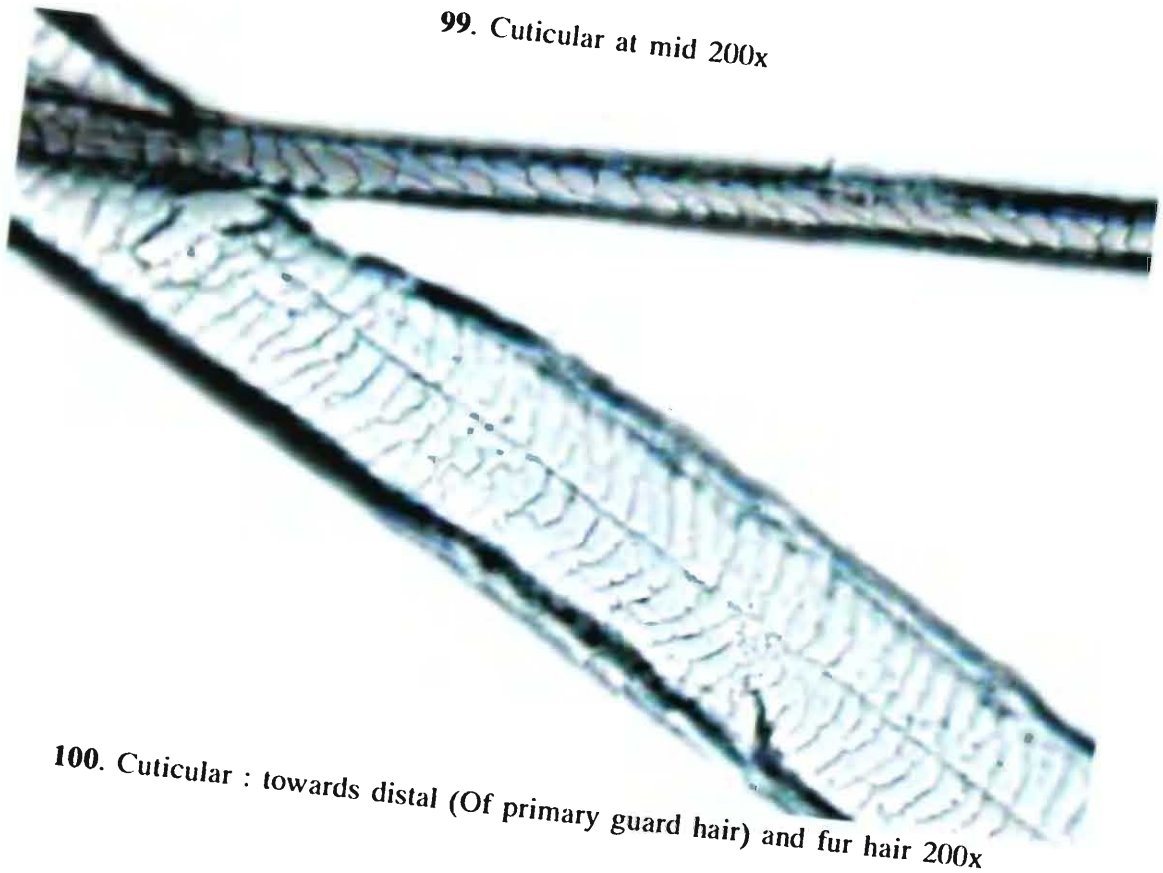
97. Cuticular at mid (with depression at periphery) 200x



98. Cuticular at mid (with depression at periphery) 200x

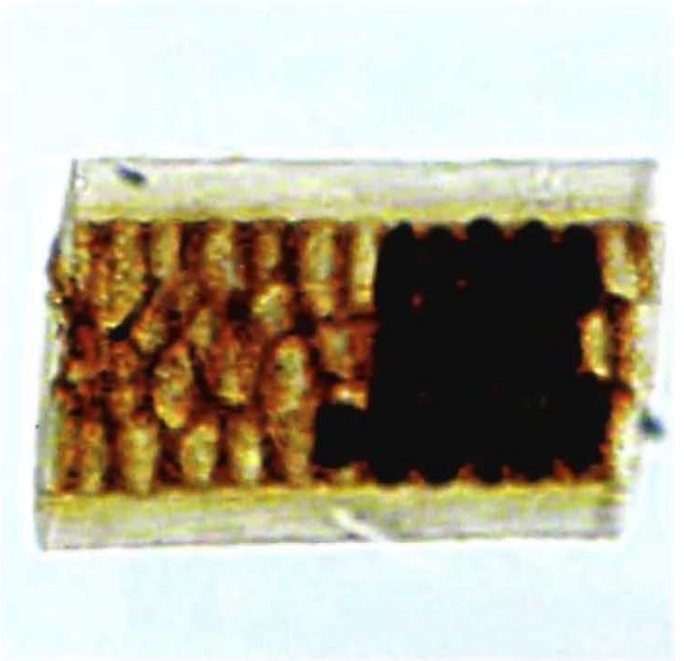


99. Cuticular at mid 200x

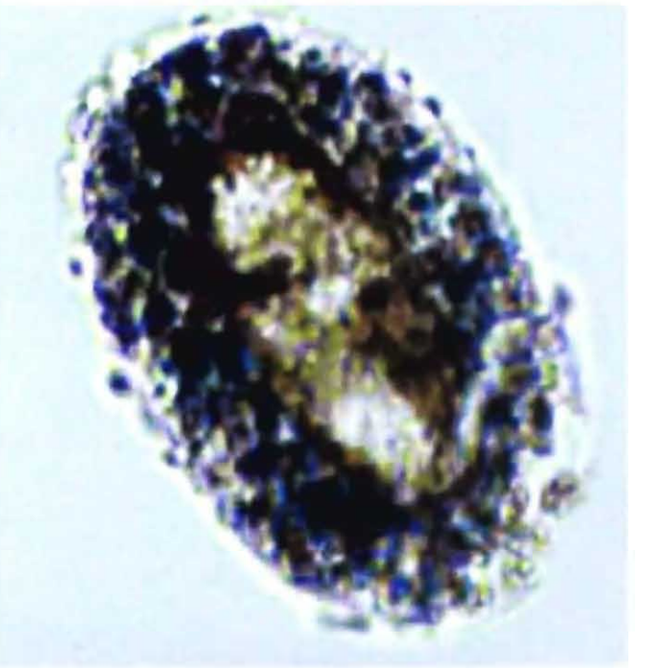


100. Cuticular : towards distal (Of primary guard hair) and fur hair 200x

Plate 5a. ***Dremomys pernyi*** (Milne-Edwards, 1867)
(Perny's long nosed squirrel)
Dorsal Photomicrographs (Figs 101-104, mag 200x)



101. Medulla type : multiserial ladder



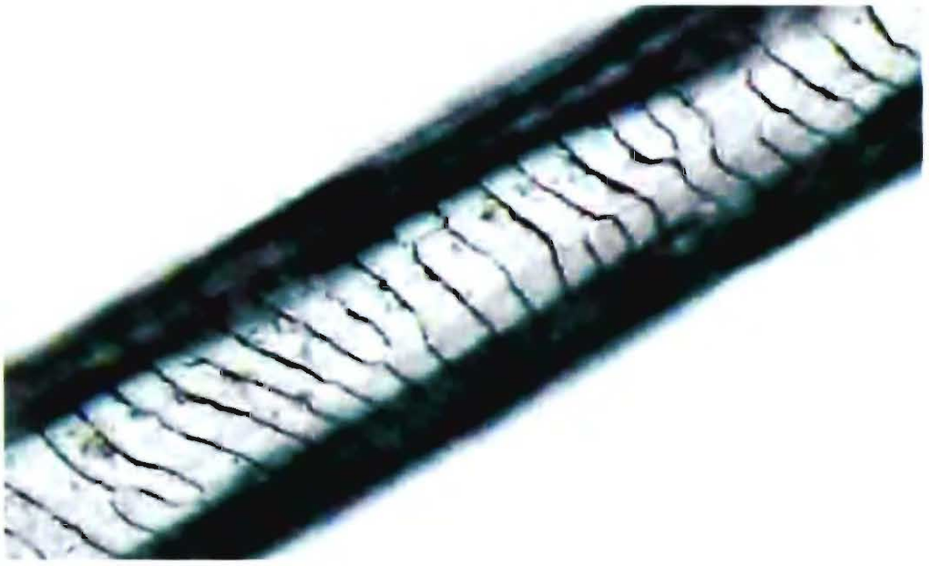
102. Cross section : oblong, divided medulla



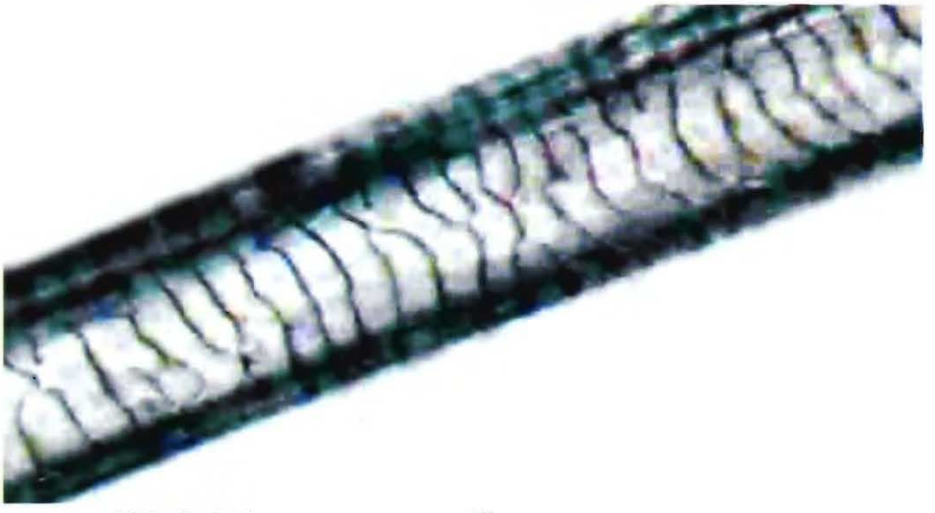
103. Cuticular regular wave, smooth, near (towards distal)



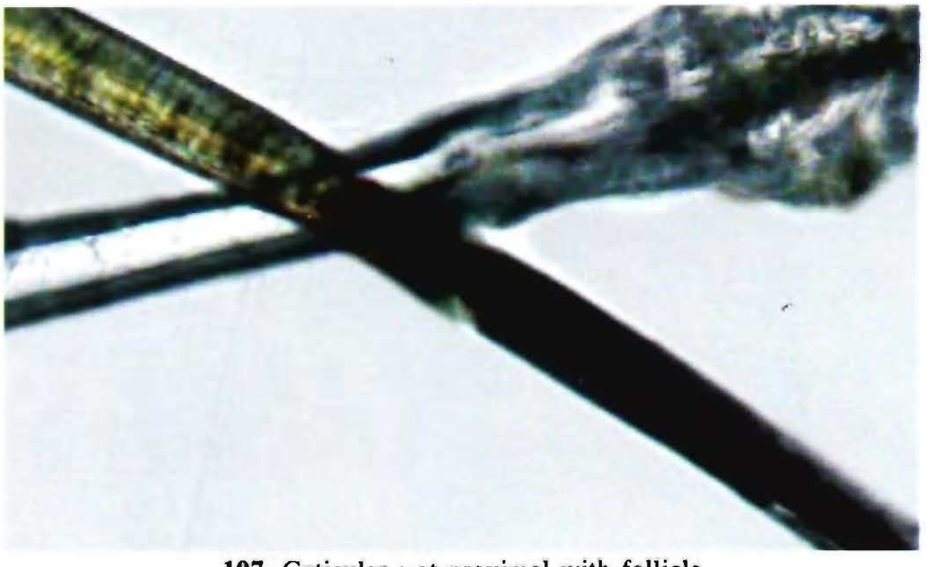
104. Cuticular : regular wave, slightly rippled, near (at mid)



105. Cuticular : regular wave, smooth, near (at proximal)

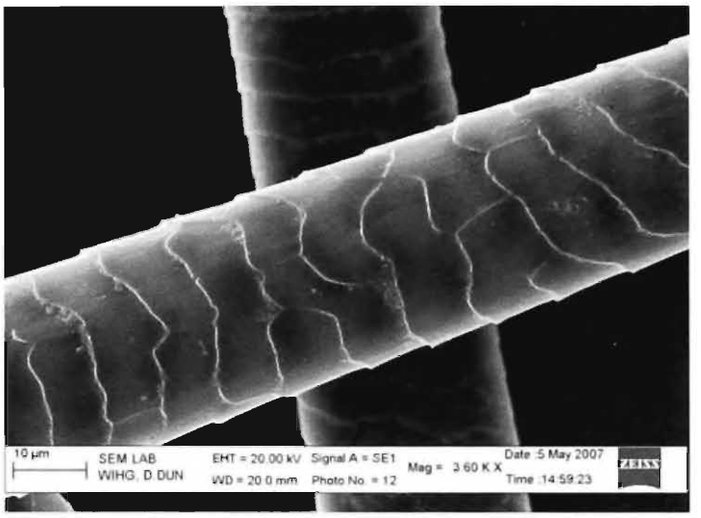


106. Cuticular : regular wave, slightly rippled, near (at mid)

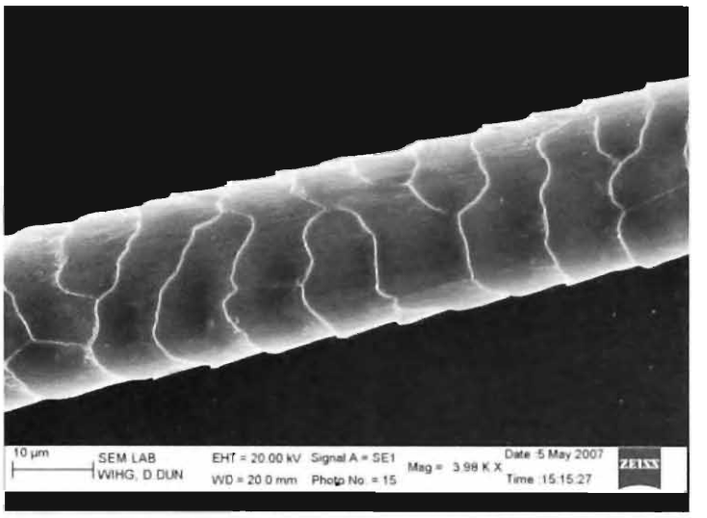


107. Cuticular : at proximal with follicle

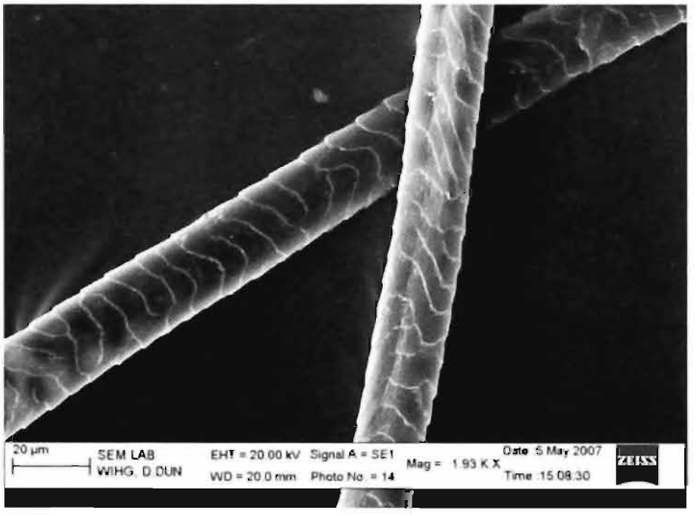
Dorsal
Scanning Electron Micrographs
(Cuticular architecture)



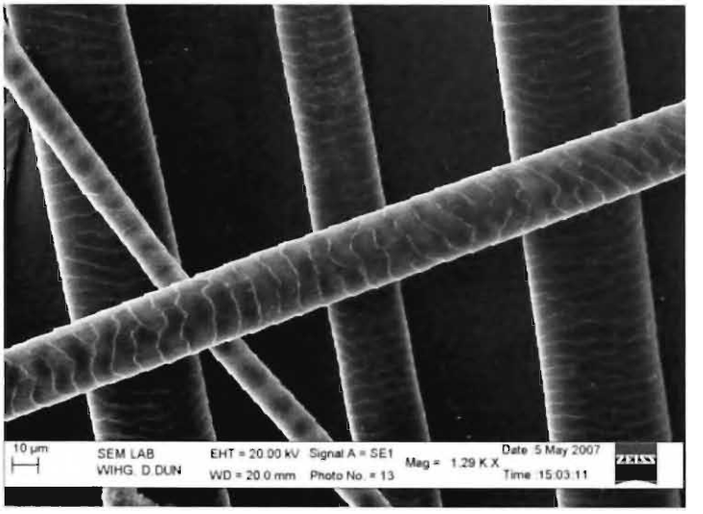
108. At mid



109. At proximal



110. At distal

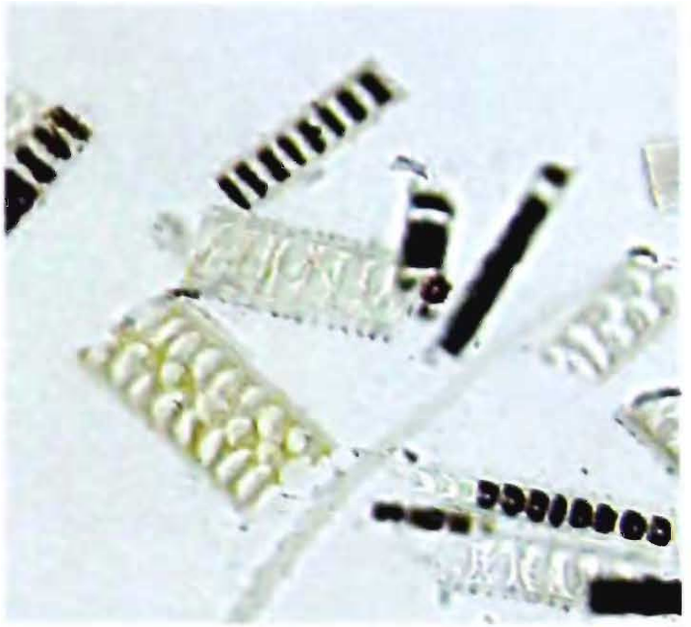


111. At mid, distal and roximal

Plate 5b. ***Dremomys pernyi*** (Milne-Edwards, 1867), (Perny's long nosed squirrel)

Ventral

Photomicrographs (Figs. 112-116, 200x,400x)



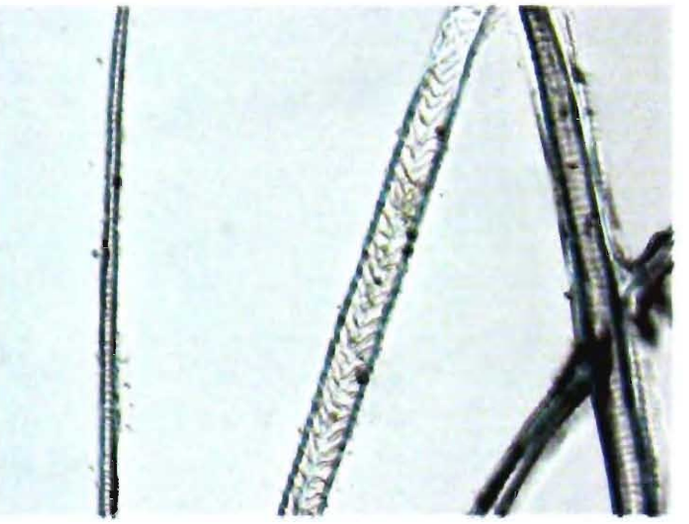
112. Medulla : multiserial ladder, 200x



113. Cross section : oblong, large divided medulla, 400x

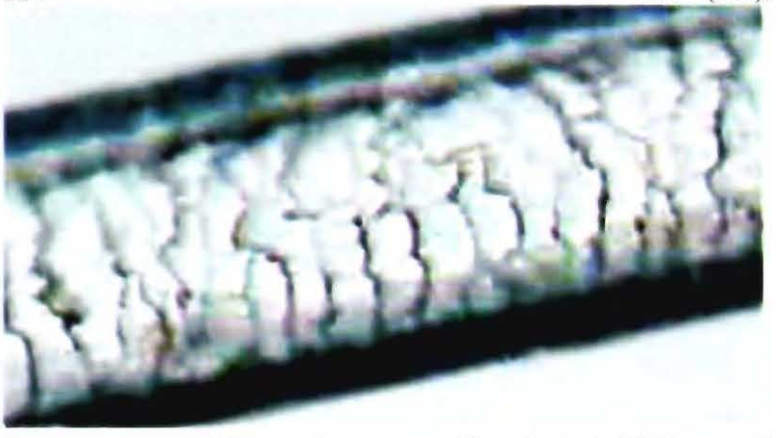


114



115

Fig. Cuticular pattern at distal (**114**), at proximal (**115**) single chevron SP, smooth (SM), near (DS)) with fur hair (simple coronal (SP), smooth (SM) near (DS), x200

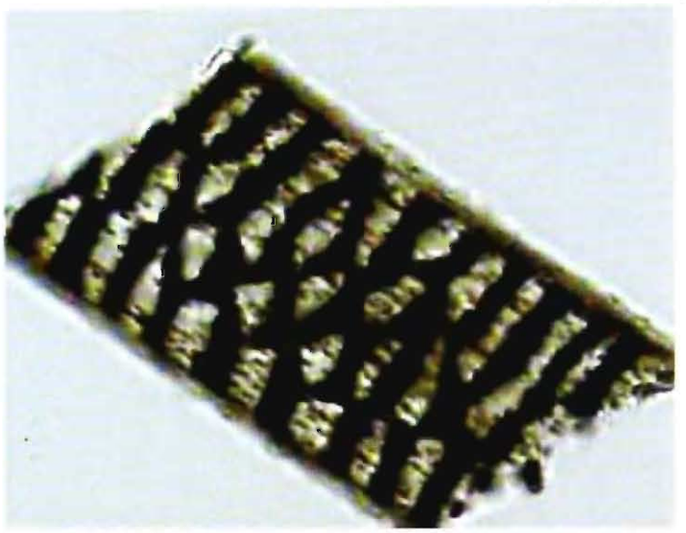


116. Cuticular pattern at mid : regular wave (SP), rippled (SM), near (DS), x400

Plate 5c. ***Dremomys pernyi*** (Milne-Edwards, 1867)

(Perny,s long nosed squirrel)

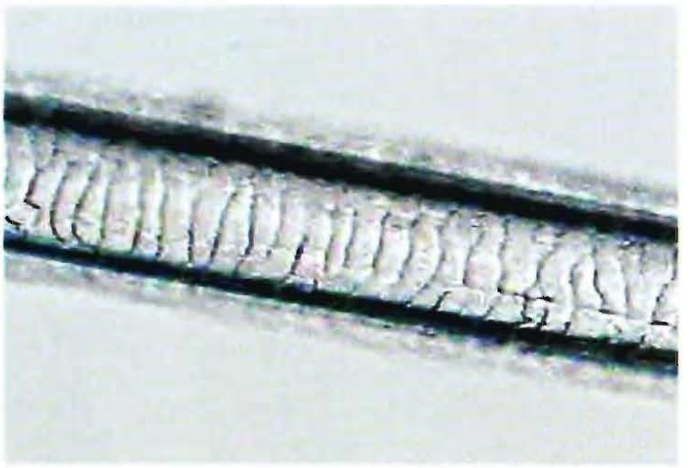
Head (Phototmicrographs Figs. 117-121; mag 400x, 200x)



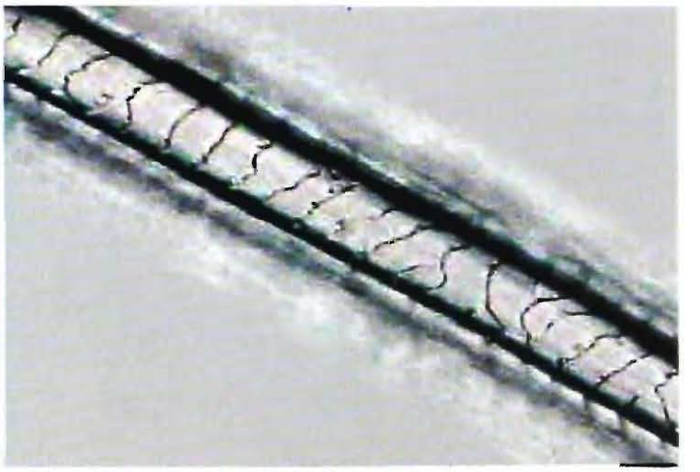
117. Medulla type : multiserial ladder 400x



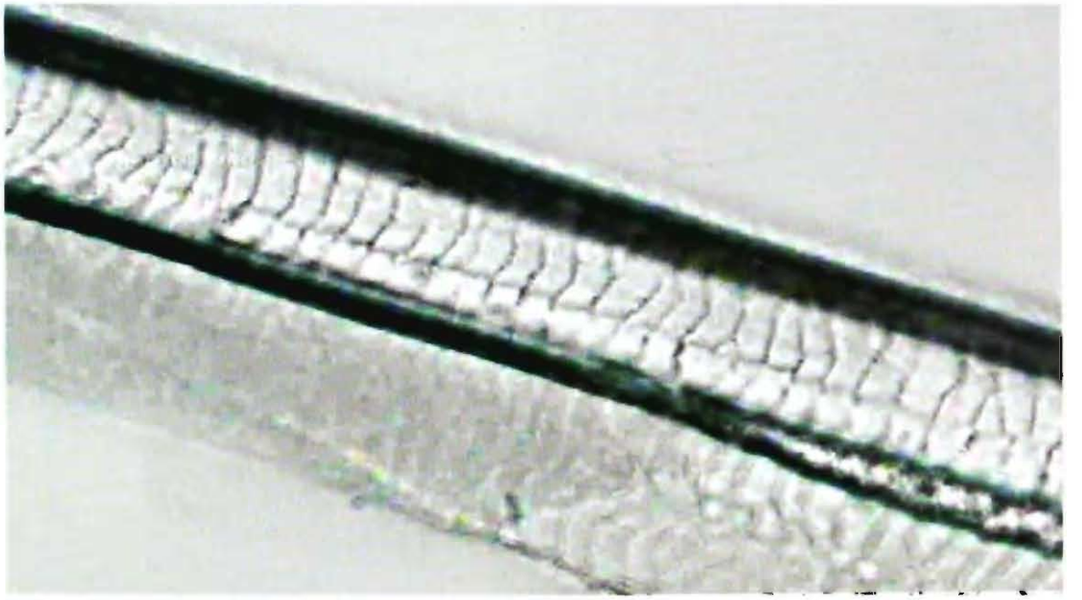
118. Cross section : oblong with large, divided medulla 400x



119. Cuticular : At distal, proximal

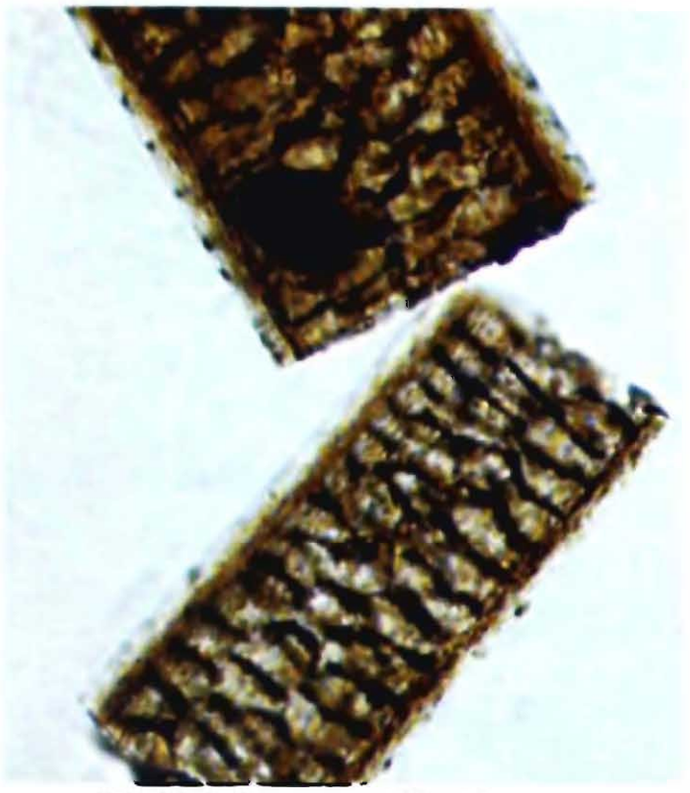


120. Cuticular pattern at proximal : regular wave (SP), smooth (SM) near (DS)



121. Cuticular pattern at mid : regular wave (SP), slightly rippled (SM) near (DS)

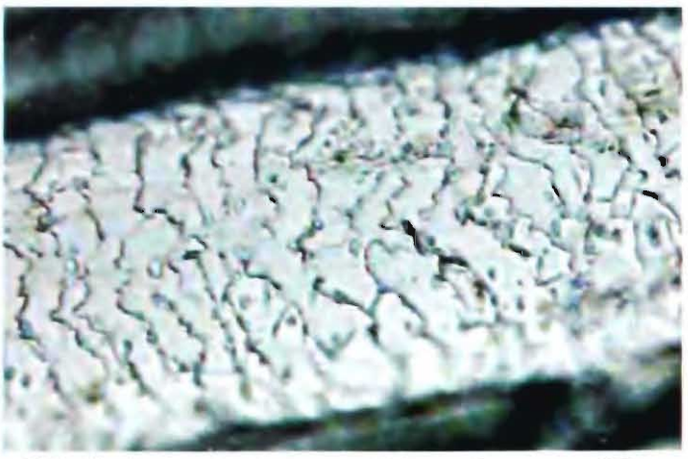
Plate 5d. ***Dremomys pernyi*** (Milne-Edwards, 1867)
(Perny's long nosed squirrel)
Tail (Photomicrographs, Figs. 122-126, 400x)



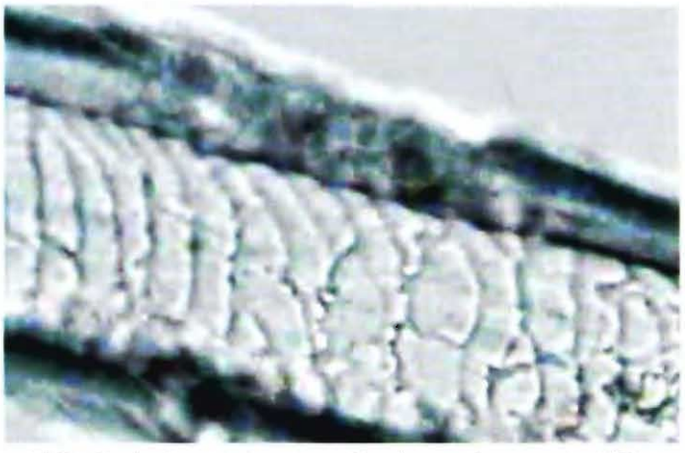
122. Medulla type : multiserial ladder



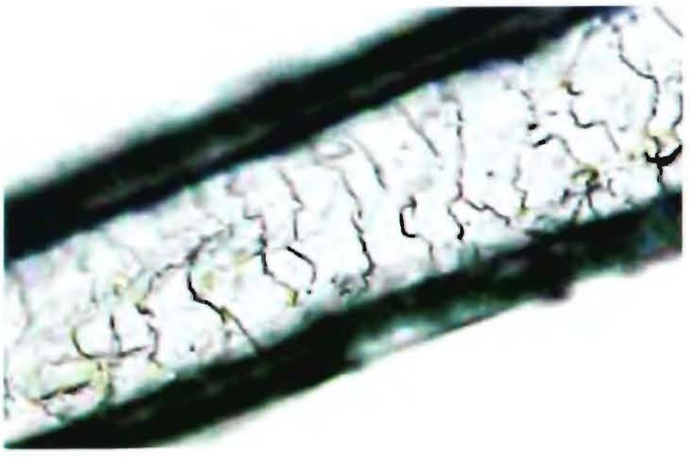
123. Cross section : circular



124. Cuticular pattern : at mid regular wave (SP), rippled (SM), near (DS)



125. Cuticular pattern at distal regular wave (SP), rippled (SM), near (DS)



126. Cuticular pattern at proximal regular wave (SP), rippled (SM), near (DS)

Plate 6a. ***Dremomys rufigenis*** (Blanford, 1878), (Red checked squirrel)

Dorsal

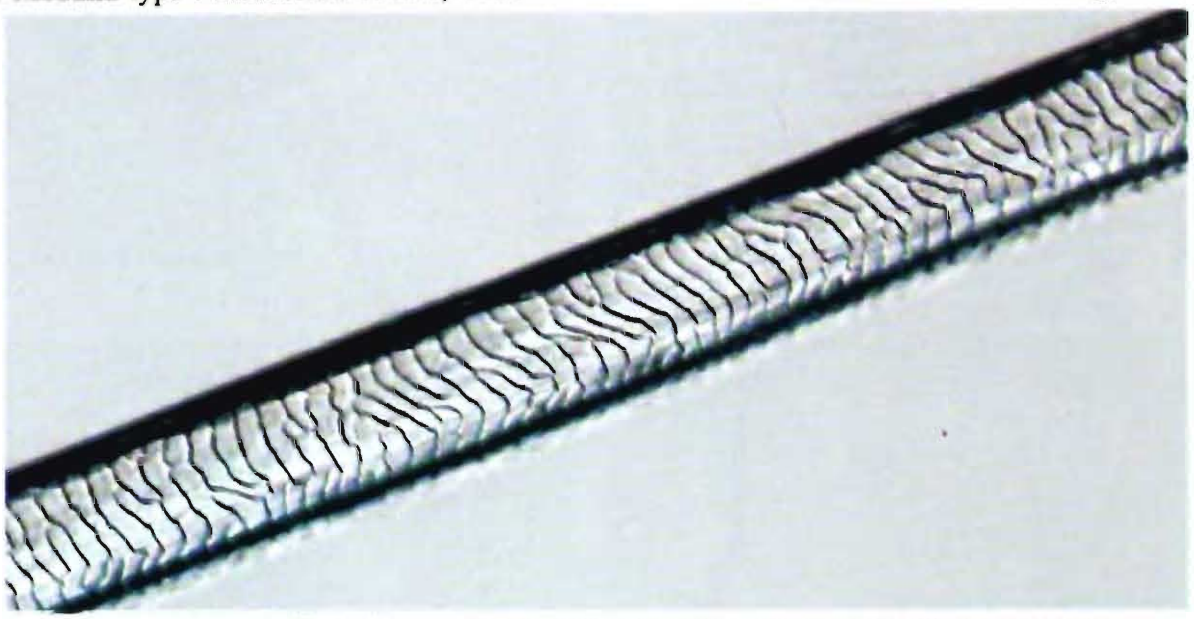
(Photomicrographs, mag 200x, 400x)



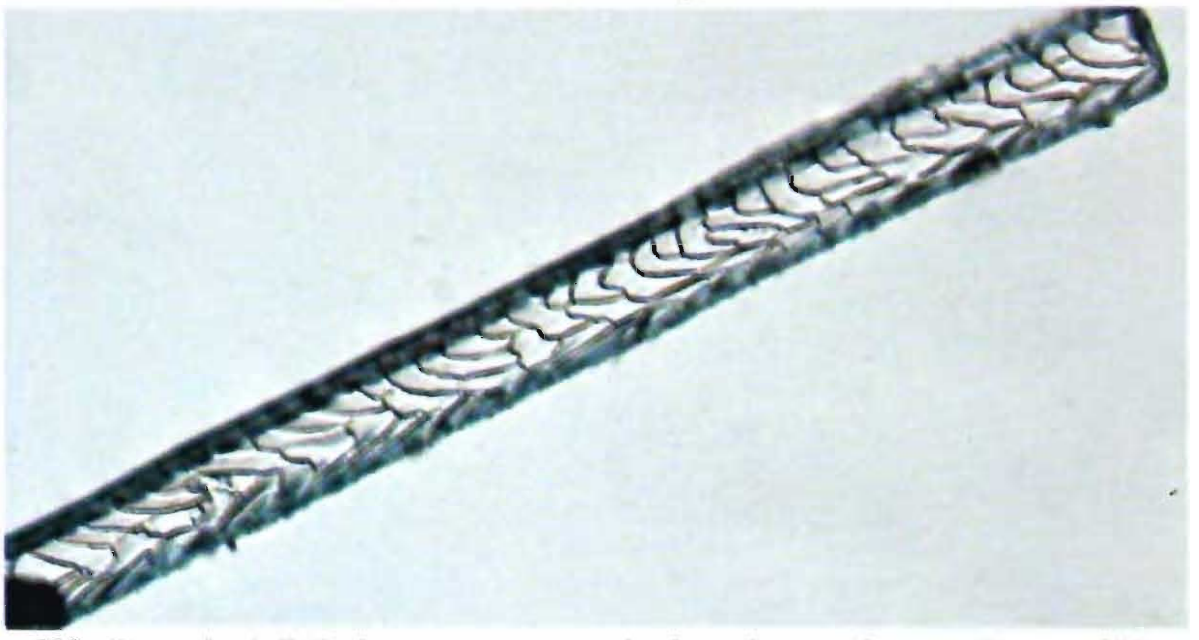
127. Medulla type : multiserial ladder, 400x



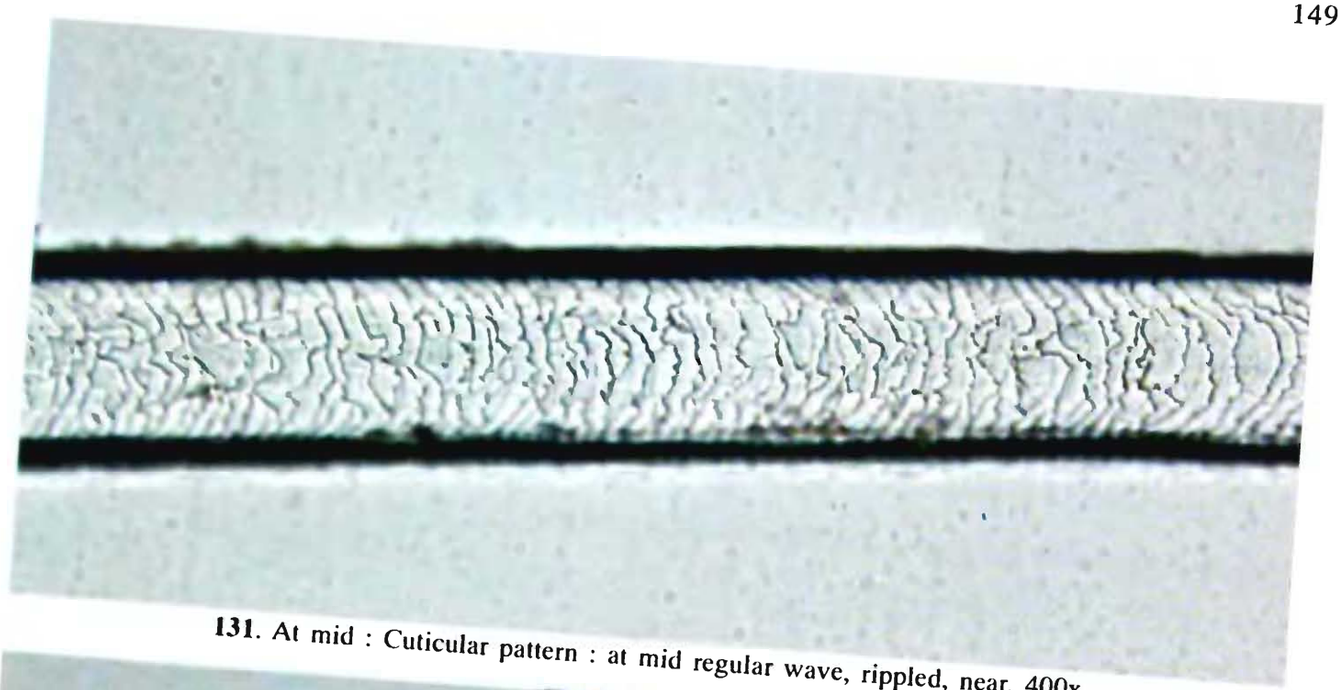
128. Cross section : oblong, 400x



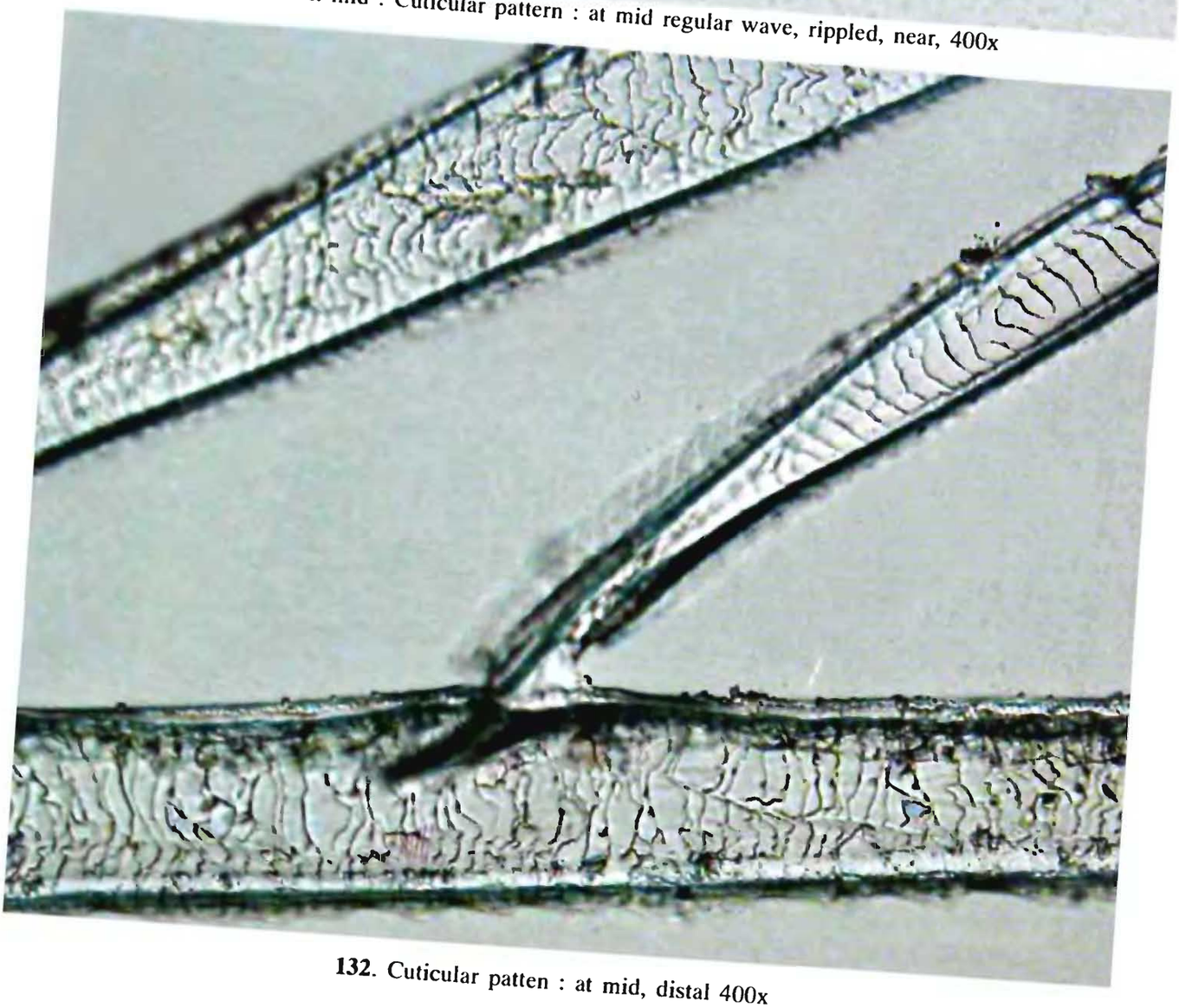
129. At distal Cuticular pattern : at distal regular wave, smooth, near, 200x



130. At proximal Cuticular pattern : at proximal regular mosaic, smooth, near, 200x

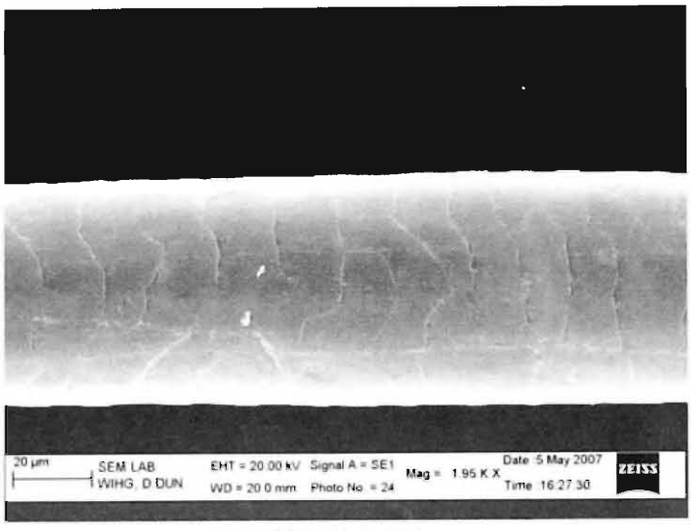


131. At mid : Cuticular pattern : at mid regular wave, rippled, near, 400x

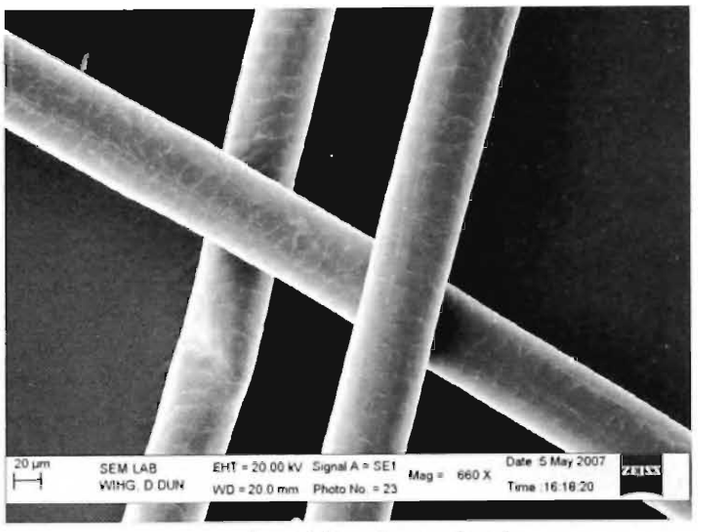


132. Cuticular patten : at mid, distal 400x

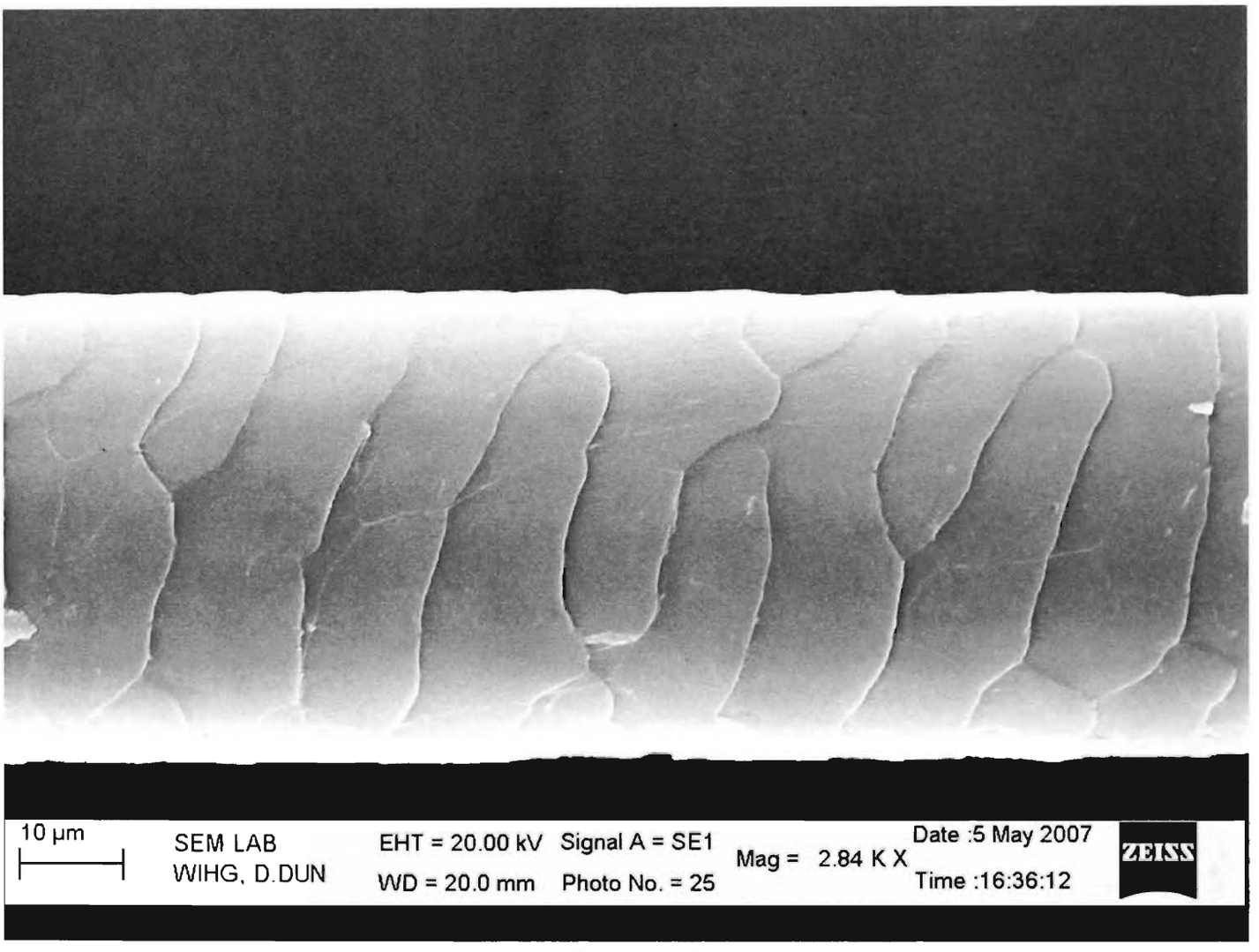
Dorsal
Scanning Electron Micrographs
(Cuticular architecture)



133. At mid

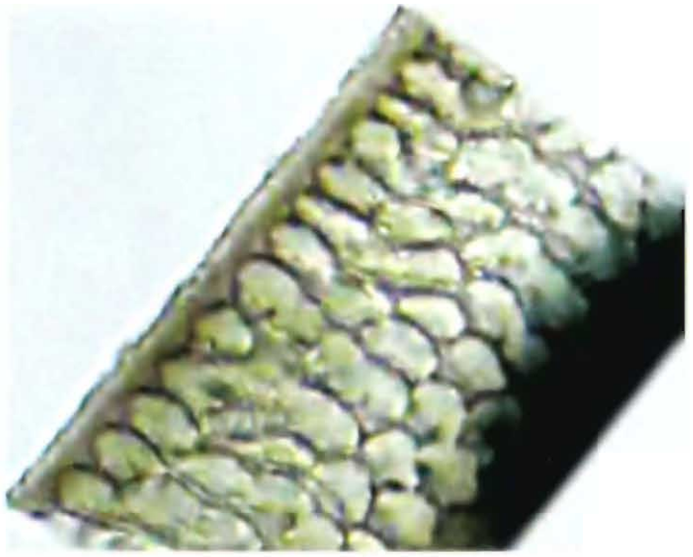


134. At mid and proximal



135. At distal

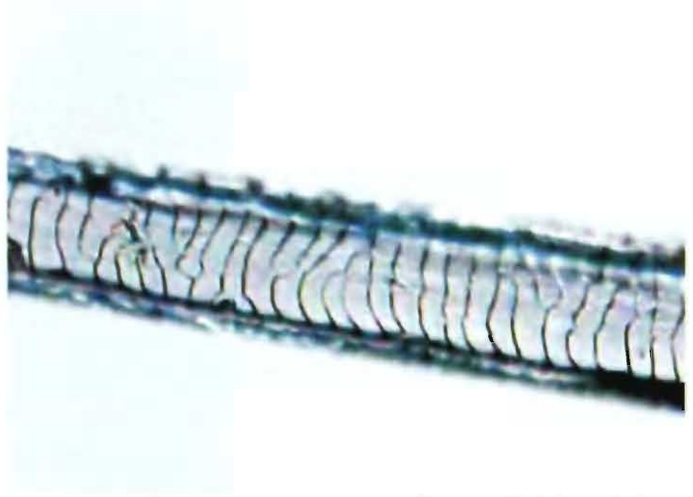
Plate 6b. ***Dremomys rufigenis*** (Blanford, 1878)
(Red checked squirrel)
Ventral (Photomicrographs, Figs. 136-141, mag 200x, 400x)



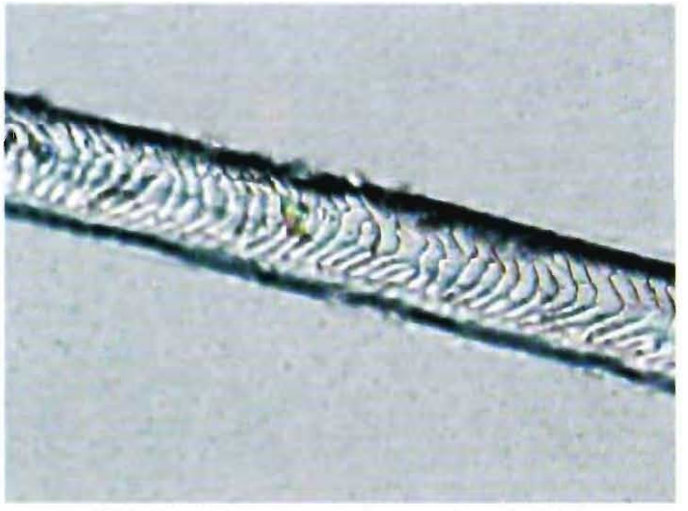
136. Medulla type : multiserial ladder, 400x



137. Cross section : oblong, 400x



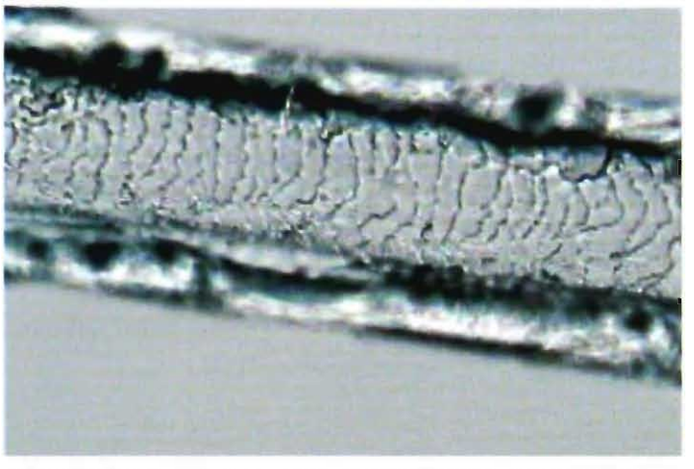
138. Cuticular pattern : towards proximal regular wave, smooth, near, 200 x



139. Cuticular : towards proximal, 200x



140. Cuticular at mid, 200x

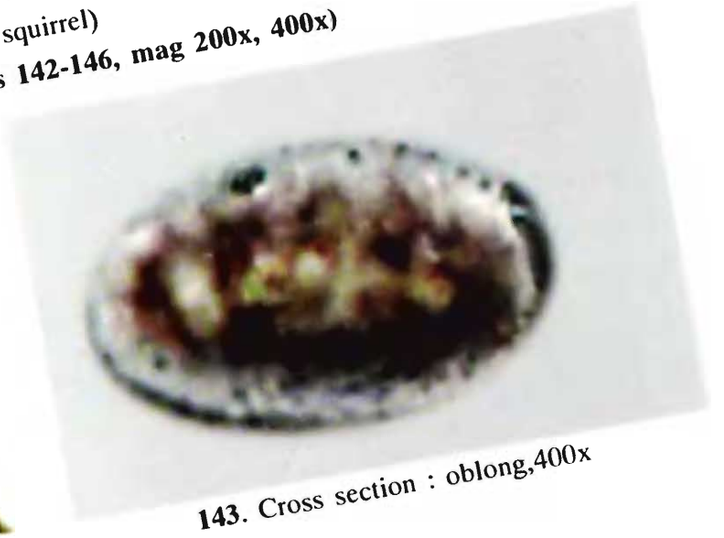


141. Cuticular pattern : towards distal : regular wave, smooth, near, 200x

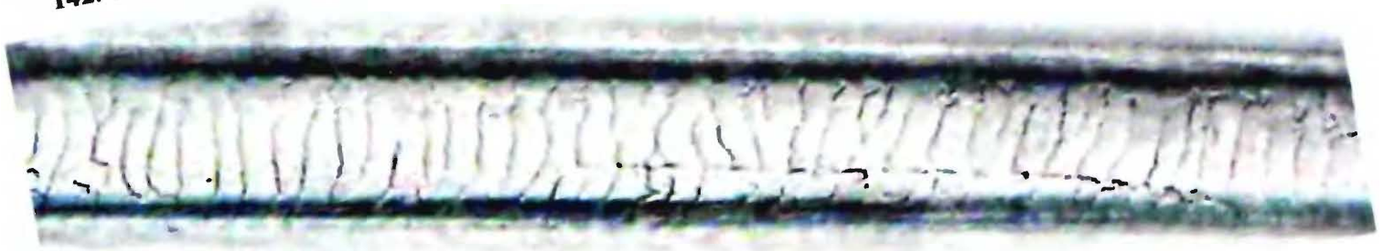
Plate 6c. ***Dremomys rufigenis*** (Blanford, 1878)
(Red checked squirrel)
Head (Photomicrographs, Figs 142-146, mag 200x, 400x)



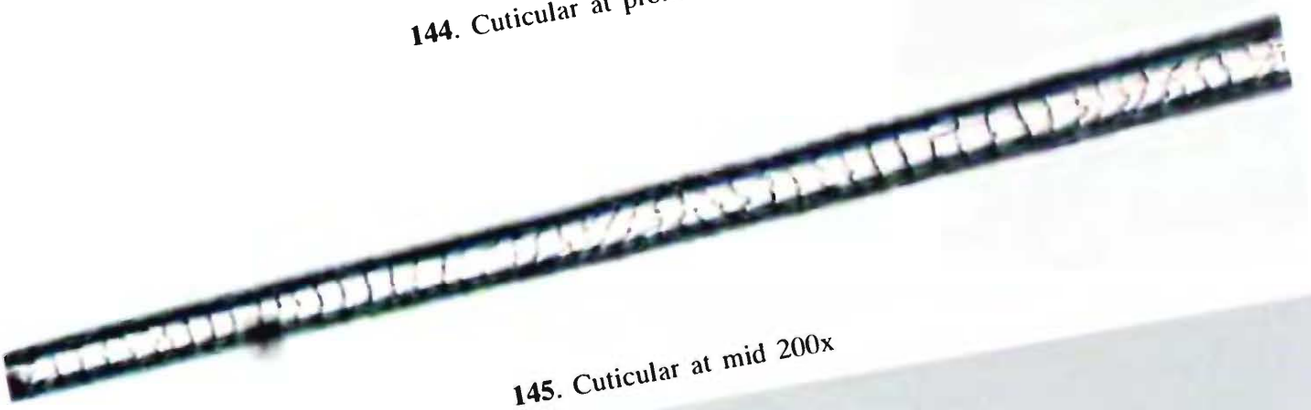
142. Medulla type : Multiserial ladder, 200x



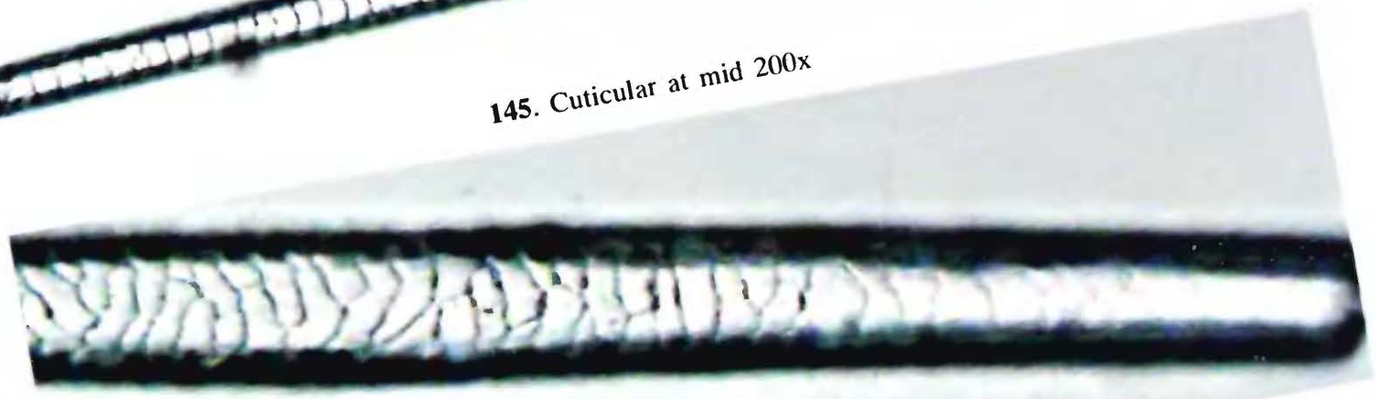
143. Cross section : oblong,400x



144. Cuticular at proximal, 200x



145. Cuticular at mid 200x



146. Cuticular at distal 200x

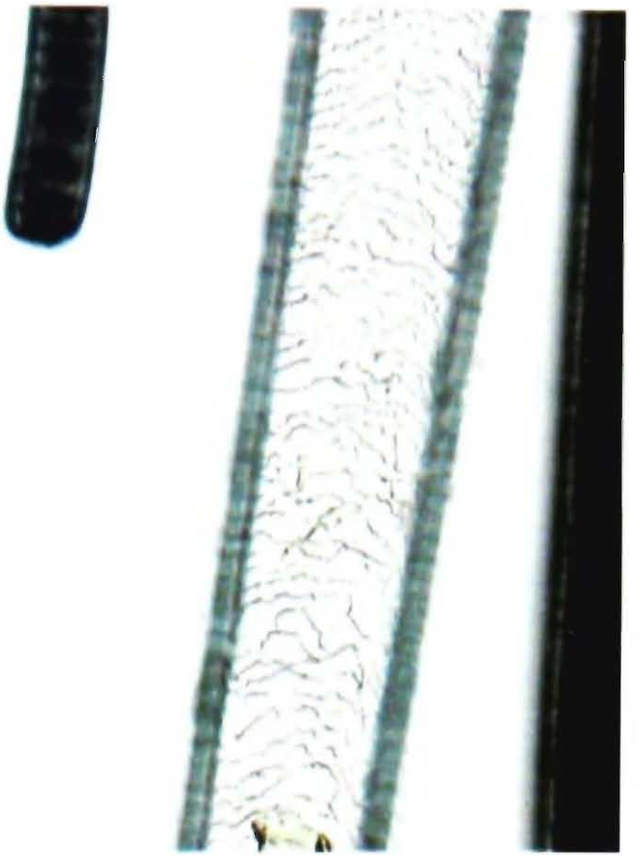
Plate 6d. ***Dremomys rufigenis*** (Blanford, 1878)
(Red checked squirrel)
Tail (Photomicrographs, 200x, 400x)



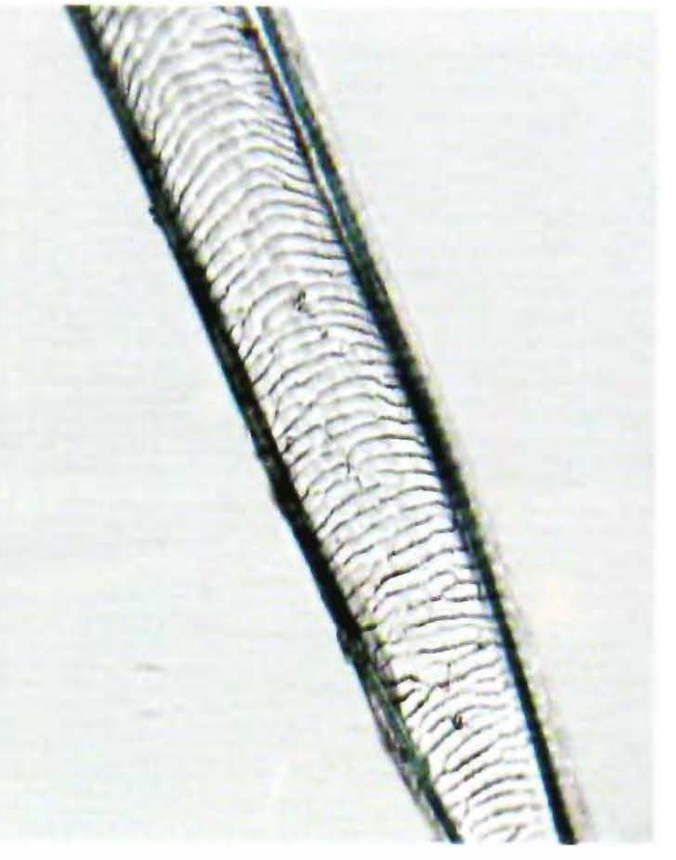
147. Cross section : oblong, 200x



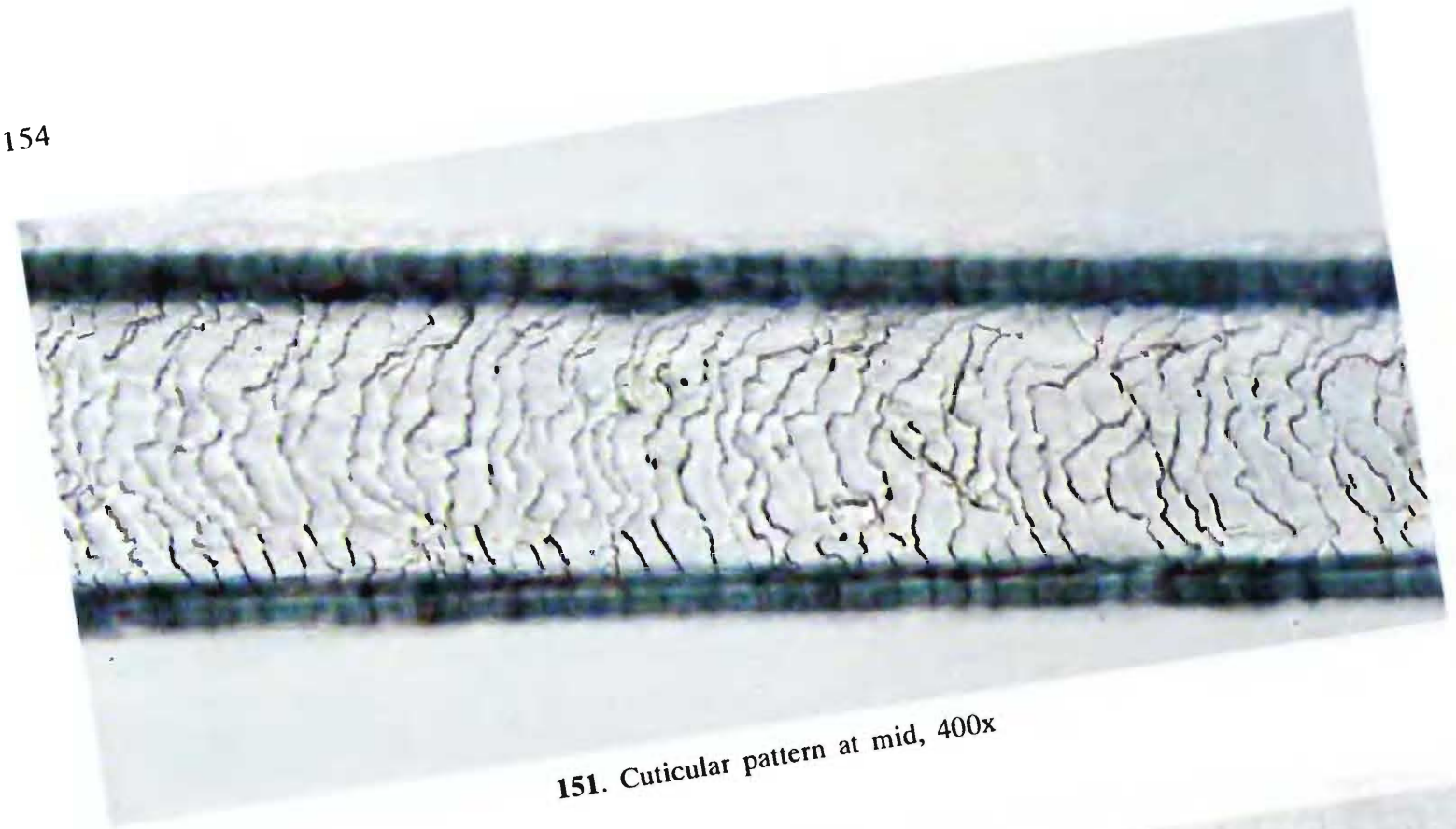
148. Medulla type : multiserial ladder, 200x



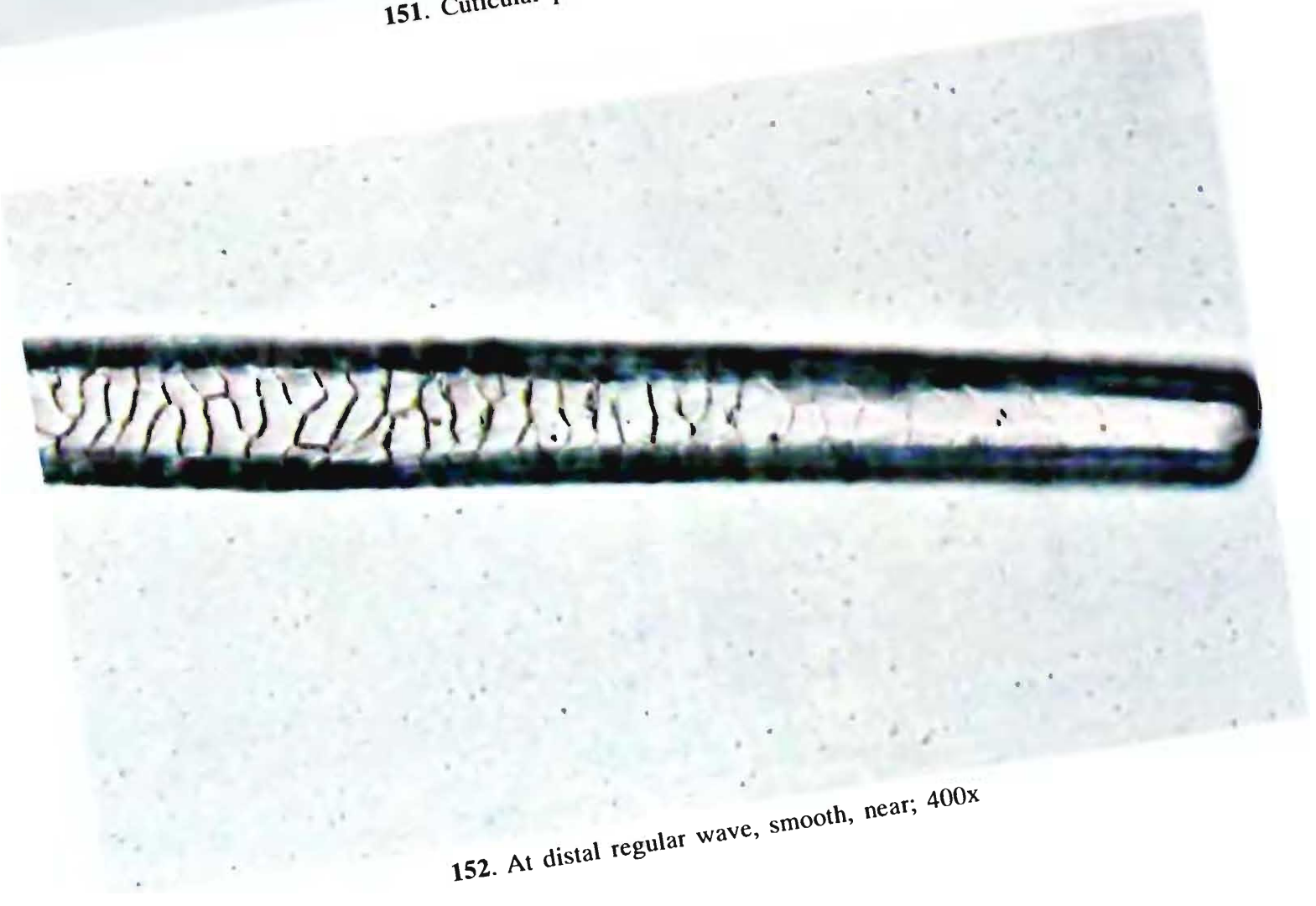
149. Cuticular pattern : at distal regular wave, smooth, near; 200x



150. Cuticular pattern at mid regular wave, rippled, near; 200x



151. Cuticular pattern at mid, 400x



152. At distal regular wave, smooth, near; 400x

Plate 7a. ***Funambulus palmarum*** (Linnaeus, 1766)
(Indian palm squirrel)
Photomicrographs (Figs 153-154; 400x)

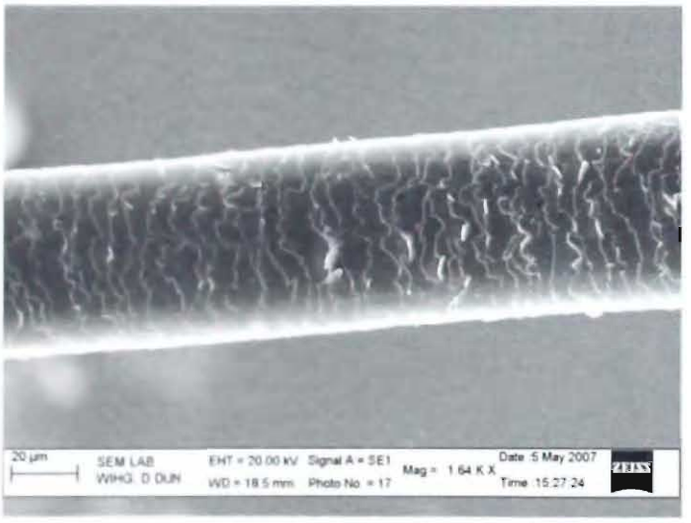


153. Medulla : multiserial, 400x

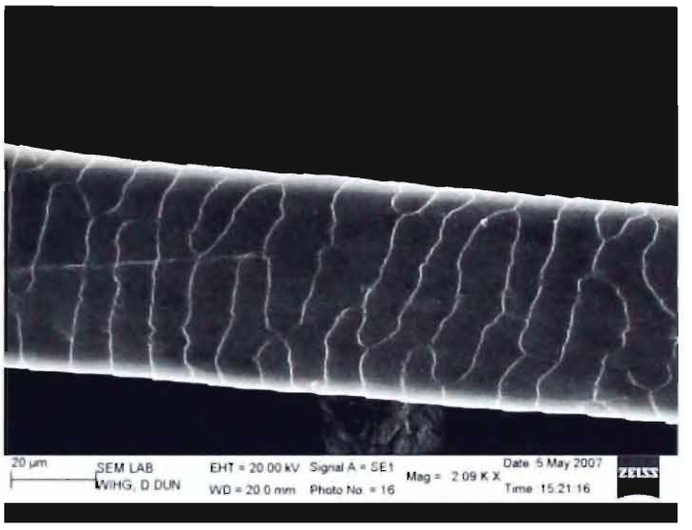


154. Cross section : reniform, large medulla, 400x

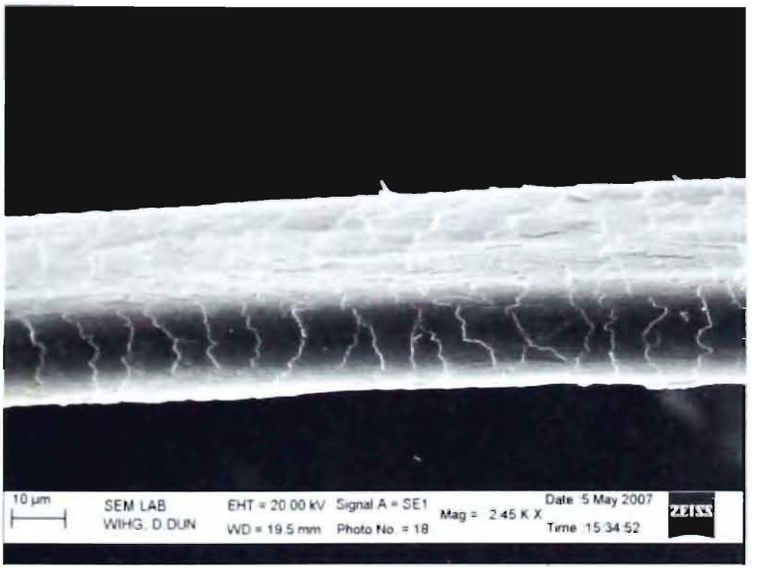
Scanning Electron Micrographs (Figs. 155-157)



155. At mid



156. Towards proximal



157. At mid

Plate 7b. ***Funambulus palmarum*** (Linnaeus, 1766), (Indian palm squirrel)

Ventral

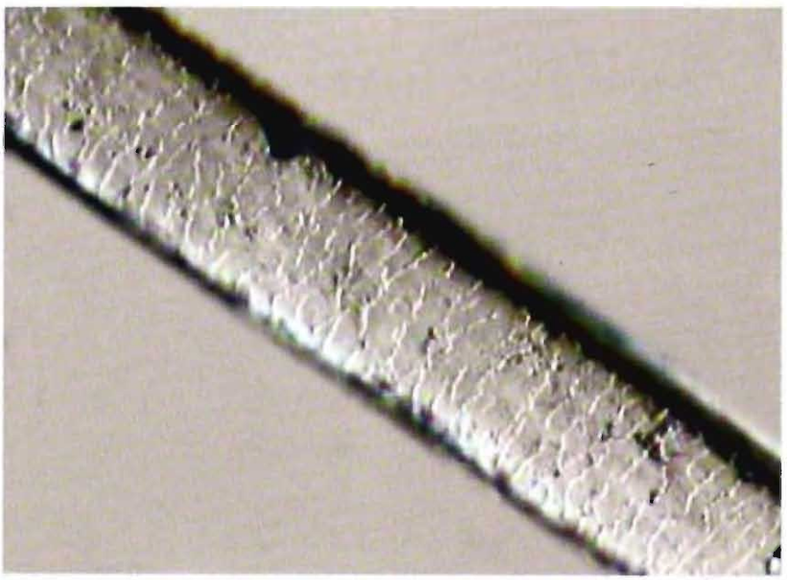
Photomicrographs (Figs 158-161; 400x, 200x)



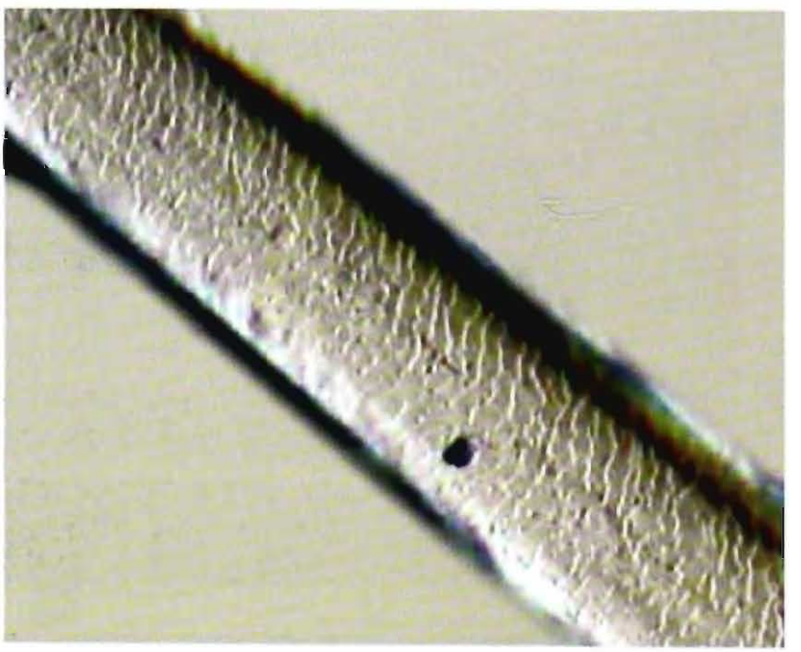
158. Medulla type : multiserial ladder, 400x



159. Cross section : oblong, large size medulla 400x



160



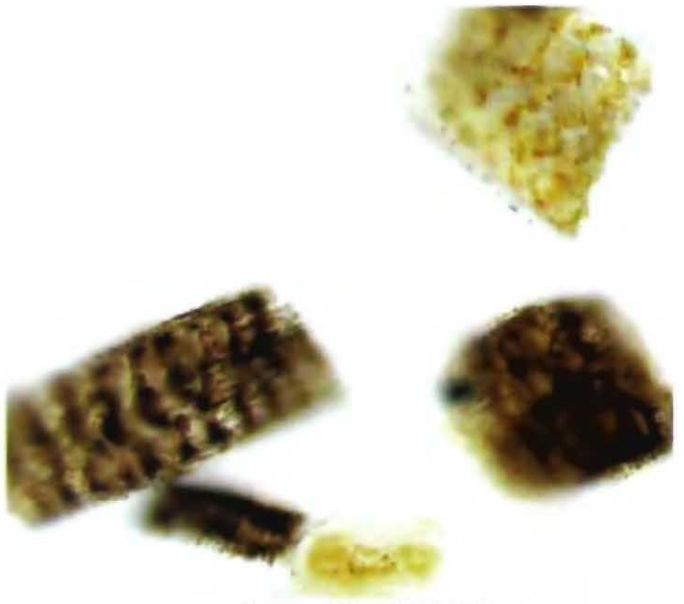
161

Cuticular pattern : at mid (**160**) and at proximal (**161**) (SP regular wave, SM slightly rippled, DS close), 200x

Plate 7c. ***Funambulus palmarum*** (Linnaeus, 1766), Indian palm squirrel

Head

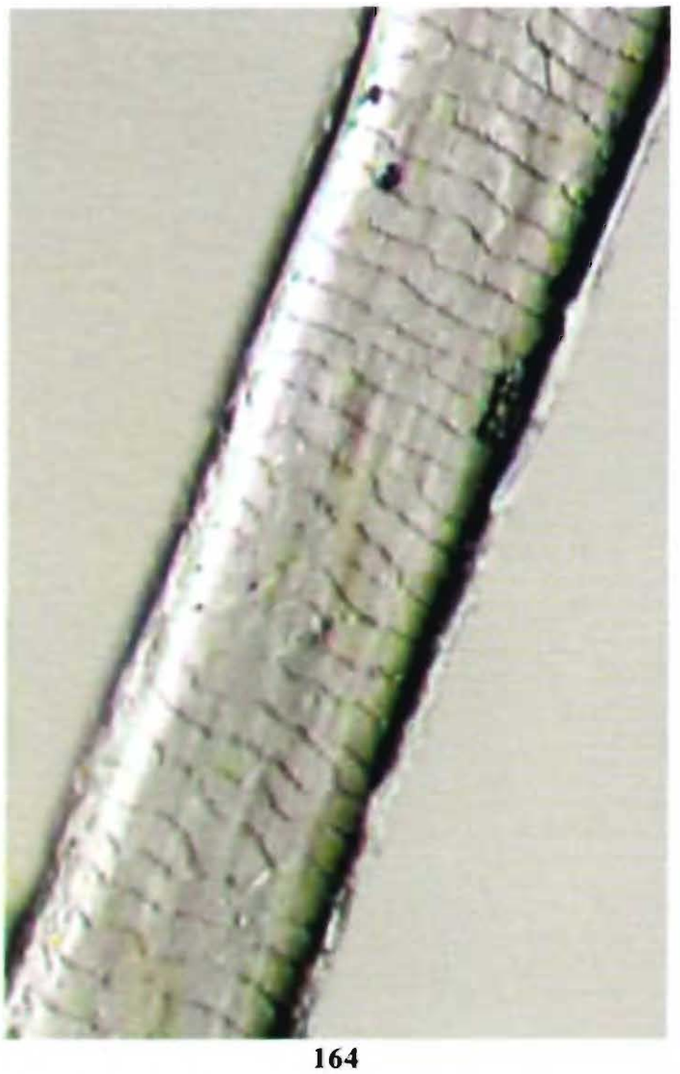
Phototmicrographs (Figs. 162-165, 200x, 400x)



162. Medulla : multiserial ladder, 200x



163. Cross section : oblong, medium size medulla, 400x



164



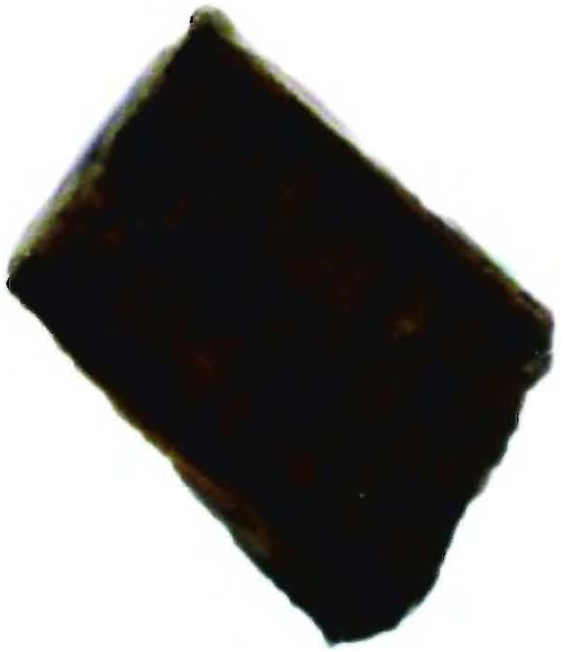
165

164. (at proximal), **165**. (at mid) Cuticular pattern SP regular wave, DS near, SM smooth; 400x

Plate 7d. ***Funambulus palmarum*** (Linnaeus, 1766), (Indian palm squirrel)

Tail

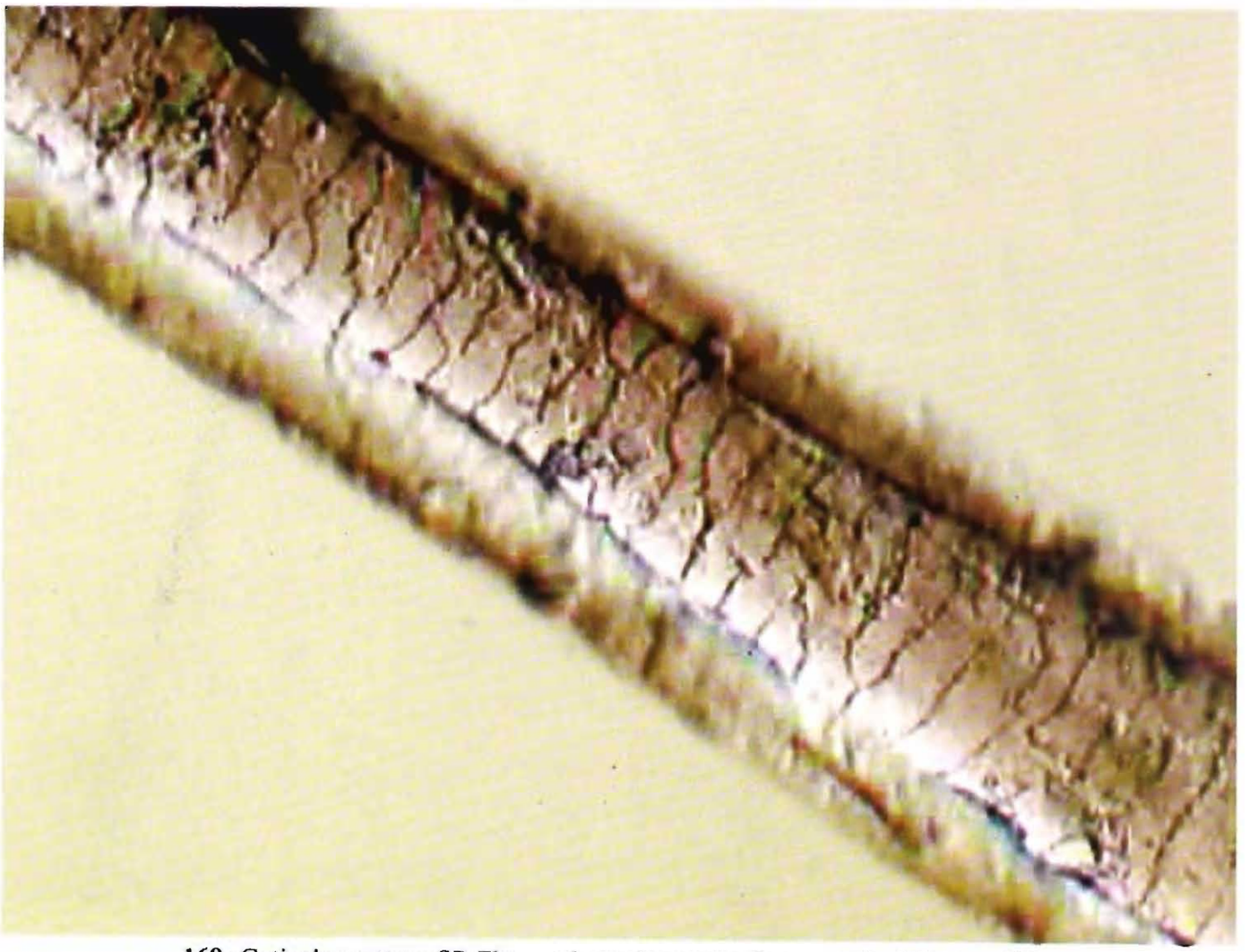
Photomicrographs (Figs. 166-168; 400x)



166. Medulla type 400x



167. Cross section, oblonlarge size medulla 400x



168. Cuticular pattern SP Flattened regular wave, SM smooth, DS near 400x

Plate 8a. ***Funambulus sublineatus sublineatus*** (Waterhouse, 1838)
(Red checked squirrel)

Dorsal

Photomicrographs (Figs 169-173; 200x, 400x)



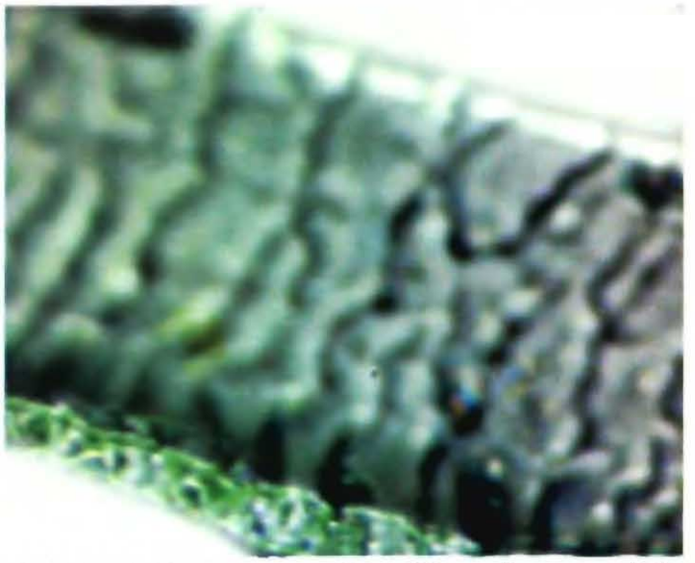
169. Medulla type, 200x



170. Cross section oblong, with divided medulla, 400x



171. Cuticular pattern, SP regular wave, SM rippled, DS distant, 400x



172. Cuticular pattern atdistal SP regular wave, DS distant 400x

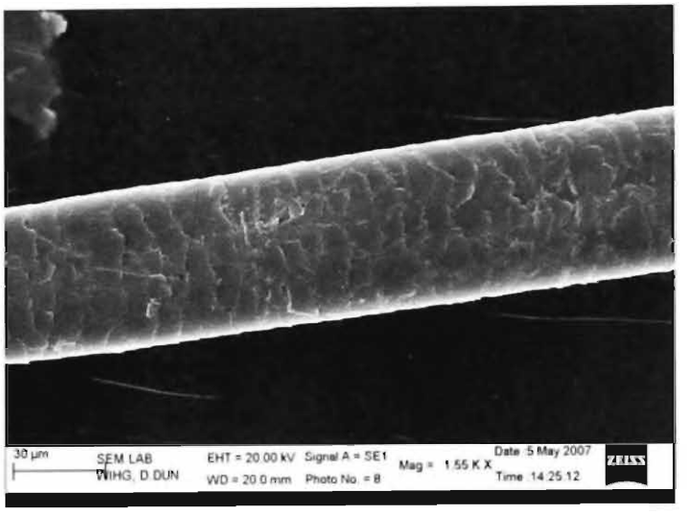


173. Cuticular pattern at proximal SP regular wave, smooth, distant 400x

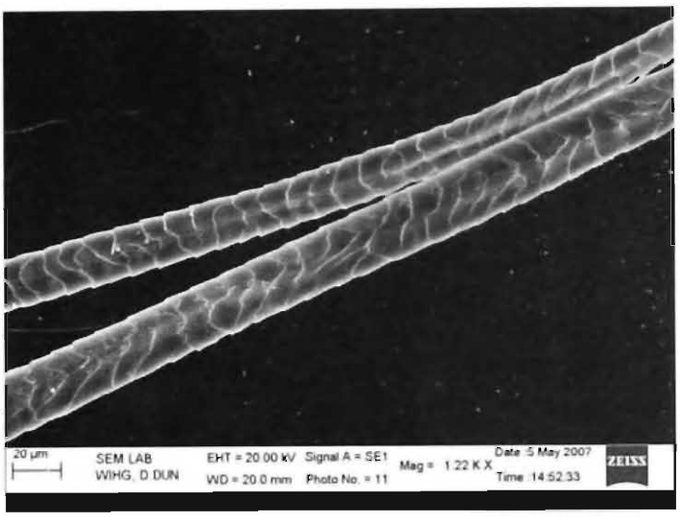
Funambulus sublineatus sublineatus (Waterhouse, 1838)
(Red checked squirrel)

Dorsal

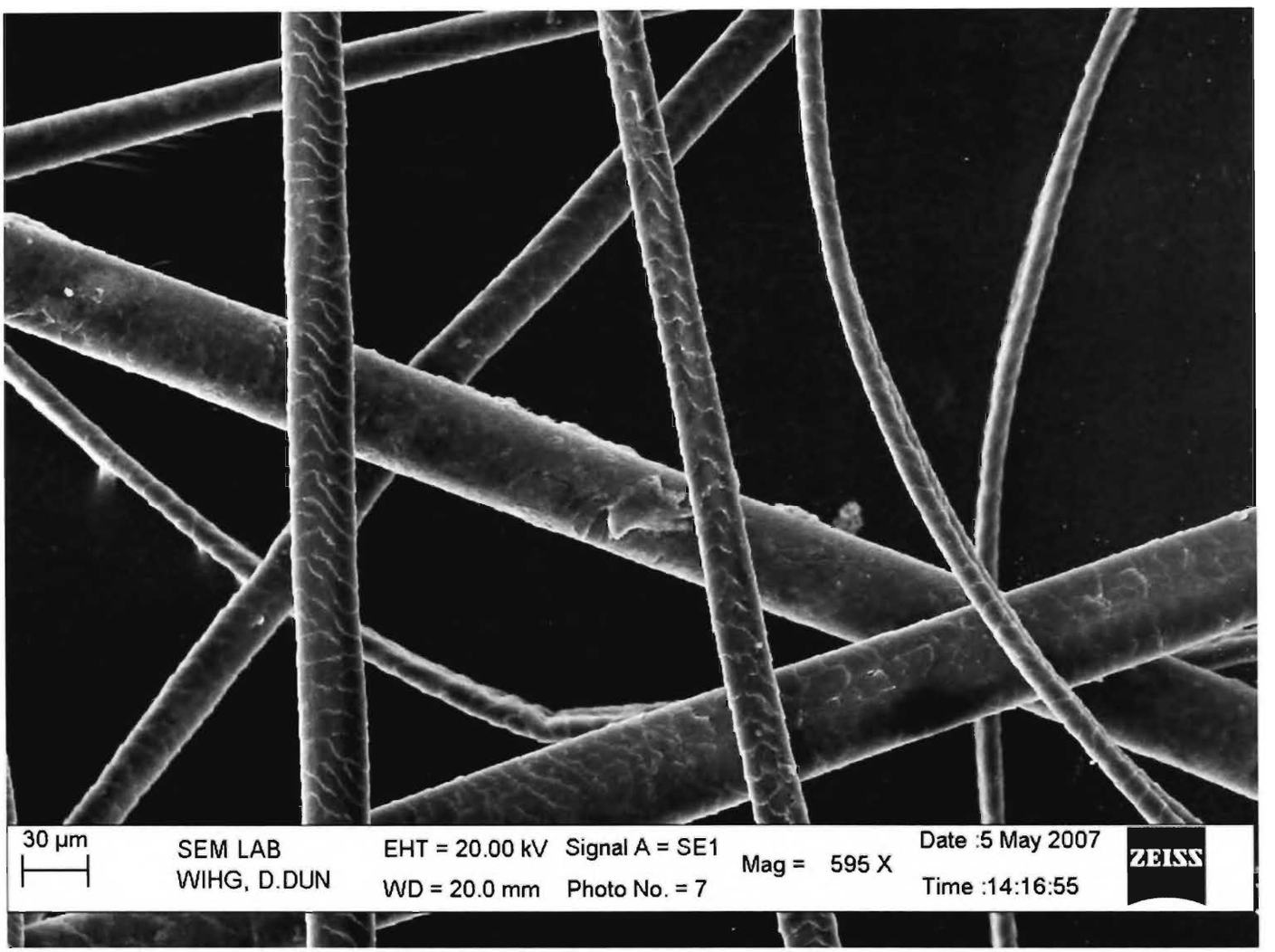
Scanning Electron Micrographs
(Cuticular architecture)



174. At mid



175. At distal and proximal



176. Group of hair at various regions

Plate 8b. ***Funambulus sublineatus sublineatus*** (Waterhouse, 1838)
(Red checked squirrel)

Ventral

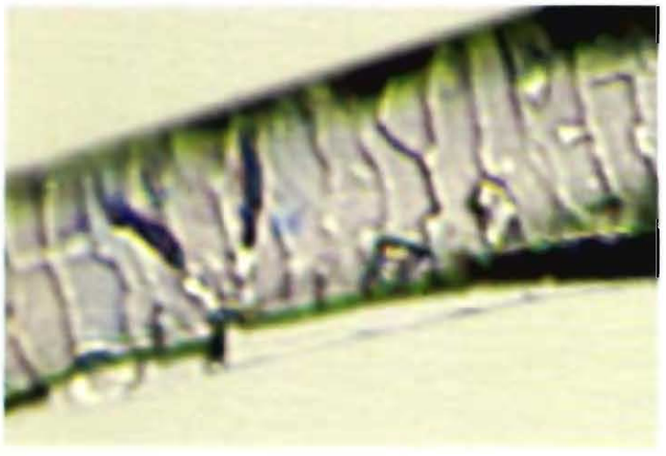
Photomicrographs (Figs. 177-182; 200x, 400x)



177. Medulla : multiserial ladder 200x



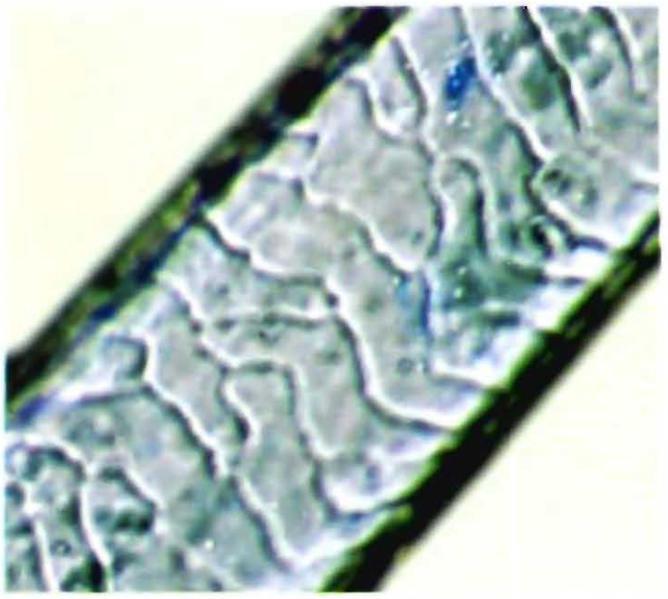
178. cross section : oblong 200x



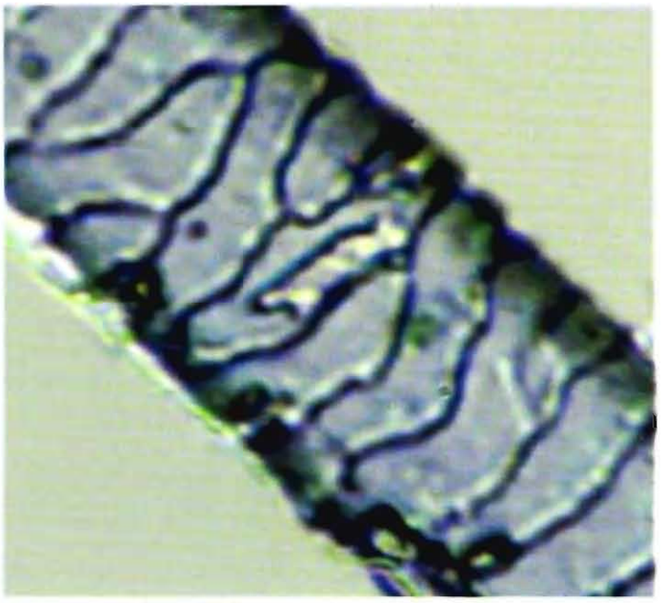
179. Cuticular at distal 200x



180. Cuticular at distal 400x



181. Cuticuar at proximal 400x

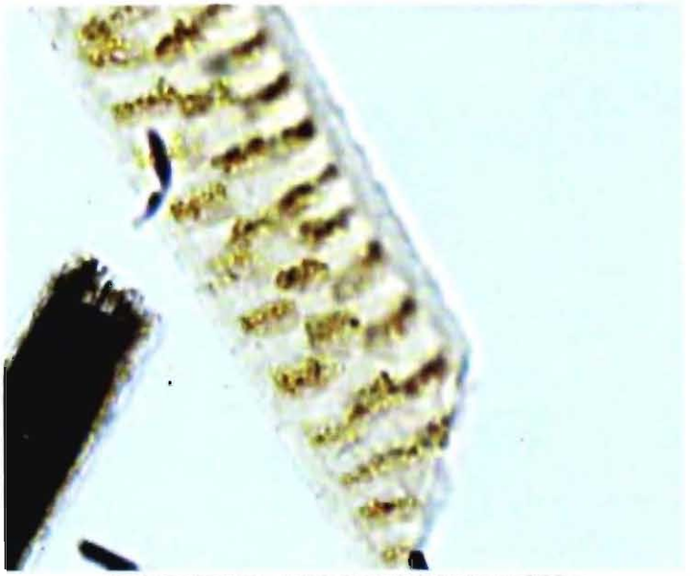


182. Cuticular at mid 400x

Plate 8c. ***Funambulus sublineatus sublineatus*** (Waterhouse, 1838)

(Red checked squirrel)

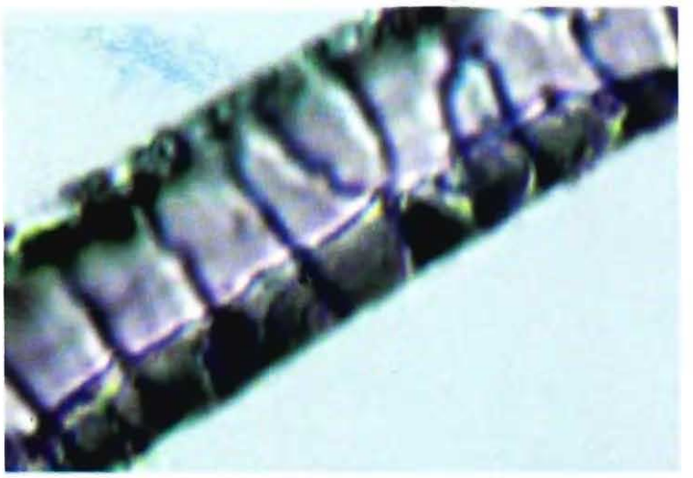
Head



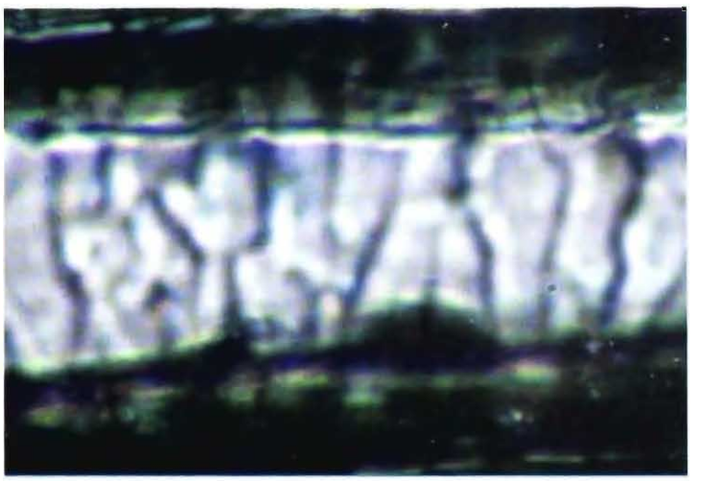
183. Medulla : Mutiserial ladder 200x



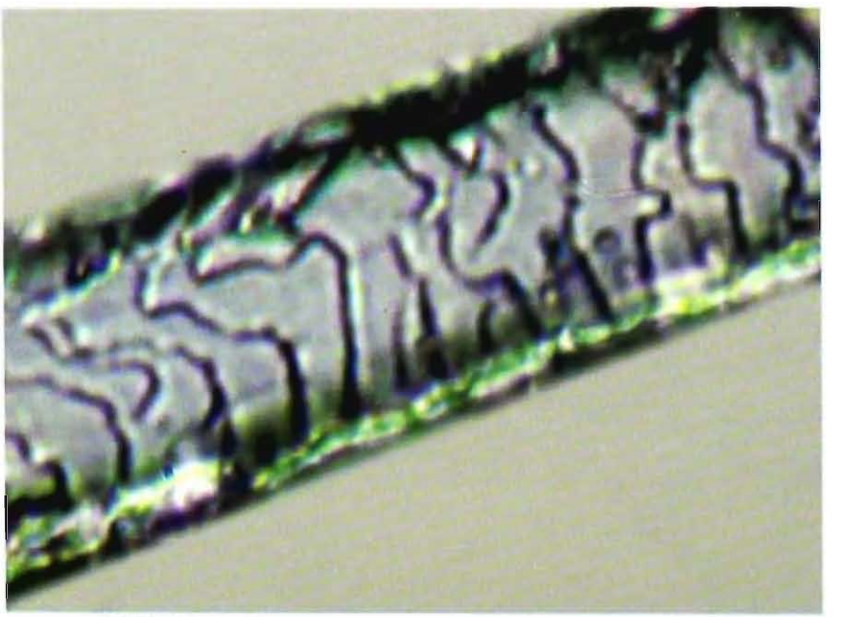
184. Cross section Oblong (with medium medulla) 200x



185. Cuticular at distal (with smooth margin) 400x



186. Cuticular at proximal (SM smooth) 400x

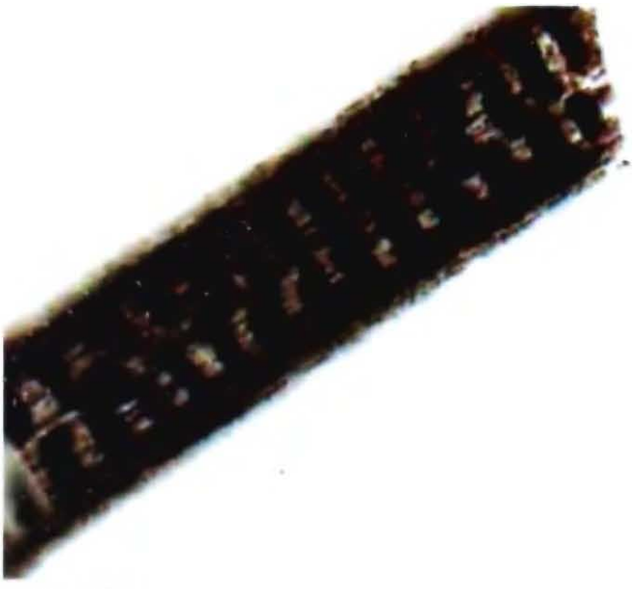


187. Cuticular pattern at mid (SM rippled) 400x

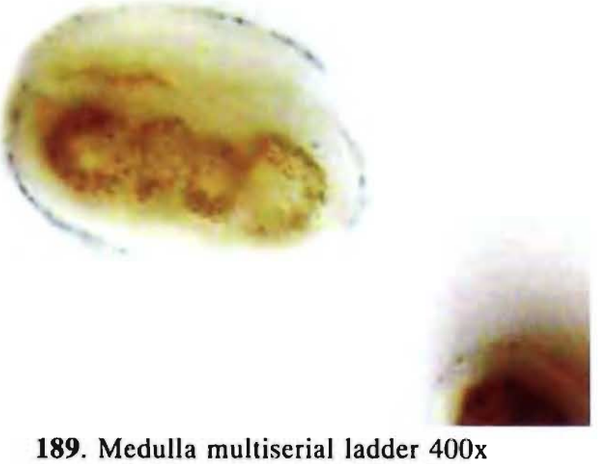
Plate 8d. ***Funambulus sublineatus sublineatus*** (Waterhouse, 1838)

(Red checked squirrel)

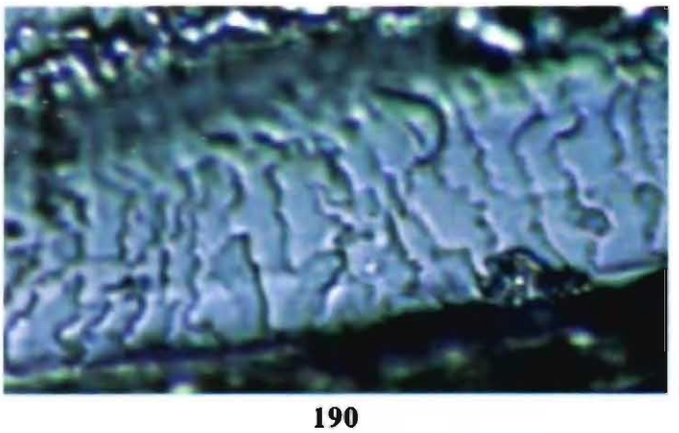
Tail



188. Cross section Oblong,medium sized medulla 400x



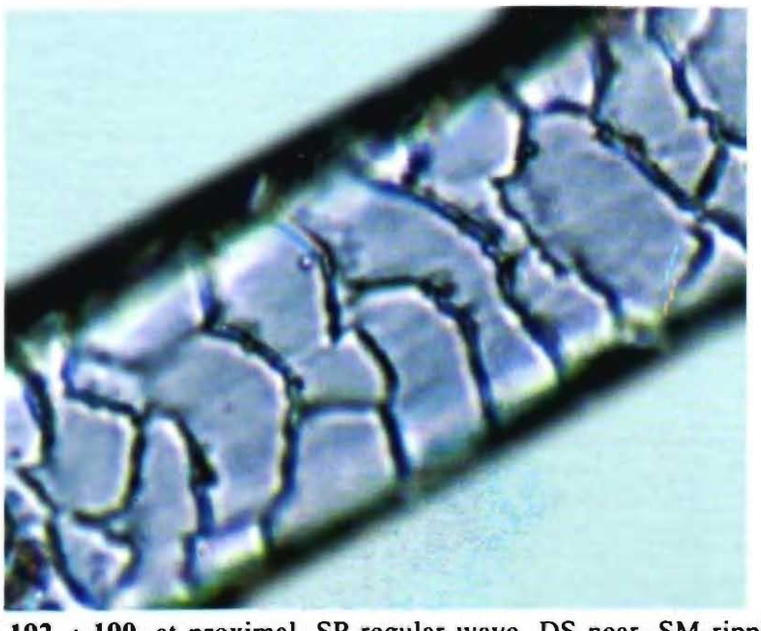
189. Medulla multiserial ladder 400x



190



191



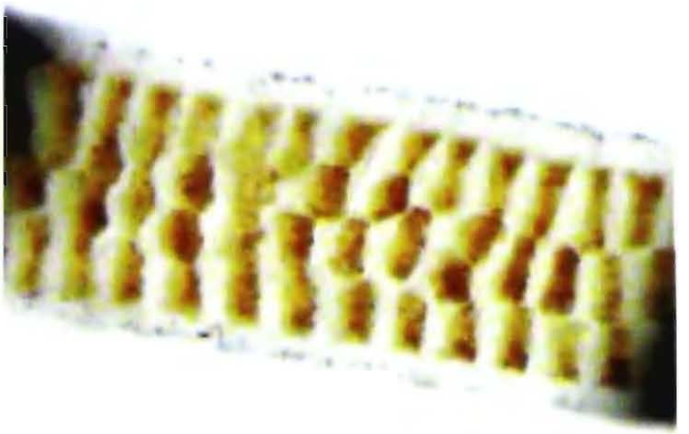
192

Figs. 188-192. : **190**. at proximal, SP regular wave, DS near, SM rippled 400x

191. at mid : SP regular wave, SM smooth, DS near 400x

192. at distal SP regular wave, SM slightly rippled, DS near 400x

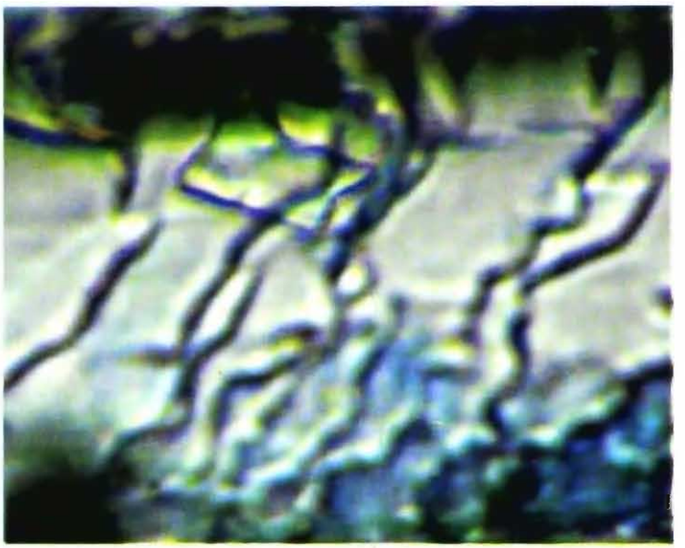
Plate 9a. ***Funambulus tristata tristata*** (Waterhouse)
Jungle striped squirrel
Dorsal
Photomicrographs (Figs. 193-197, mag 400x)



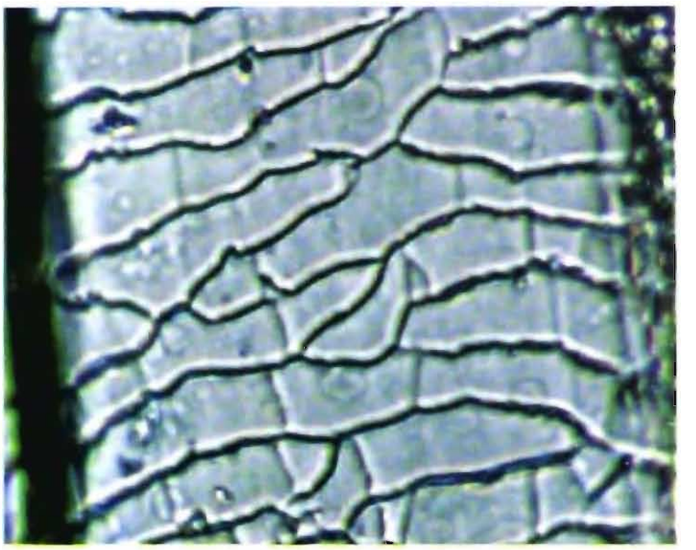
193. Medulla type : multiserial ladder



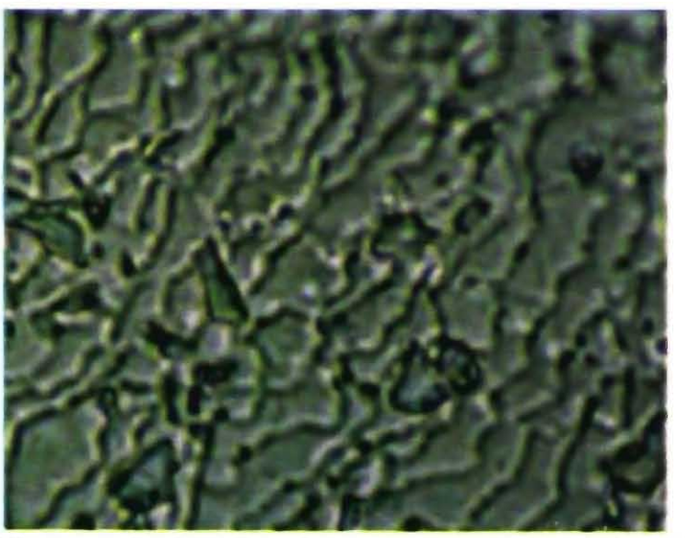
194. Cross section : oblong, medium size medulla



195. Cuticular at mid (SP regular wave, SM smooth, DS near)



196. Cuticular at distal



197. at proximal (SP regular wave, SM rippled, DS near)

Plate 9b. ***Funambulus tristata tristata*** (Waterhouse)

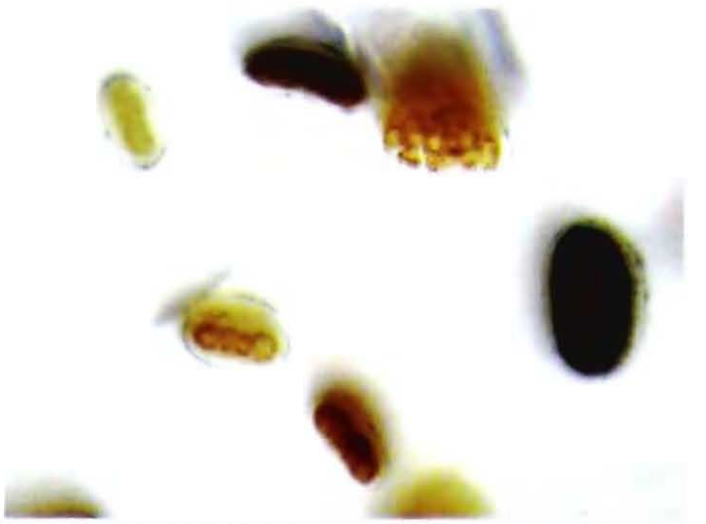
Jungle striped squirrel

Ventral

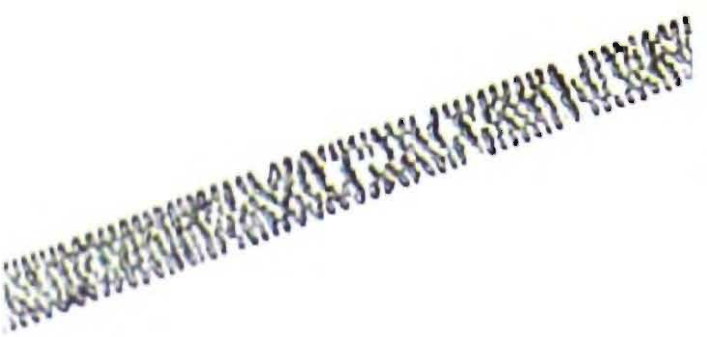
Photomicrographs (Figs. 198-203, 200x, 800x)



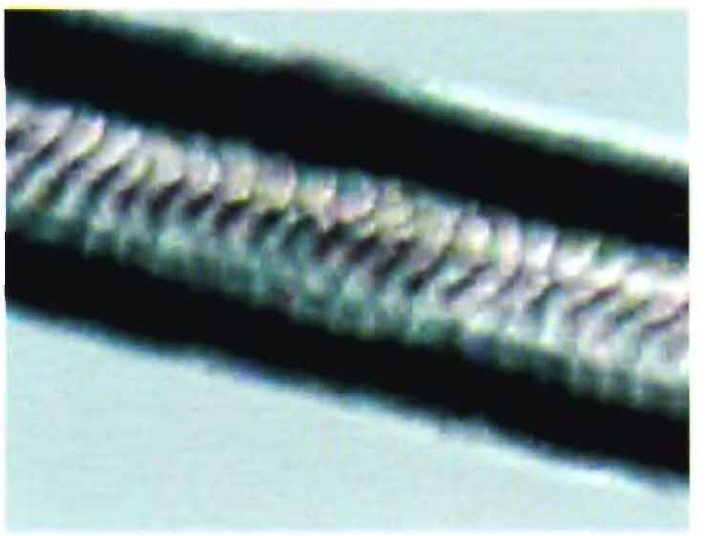
198. Medulla multiserial lader 200x



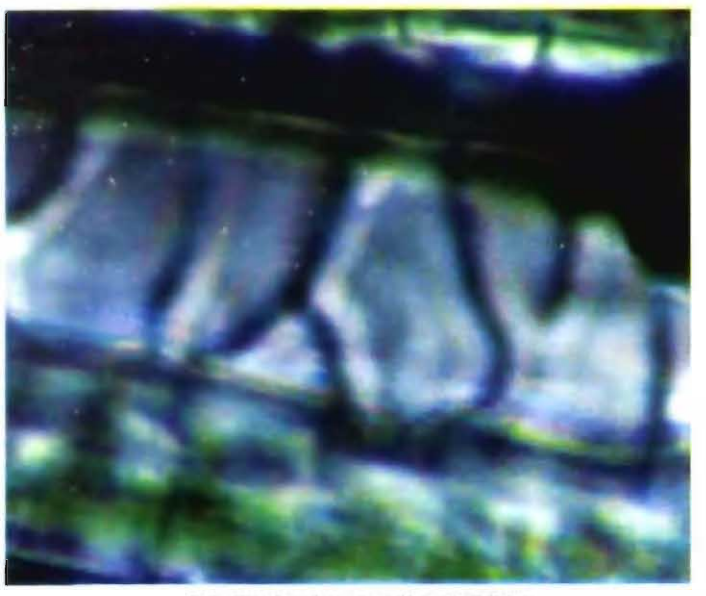
199. Cross section oblong, large medulla 200x



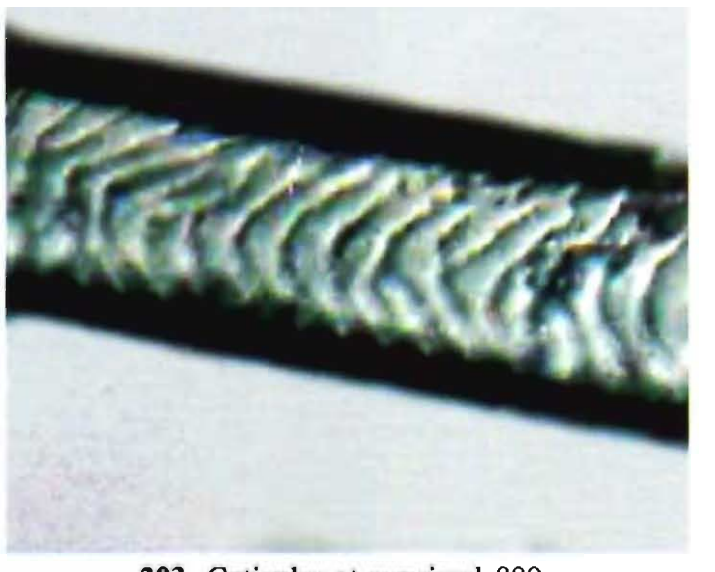
200. Medulla multiserial lader 200x



201. Cuticular at mid 800x



202. Cuticular at distal 800x



203. Cuticular at proximal 800x

Figs. 201-203 : SP regular wave, SM smooth, DS near

Plate 9c. ***Funambulus tristata tristata*** (Waterhouse)

Jungle striped squirrel

Head

Photomicrographs (Figs. 204-208, mag 200x, 400x)



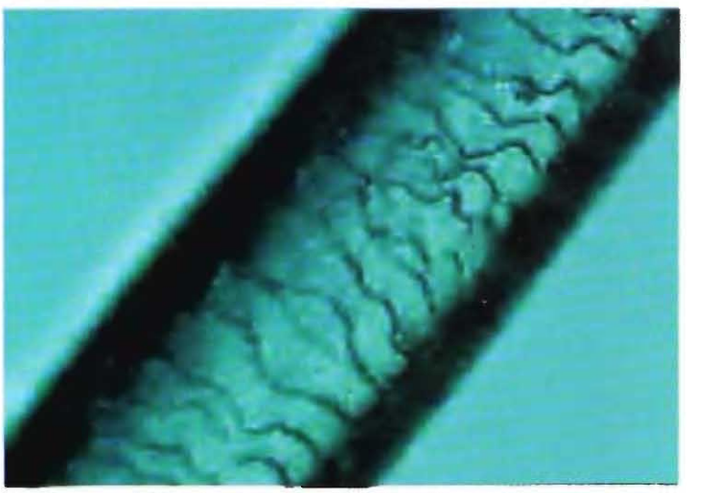
204. medulla : multiserial lader 200x



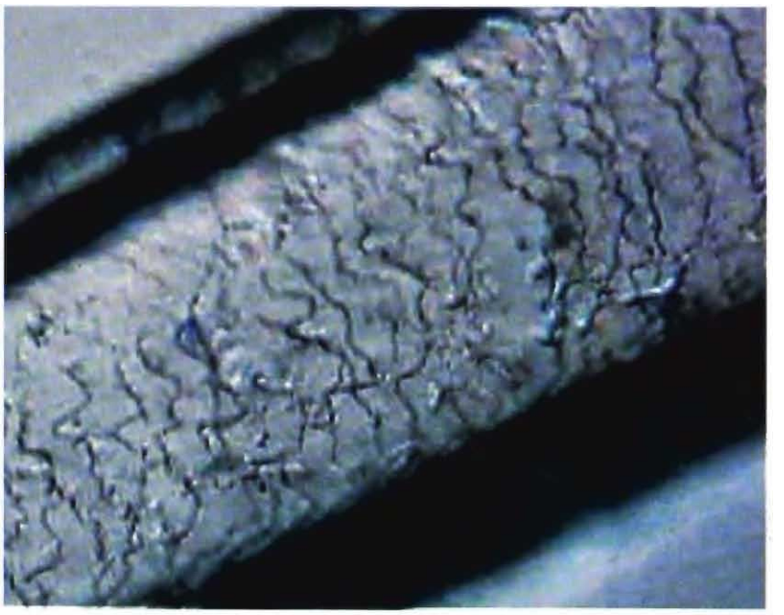
205. cross section Oblong, medium medulla 200x



206. cuticular at proximal : regular wave, smooth, distant 400x



207. Cuticular at distal SM 400x



208. Cuticular at mid 400x

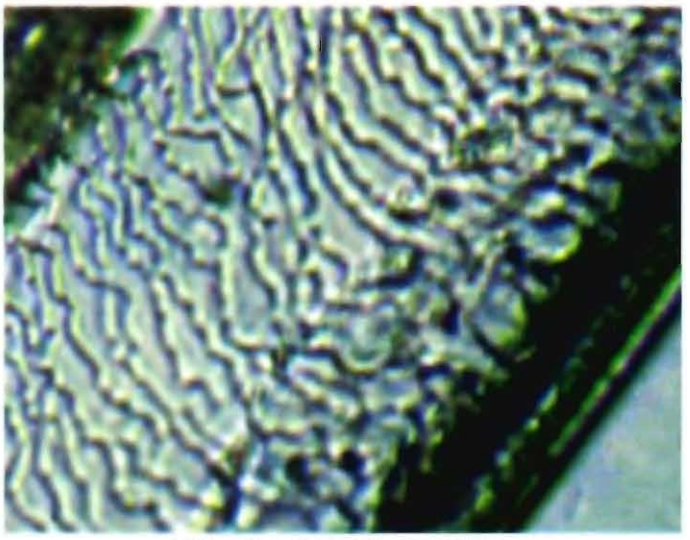
Plate 9d. ***Funambulus tristata tristata*** (Waterhouse)
Jungle striped squirrel
Tail
Photomicrographs (Figs. 209-213, 100x, 200x, 400x)



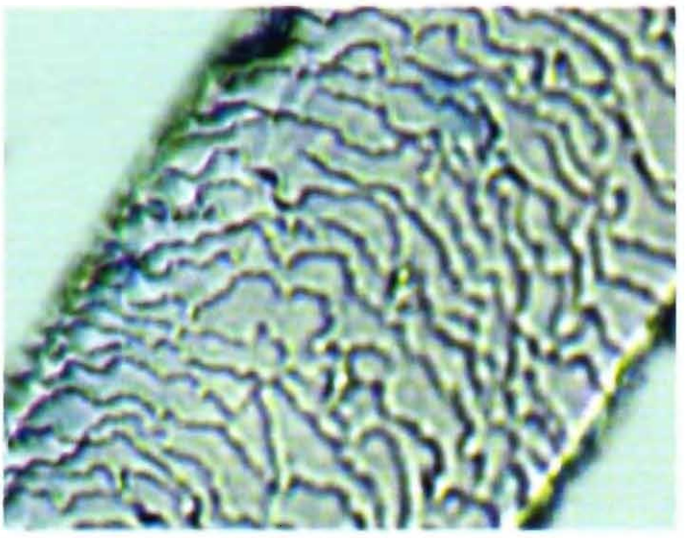
209. Medula type wide aeriform, 200x



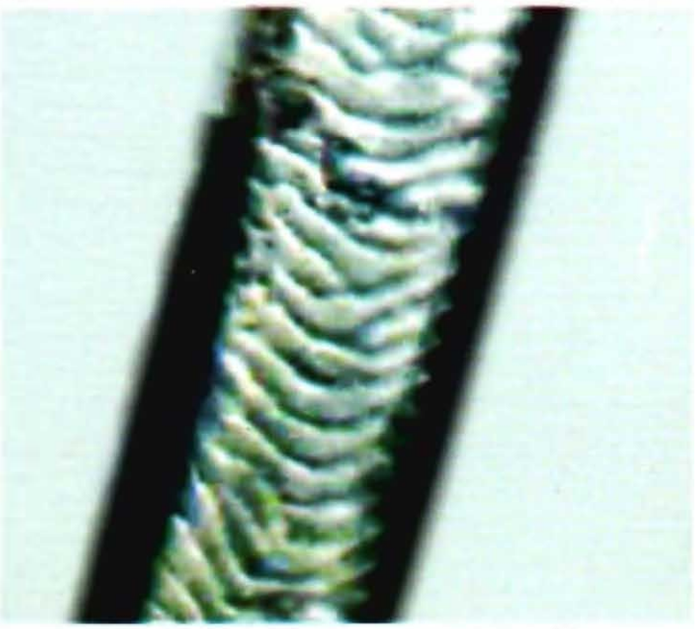
210. Cross section : circular large medulla 100x



211. Cuticular at mid 800x



212. Cuticular at proximal 800x



213. Cuticular pattern of fur hair 400x

Plate 10a. ***Marmota himalayanum himalayanum*** (Hodgson)

Dorsal

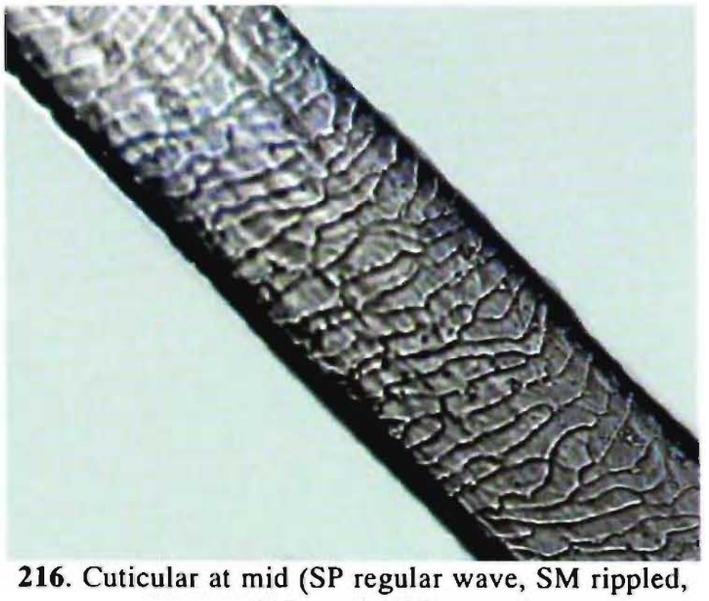
Photomicrographs (Figs. 214-218)



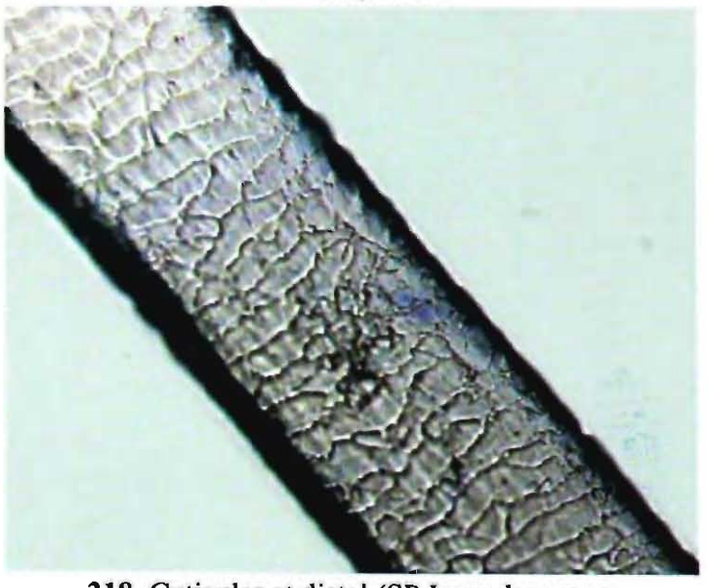
214. Wide aeriform lattice 200x



215. Cross section : oblong, large medulla 400x



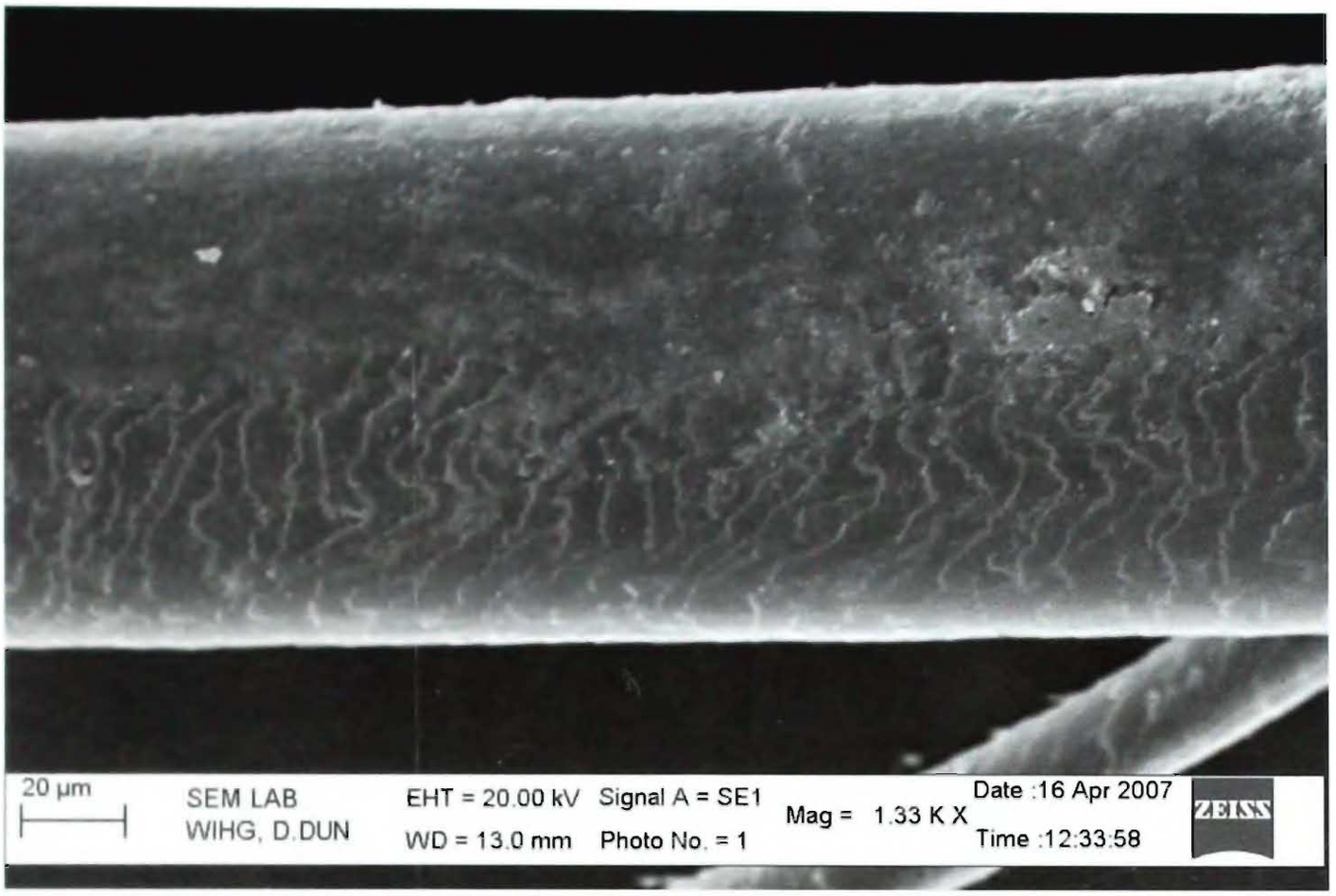
216. Cuticular at mid (SP regular wave, SM rippled, DS near) 400x



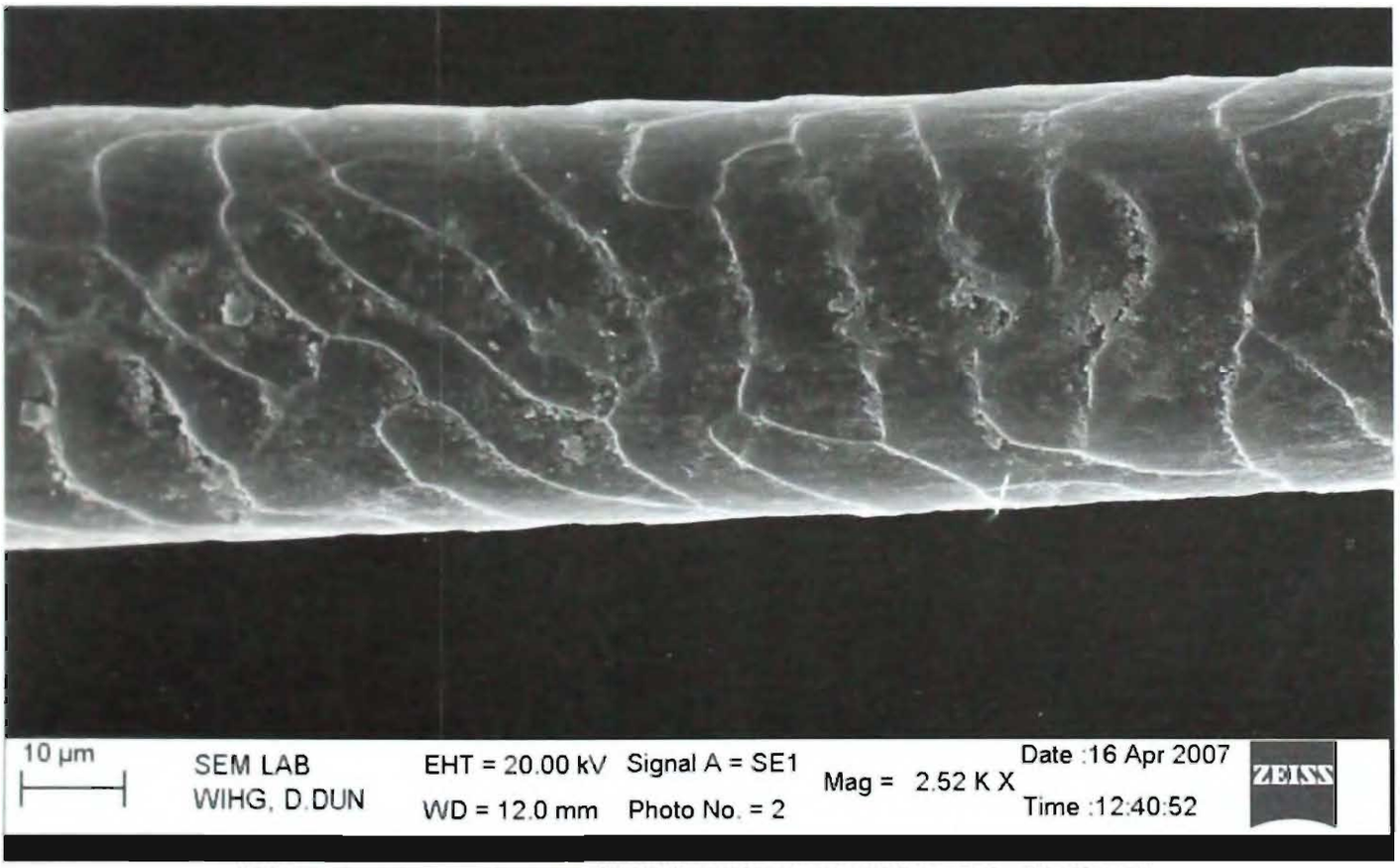
218. Cuticular at distal (SP Irregular wave, DS distant, SM smooth) 400x



217. At proximal (DS distant) 800x



219. Cuticular at mid (SP Irregular wave, SM rippled, DS near)

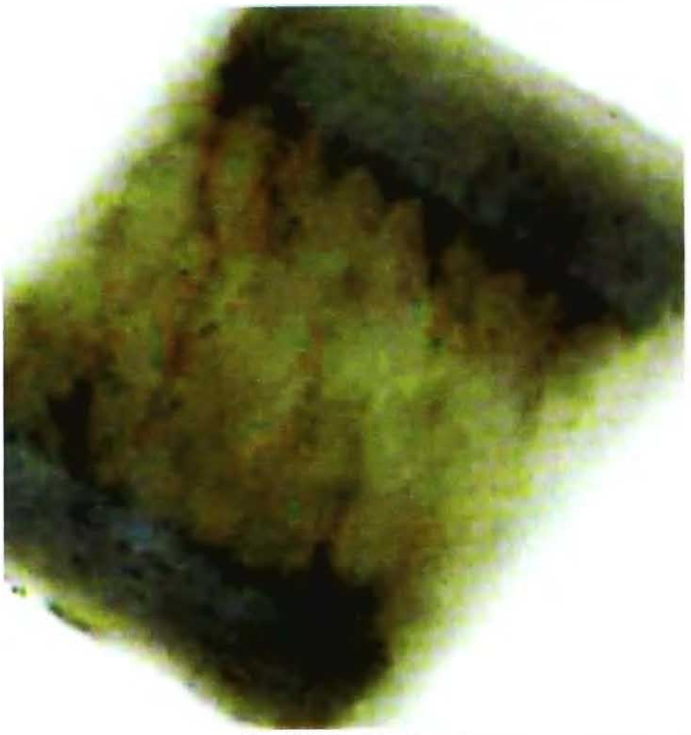


220. Cuticular pattern at distal (SP Irregular wave, SM smooth, DS distant)

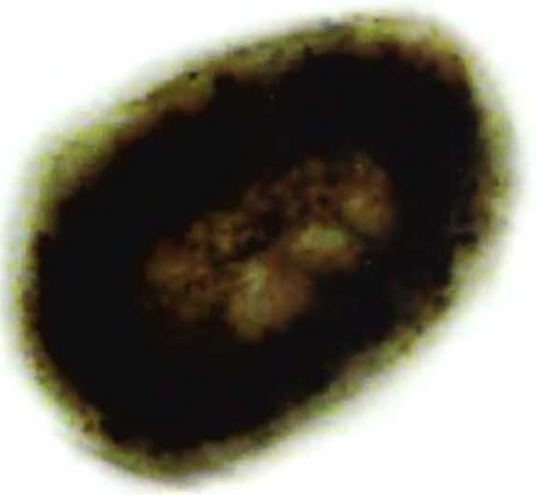
Plate 10b. ***Marmota himalayanum himalayanum*** (Hodgson)

Ventral

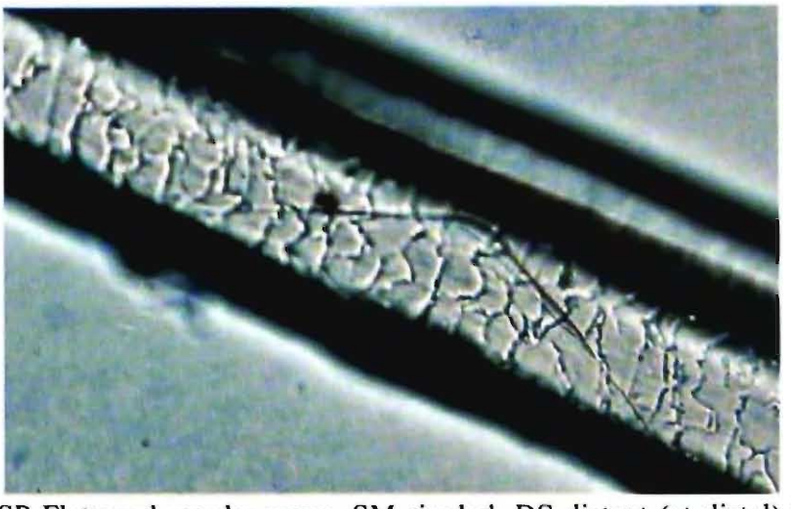
Photomicrographs (Figs. 221-224; 400x)



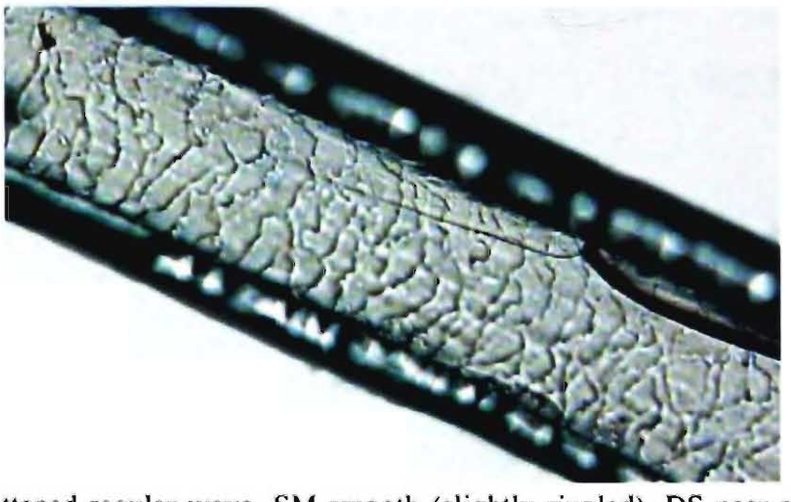
221. Medulla type



222. Cross section : oblong



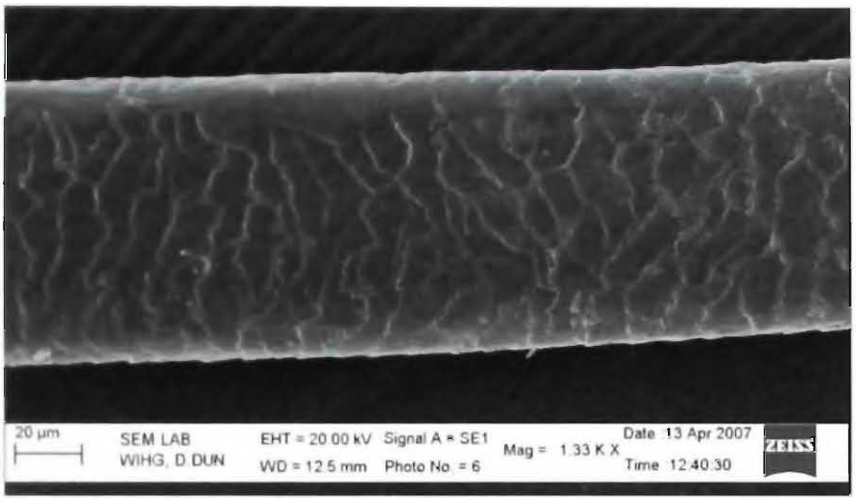
223. SP Flattened regular wave, SM rippled, DS distant (at distal) 200x



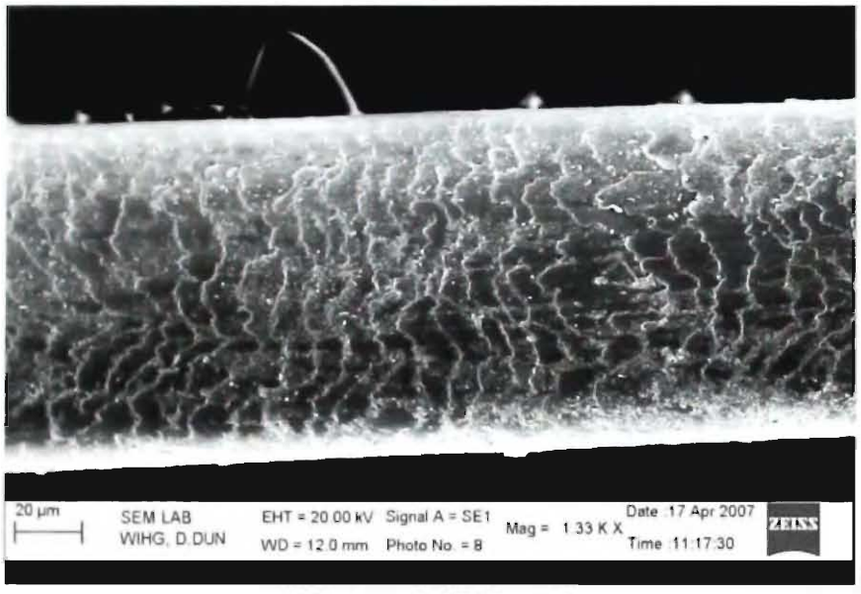
224. SP Flattened regular wave, SM smooth (slightly rippled), DS near at mid 200x

Ventral

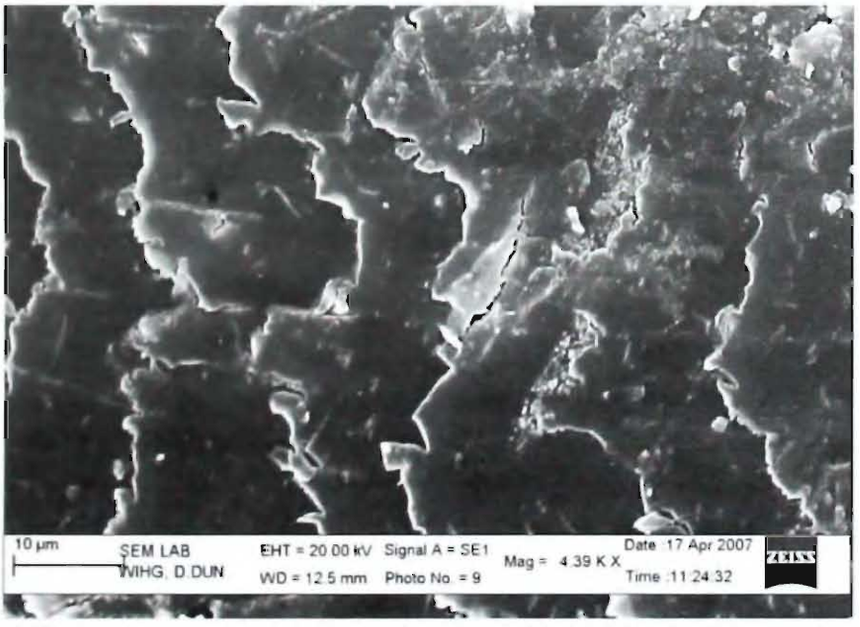
Scanning Electron Micrographs (225-227)



225. At proximal



226. At mid (DS near)

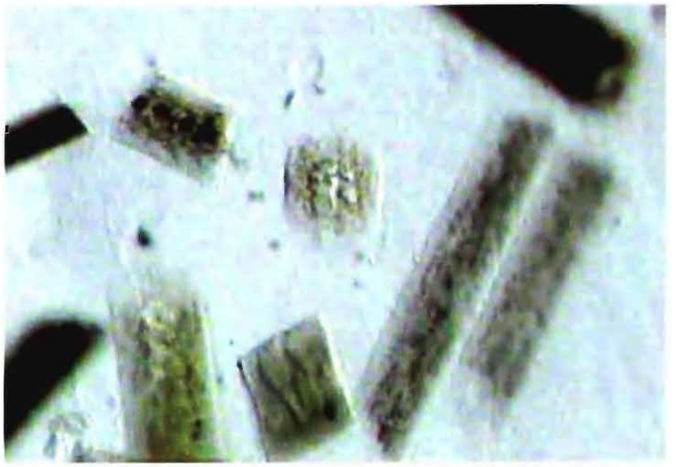


227. Further magnified view of scales with highly rippled margin

Plate 10c. ***Marmota himalayanum himalayanum*** (Hodgson)

Head

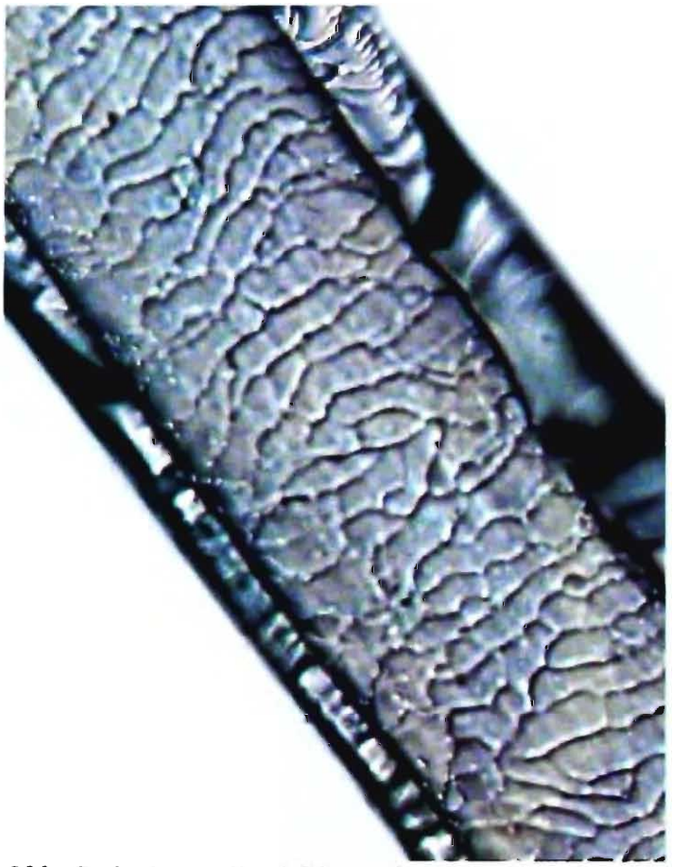
Photomicrographs (Figs. 228-231; 200x, 400x)



228. Medulla : Simple 200x



229. Cross section : oblong 400x



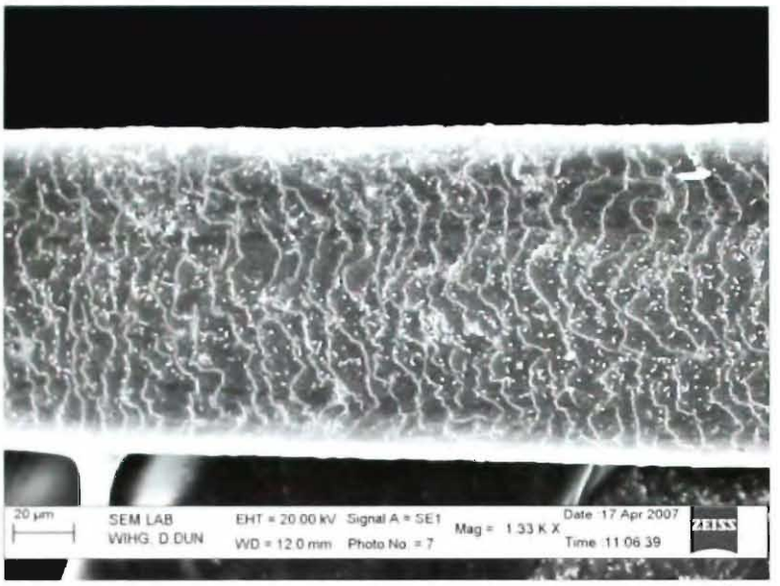
230. Cuticular at distal SP regular wave, SM smooth (slightly rippled), DS near, 400x



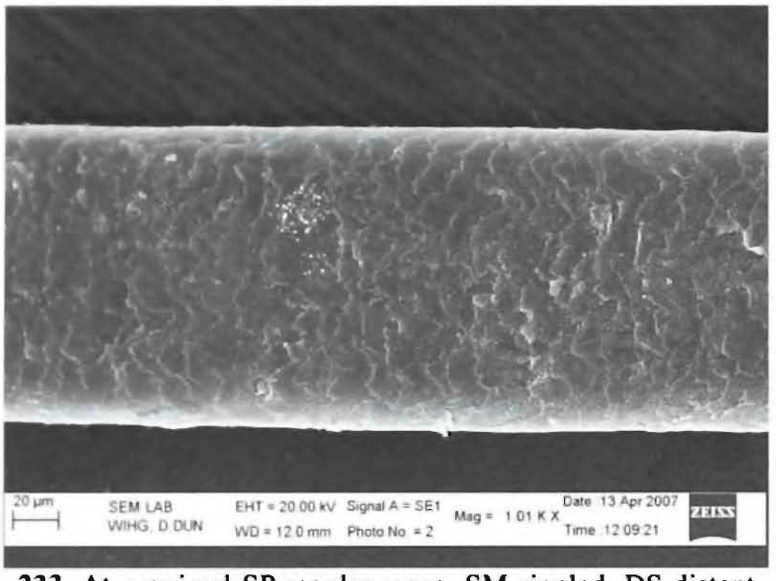
231. Cuticular at mid SP regular wave, SM rippled, DS near (at some places distant), 400x

Head

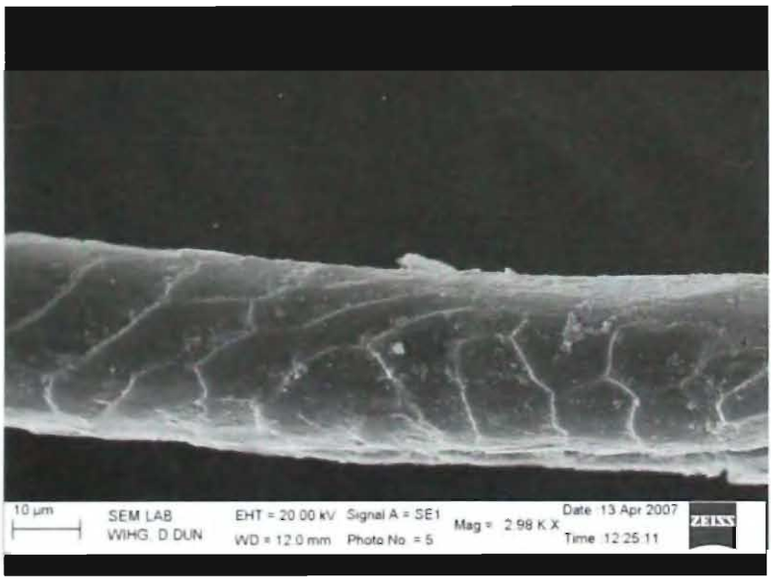
Scanning Electron Micrographs (232-234)



232. Cuticular at mid (rippled and near) at some places distant



233. At proximal SP regular wave, SM rippled, DS distant

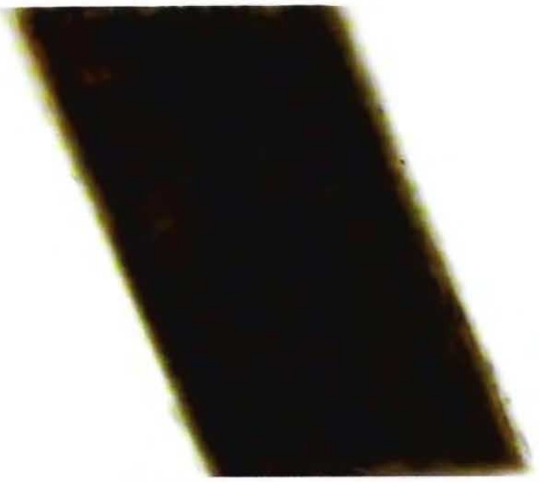


234. At distal, SP regular wave, SM smooth, DS distant

Plate 10d. ***Marmota himalayanum himalayanum*** (Hodgson)

Tail

Photomicrographs (Figs. 235-238; 400x)



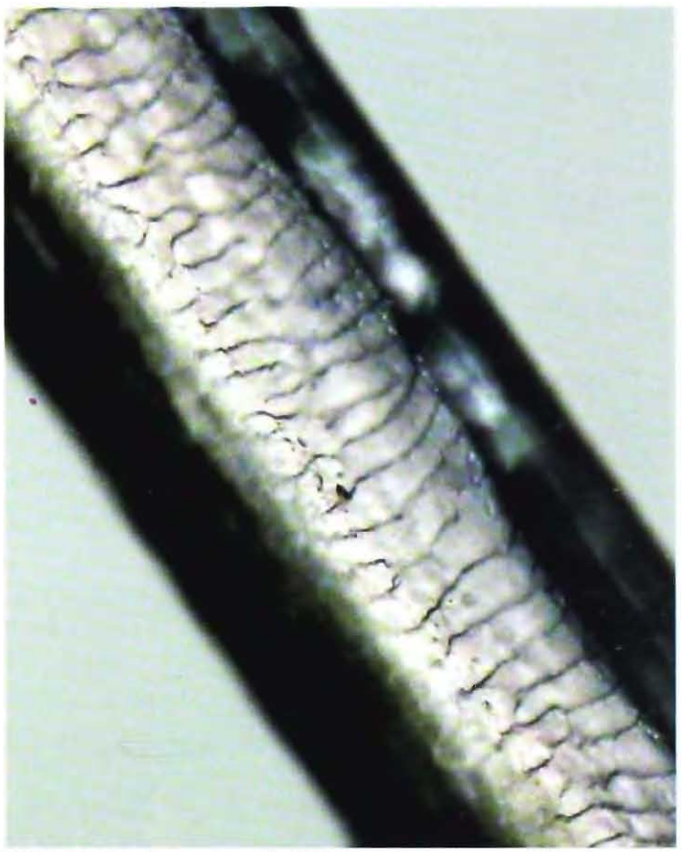
235. Medulla : wideaeriform lattice 400x



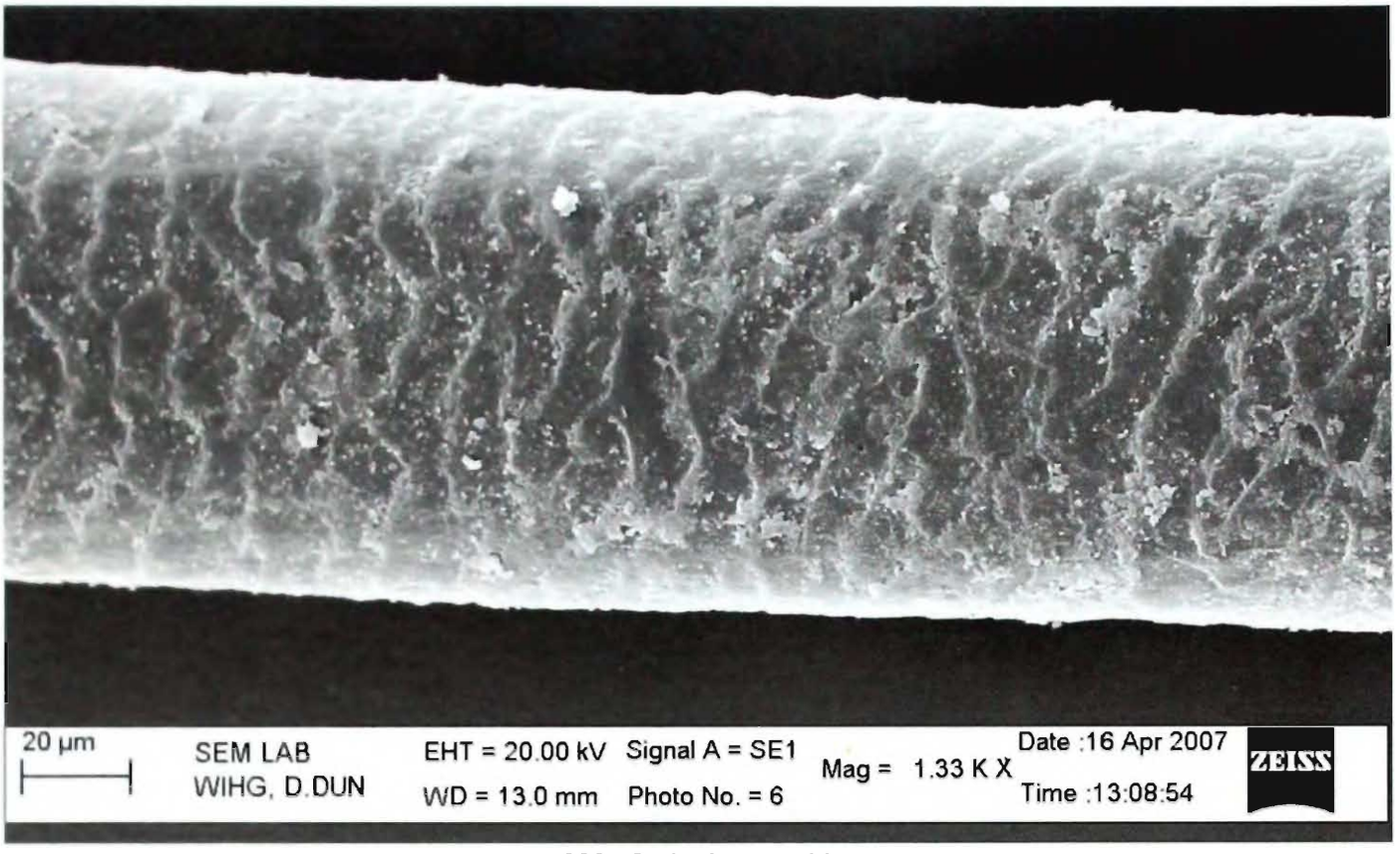
236. Cross section : oblong, large medulla 400x



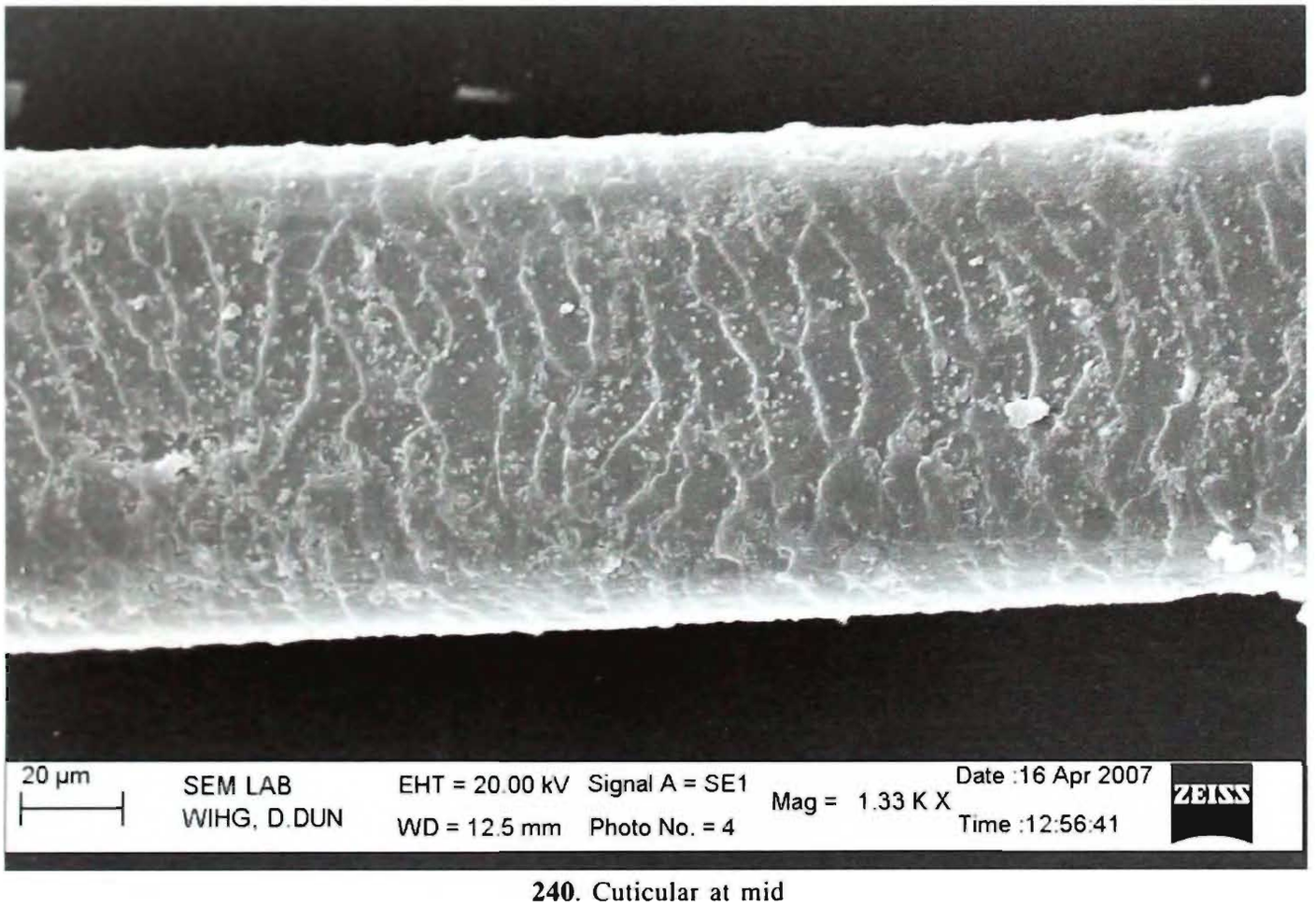
237. Cuticular at distal : SP regular wave, SM smooth, DS near 400x



238. Cuticular at mid : SP Iregular wave, SM rippled, DS near 400x



239. Cuticular at mid

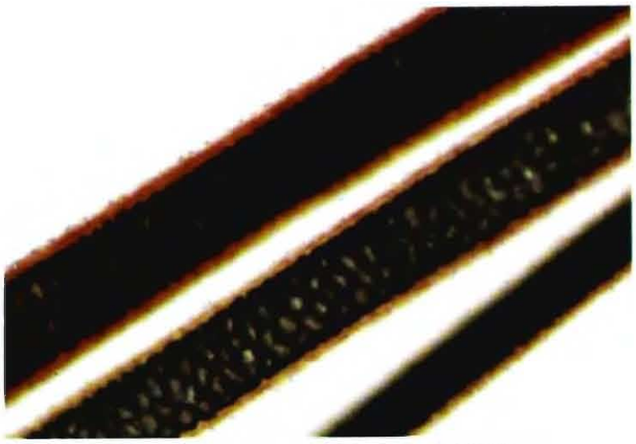


240. Cuticular at mid

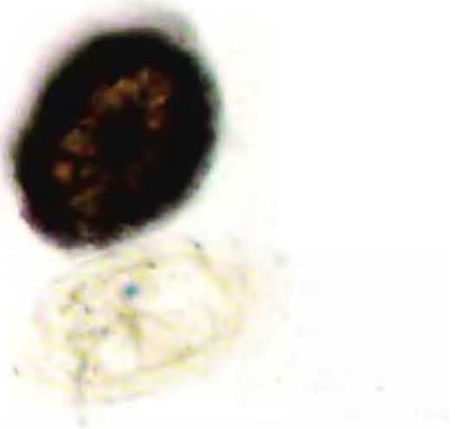
Plate 11a. ***Ratufa bicolor*** (Sparrman, 1778), Large Malaya squirrel

Photomicrographs (Figs. 241-243, 200x)

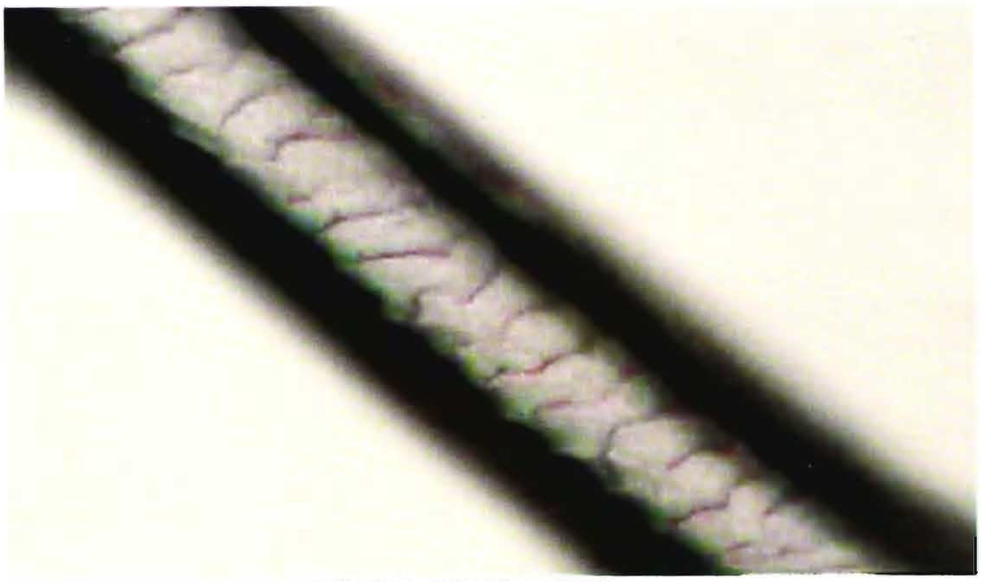
Dorsal



241. Medulla Wideaeriform lattice

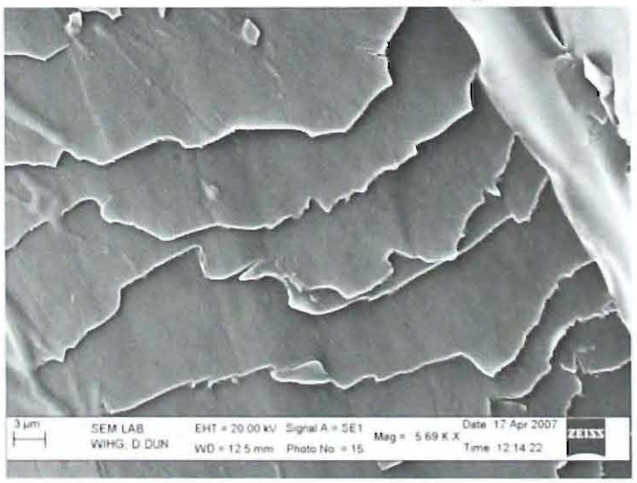


242. Cuticular at distal (SP regular wave, SM smooth, DS near)

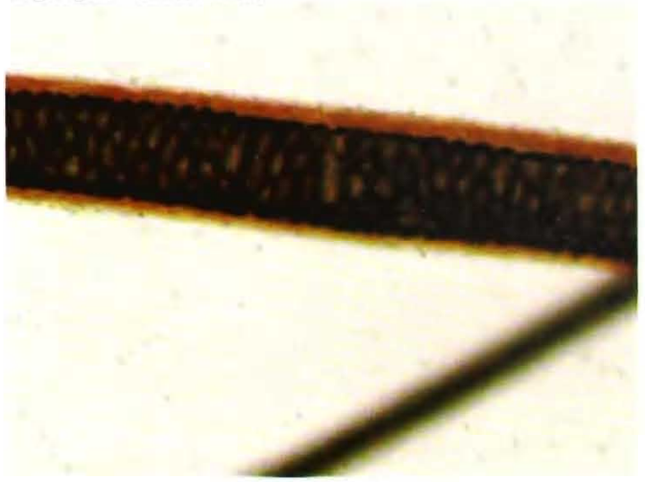


243. Cross section circular

Scanning Electron Micrographs (244, 245)



244. at mid



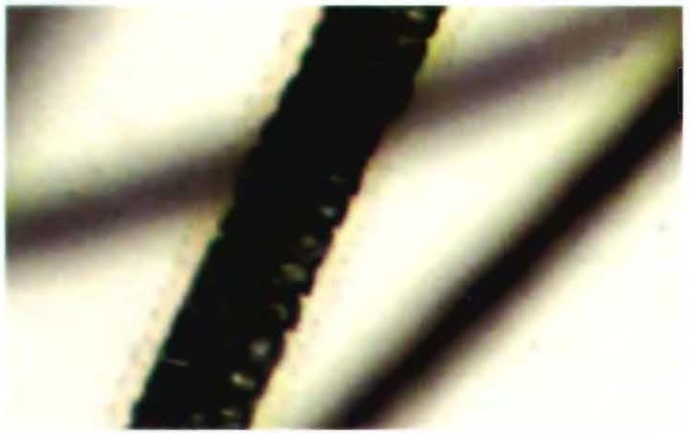
245. at mid

244, 245. Cuticular architecture at mid of hair : SP regular wave, DS : near, SM rippled

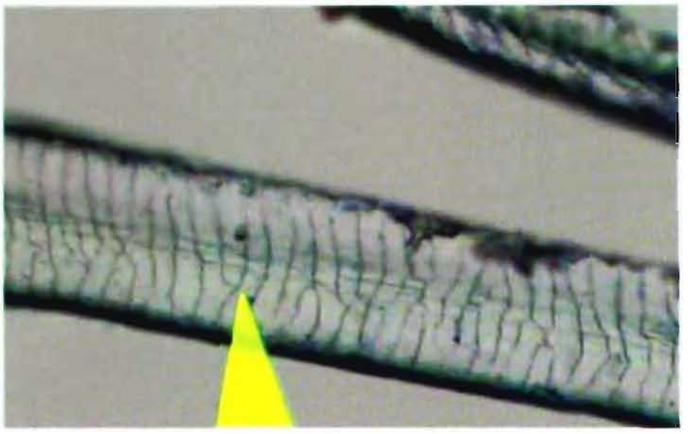
Plate 11b. ***Ratufa bicolor*** (Sparrman, 1778), Large Malaya squirrel

Ventral

Photomicrographs through compound light microscope (Figs. 246-248)



246. Medulla type Wide aeriform lattice with indentations in cortex 200x

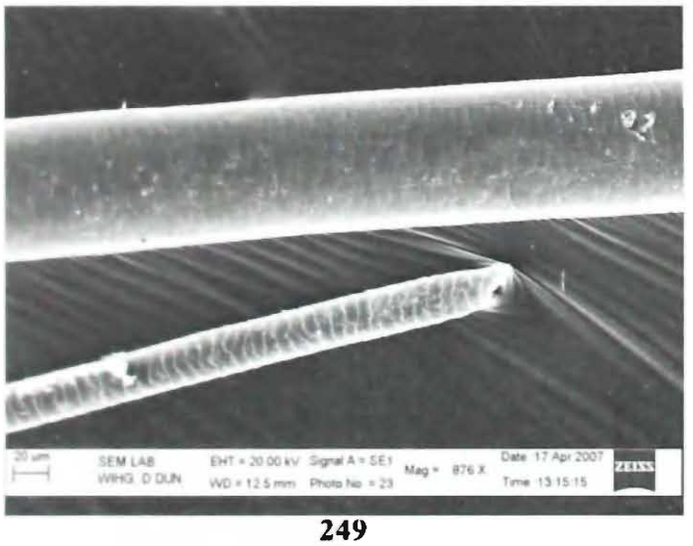


247. Cuticular pattern : SP : regular wave, DS near, SM : rippled 200x

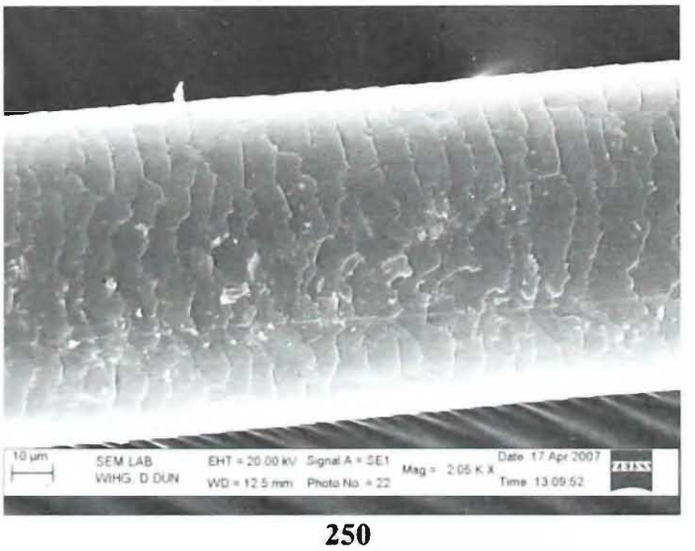


248. Cross section type : oblong with medium sized medulla 200x

Fig. 249-250. Scanning Electron Micrographs



249



250

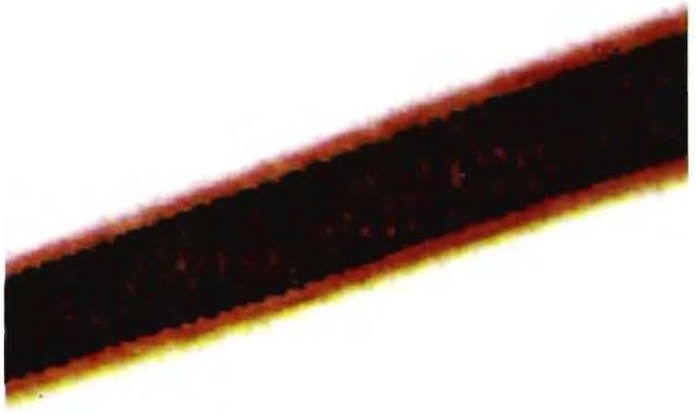
249. Cuticular pattern at mid and proximal portion SP : regular wave, DS near, SM : rippled

250. Cuticular pattern towards distal portion

Plate 11c. ***Ratufa bicolor*** (Sparrman, 1778), Large Malaya squirrel

Photomicrographs Head

Figs. 251-252. Photomicrographs hrough compound light microscope

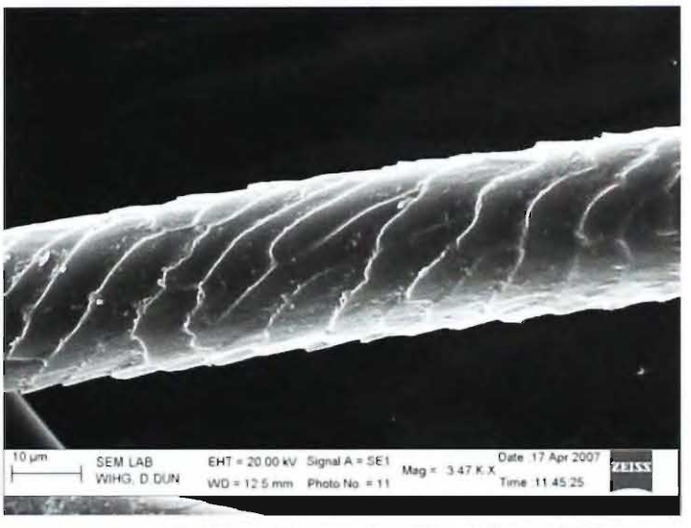


251. Medulla type : wide aeriform lattice with indentations in cortex, 200x

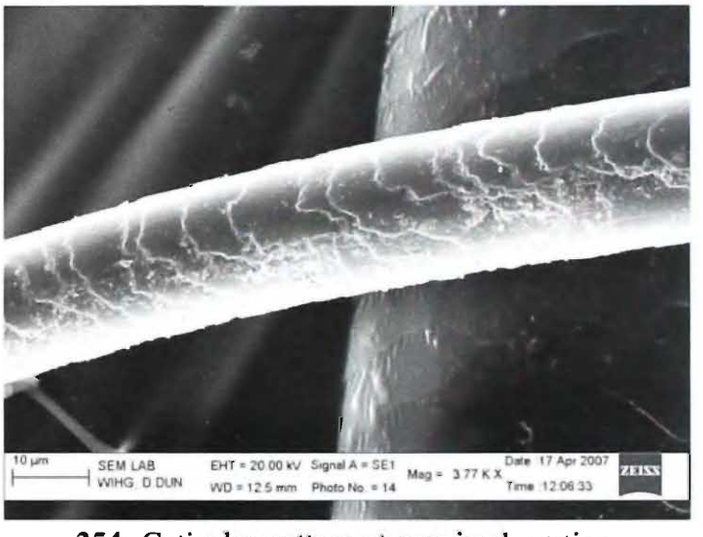


252. Cross section : oblong, large sized medulla 200z

Scanning Electron Micrographs



253. Cuticular pattern at mid of hair 200x

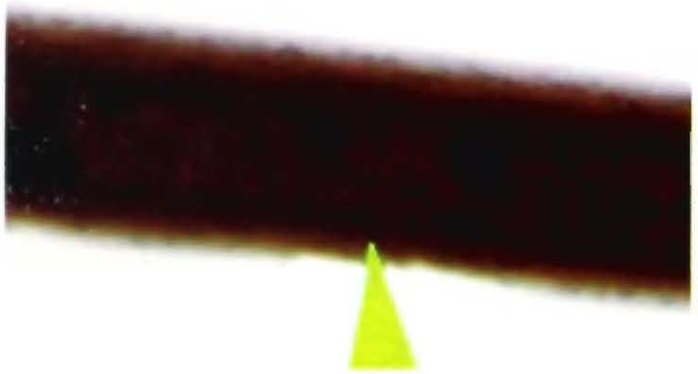


254. Cuticular pattern at proximal portion of hair, 200x

Plate 11d. ***Ratufa bicolor*** (Sparrman, 1778), Large Malaya squirrel

Photomicroraphs (Figs. 255-259)

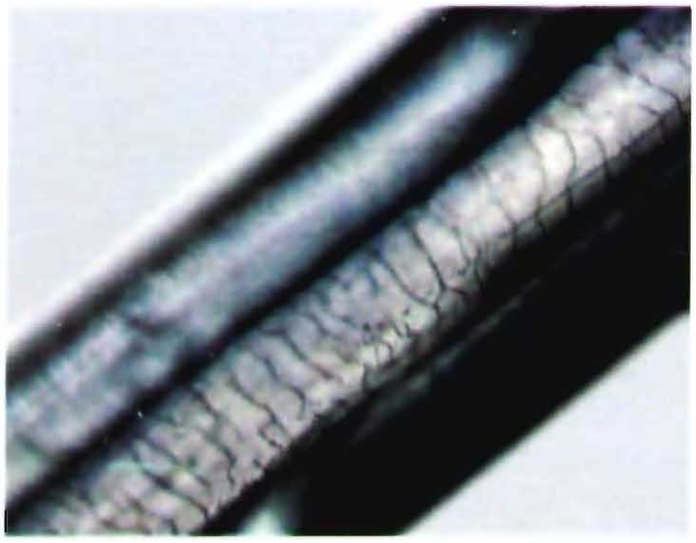
Tail



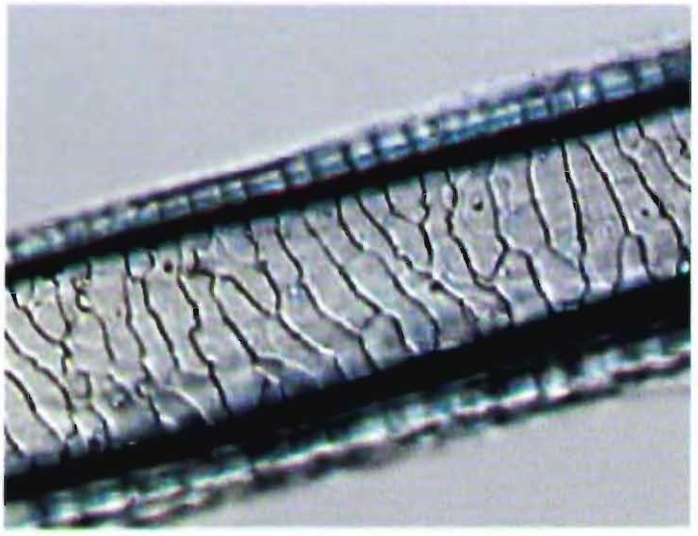
255. Medulla type : wide aeriform lattice without indentations, 200x



256. Cuticular pattern at mid SP regular wave, DS near, SM smooth 200x



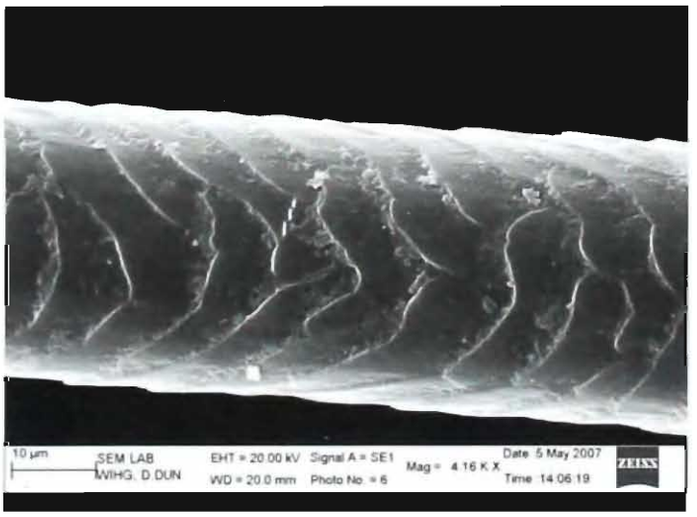
257. at proximal SP Iregular wave, DS near, SM slightly rippled 200x



258. at distal SP Iregular wave, DS near, SM smooth 200x



259. Cross section : oblong type, large medulla 200x

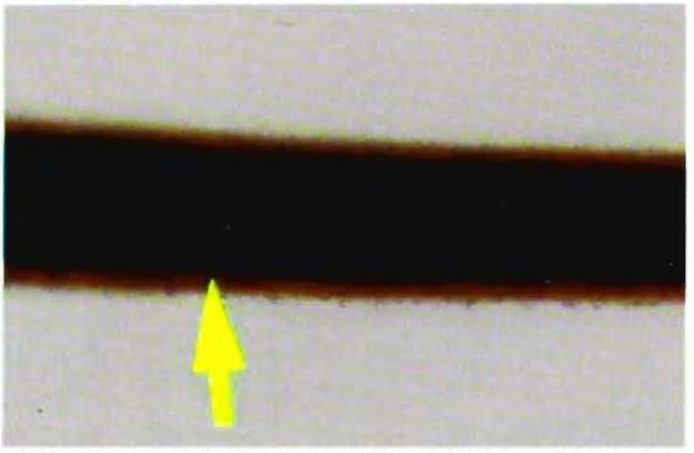


260. Scanning Electron Micrograph Cuticular pattern at mid SP Irregular wave, DS near, SM smooth (slightly rippled)

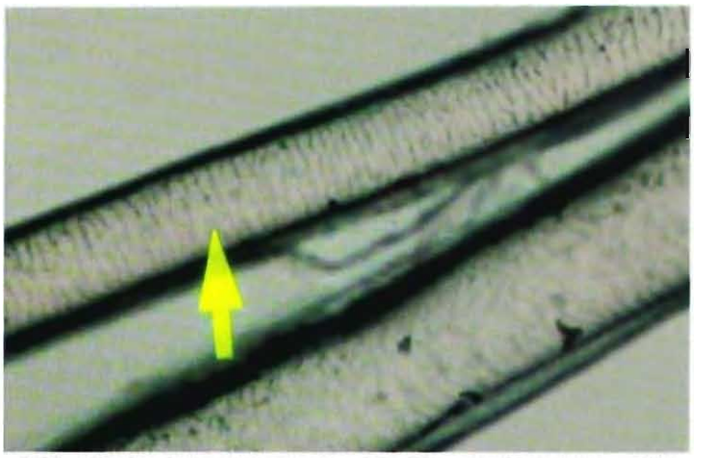
Plate 12a. ***Ratufa indica*** (Erxleben, 1777), Indian giant squirrel, Malabar squirrel

Dorsal

Figs. 261-265. Photomicrographs through compound light microscope



261. Medulla type wide aeriform lattice with slight indentations (highly pigmented) 200x

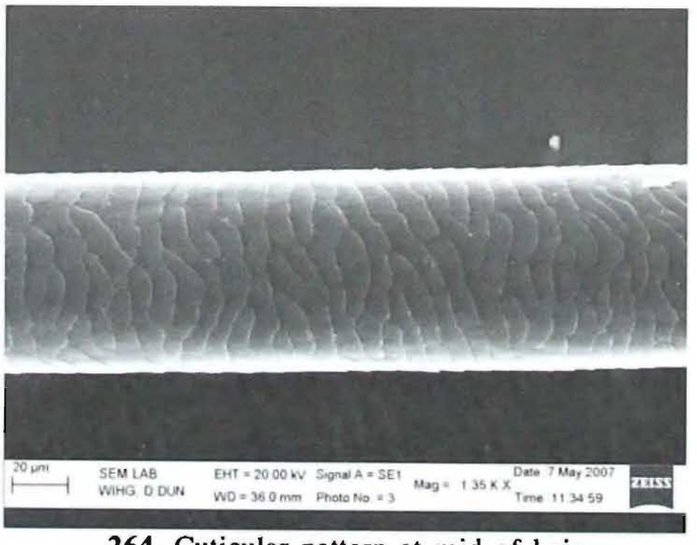


262. Cuticular pattern at mid, SP regular wave, SM rippled and DS close 200x

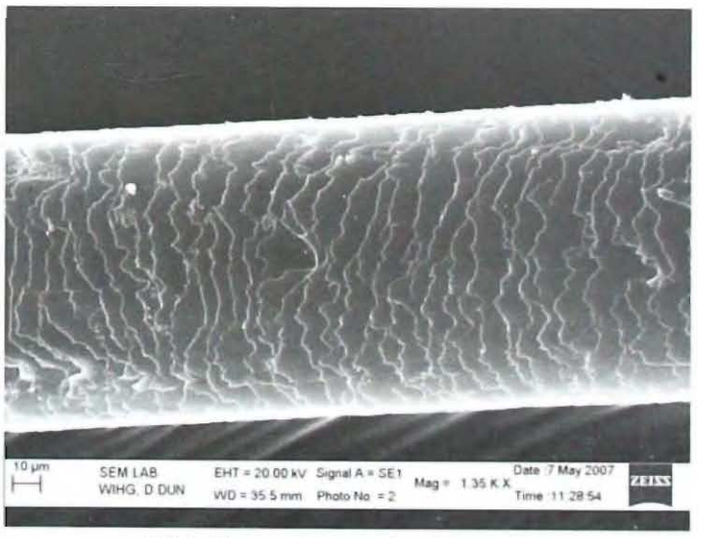


263. Cross section : oblong 200x

Figs. 264–265. Scanning Electron Micrographs



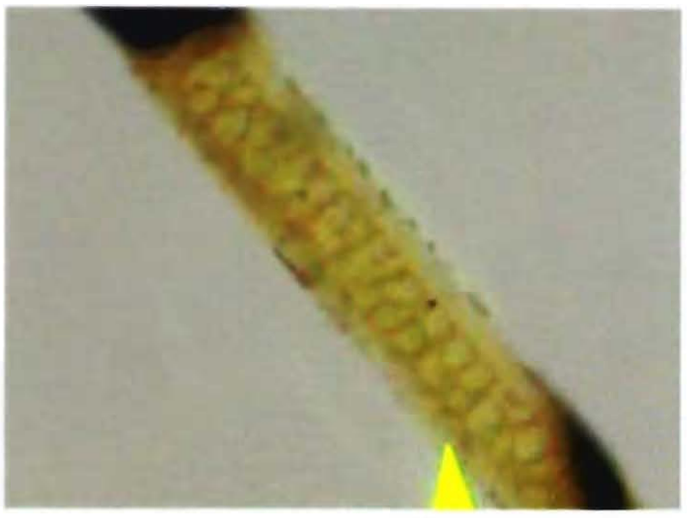
264. Cuticular pattern at mid of hair



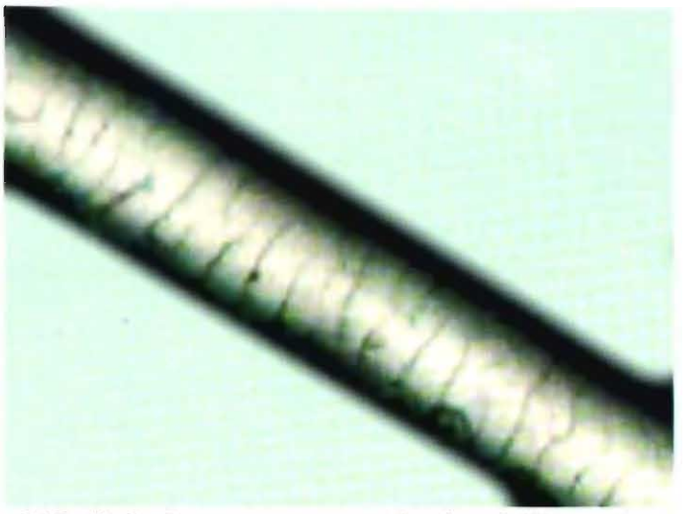
265. Towards proximal portion

Ventral

Figs. 266-270. Photomicrographs through compound light microscope



266. Medulla type : wide aeriform lattice 200x

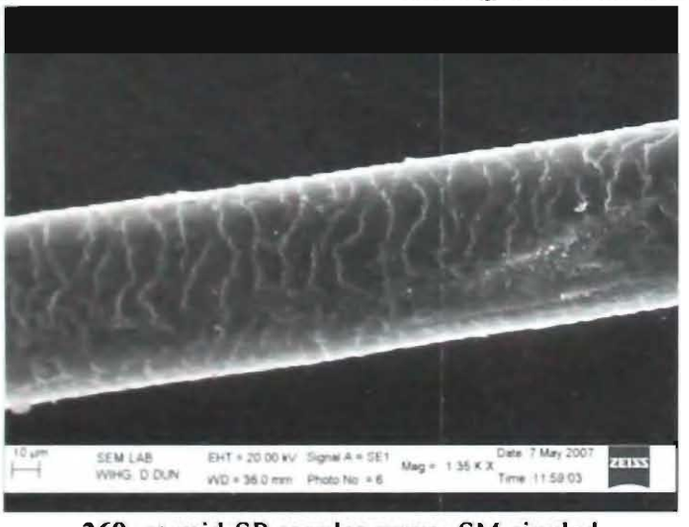


267. Cuticular pattern at proximal end SP regular wave, SM rippled and DS near 200x

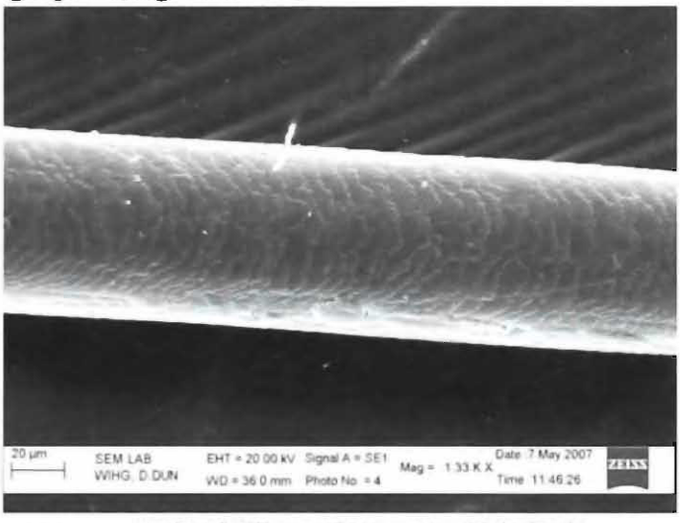


268. Cross section : oblong, medium sized medulla 200x

Scanning Electron Micrographs (Fig. 269-270)



269. at mid SP regular wave, SM rippled and DS near

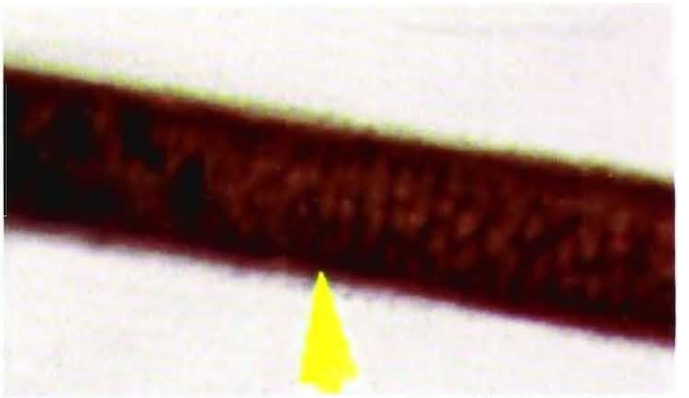


270. at proximal SP regular wave, SM rippled and DS near

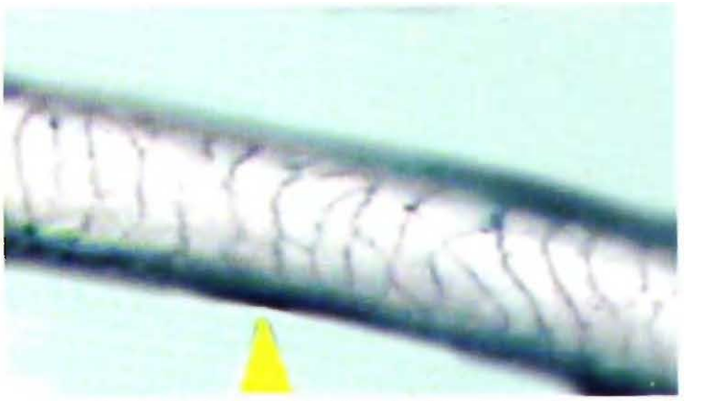
Plate 12c. ***Ratufa indica*** (Erxleben, 1777), Indian giant squirrel, Malabar squirrel

Head

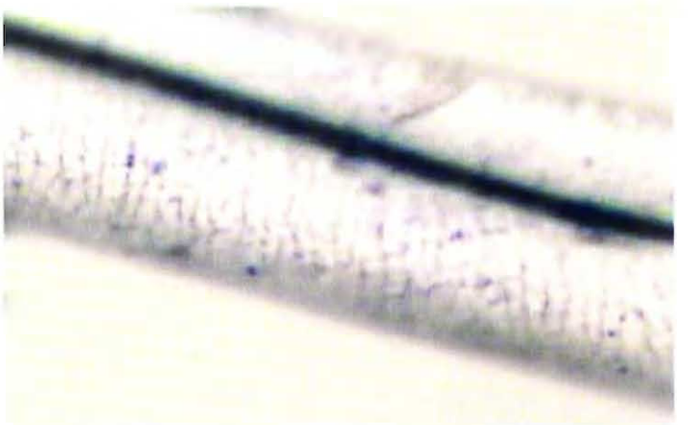
Figs. 271-275. Photomicrographs through compound light microscope



271. Medulla type : wide aeriform lattice 200x



272. Cuticular pattern at distal portion (transitional type) x200

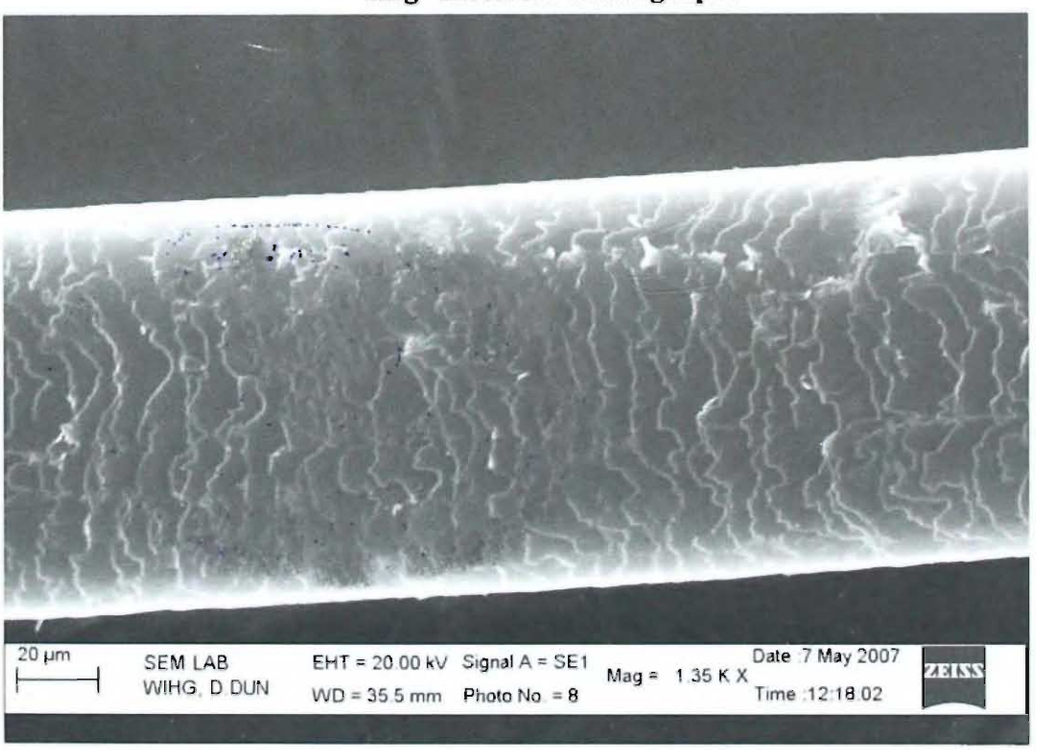


273. Cuticular pattern at mid of hair 200x



274. cross section oblong, large sized medulla 200x

Scanning Electron Micrographs

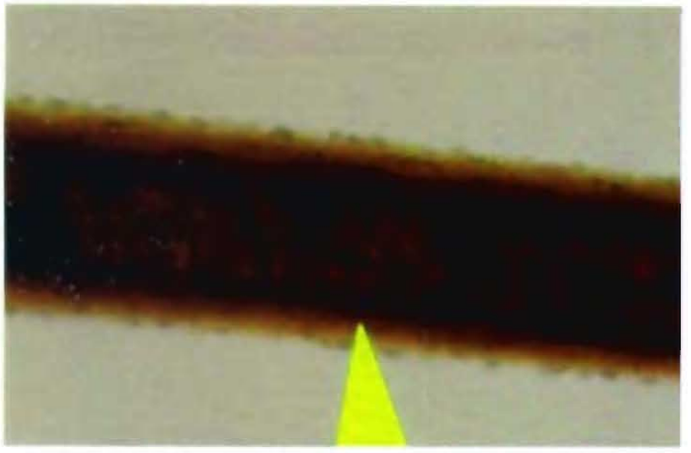


275. Cuticular pattern at mid of hair : SP regular wave, SM rippled and DS near

Plate 12d. ***Ratufa indica*** **(Erxleben, 1777), Indian giant squirrel, Malabar squirrel**

Tail

Figs. 276-277. Photomicrographs

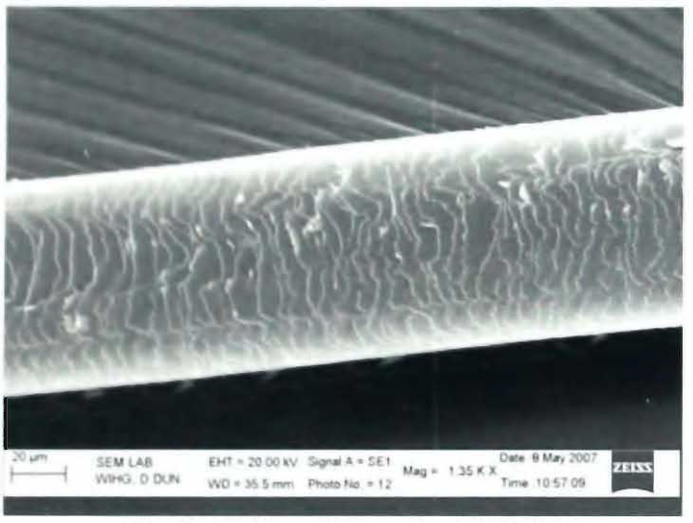


276. Medulla type wide aeriform lattice 200x

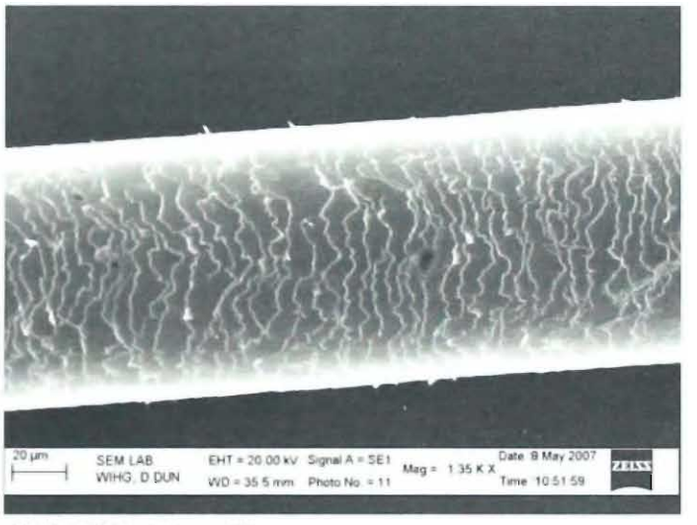


277. Cross section : oblong 200x

Scanning Electron Micrographs



278. Cuticular pattern at mid of hair

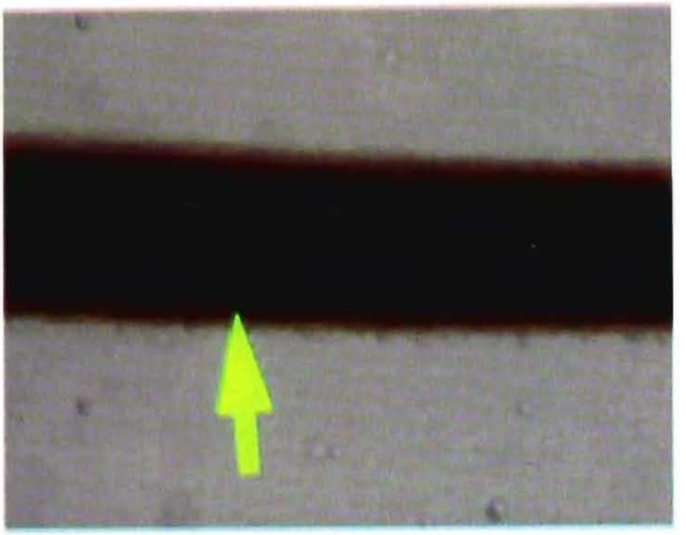


279. Cuticular pattern at mid, 42 towards proximal

Plate 13a. ***Ratufa macroura*** (Pennant 1769), Grizzled Indian Giant squirrel

Dorsal

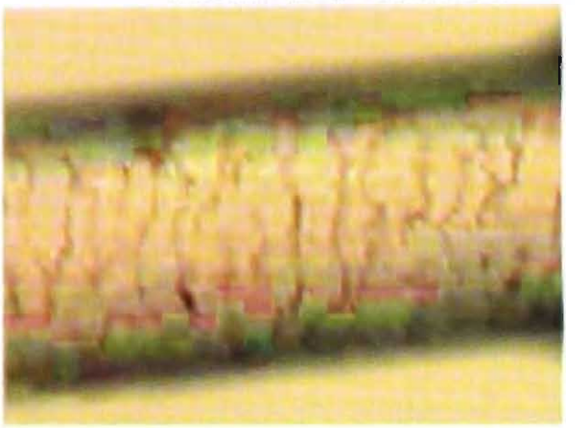
Photomicrographs (Figs. 280-283)



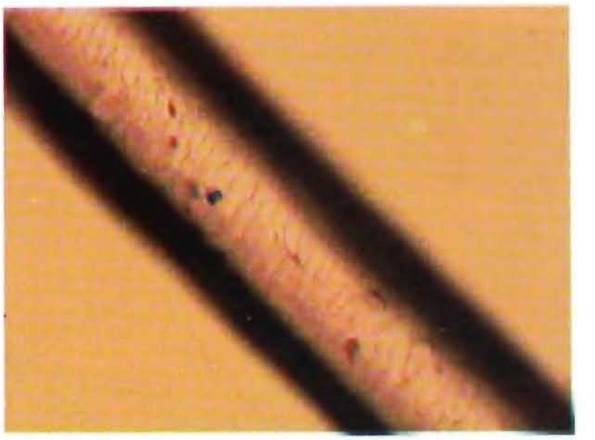
280. Medulla type wide aeriform lattice, with indentations in cortex 200



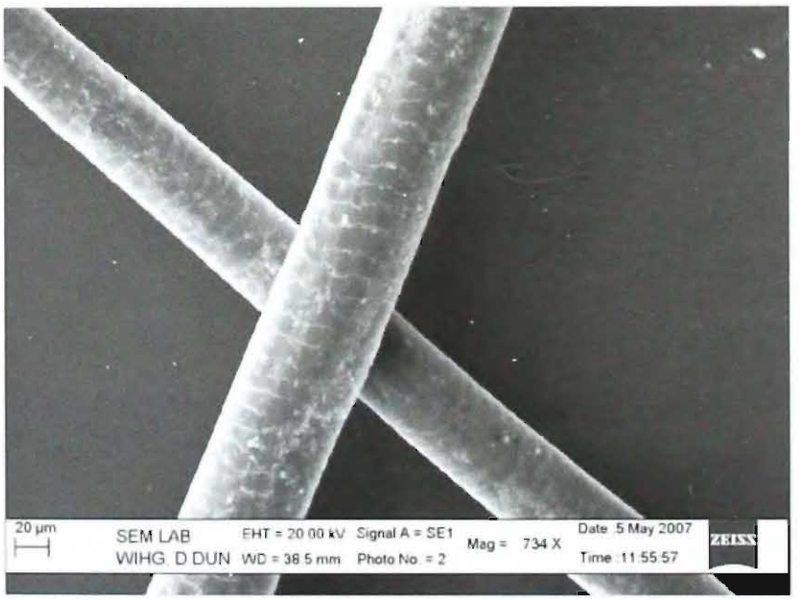
281. Cross section : oblong, large medulla 200x



282. Cuticular pattern at proximal DS near 200x



283. at mid SP regular wave, SM rippled

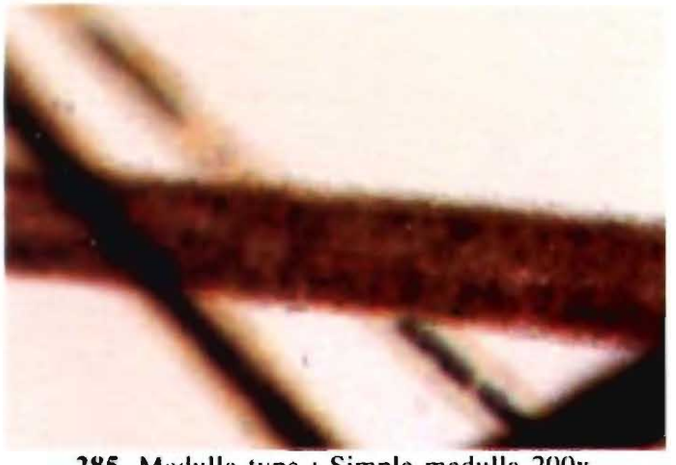


284. Scanning Electron Micrograph at mid

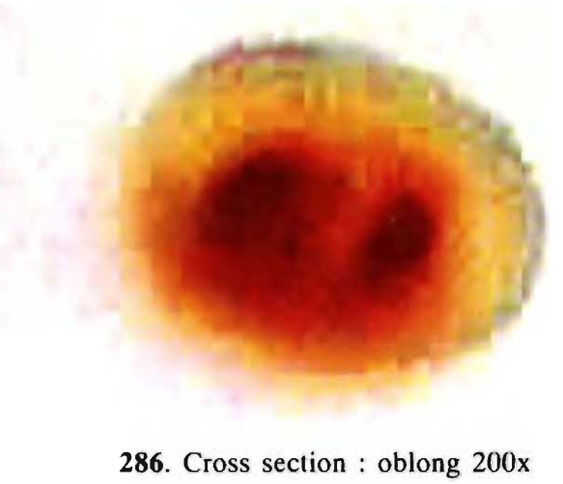
Plate 13b. ***Ratufa macroura*** (Pennant 1769), Grizzled Indian Giant squirrel

Ventral

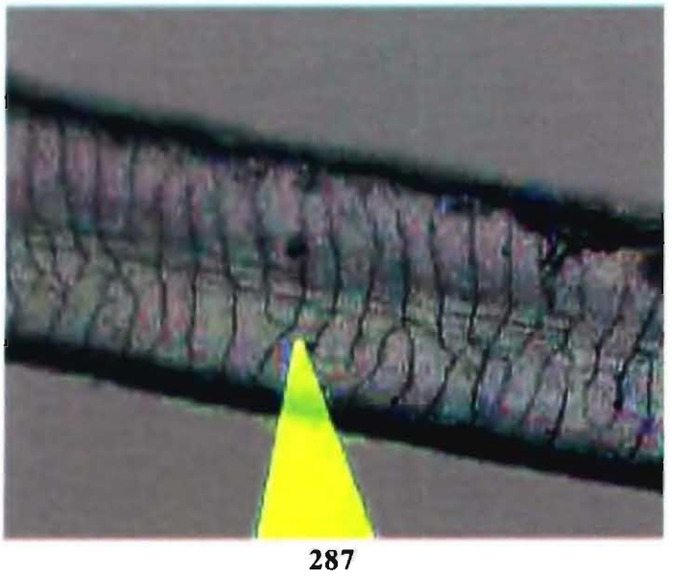
Figs. 285-289. Photomicrographs through compound light microscope



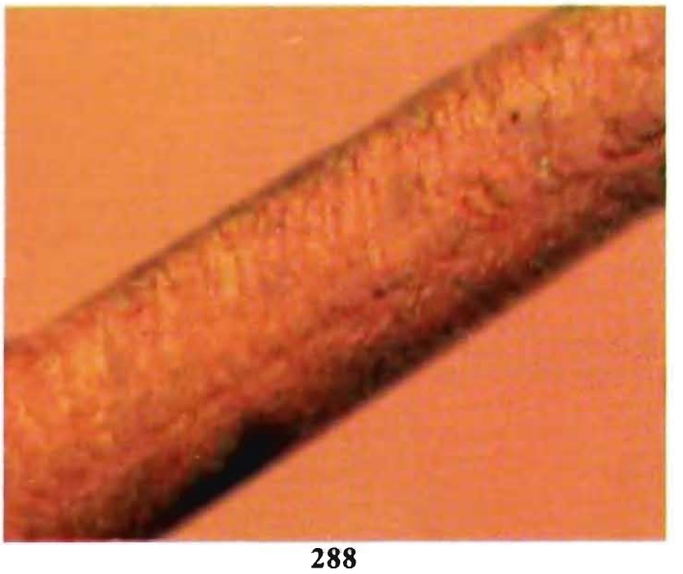
285. Medulla type : Simple medulla 200x



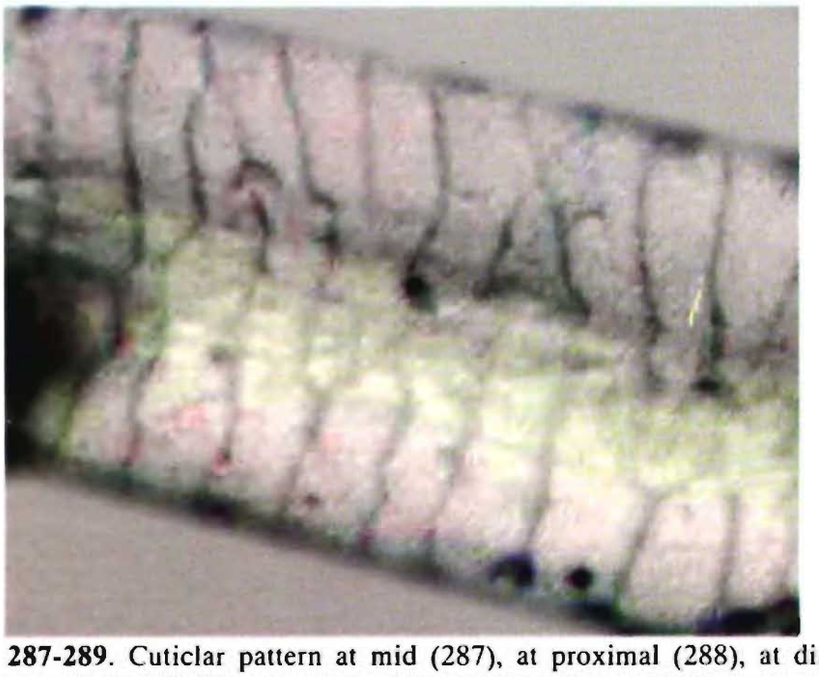
286. Cross section : oblong 200x



287



288



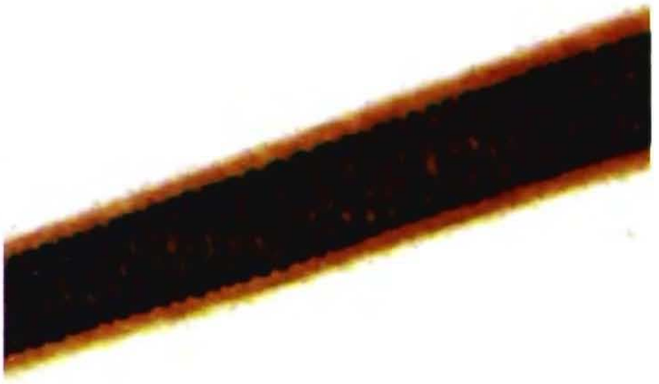
289

Fig. 287-289. Cuticlar pattern at mid (287), at proximal (288), at distal (289) : SP regular wave, SM rippled, DS near 200x.

Plate 13c. *Ratufa macroura* (Pennant 1769), Grizzled Indian Giant squirrel

Head

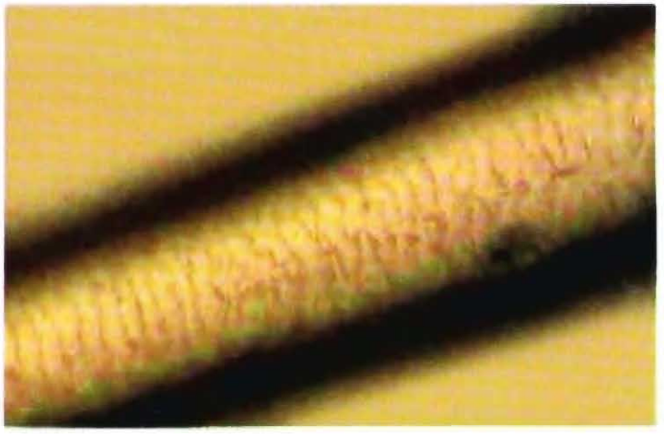
Figs. 290-294. Photomicrographs through compound light microscope



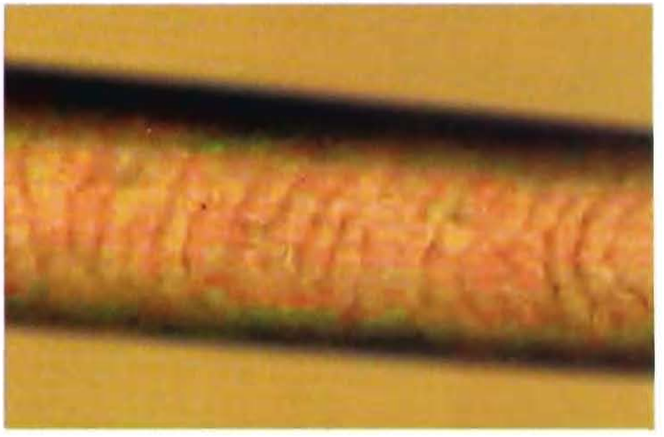
290



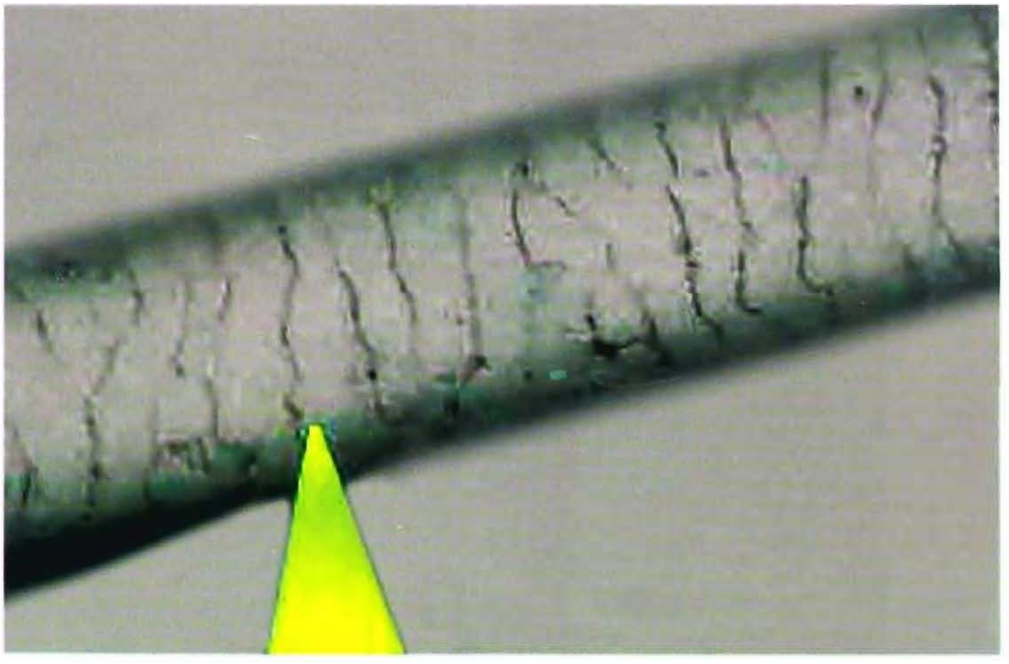
291



292



293



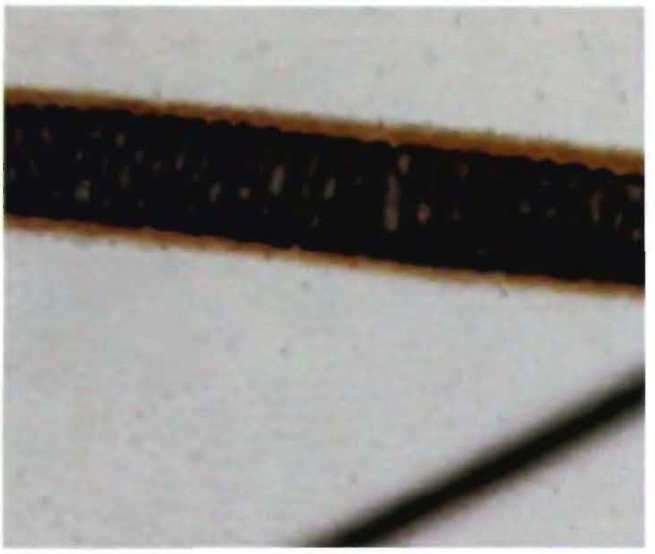
294

Fig. 290. Medulla type : Wide aeriform lattice, with indentations (200x)

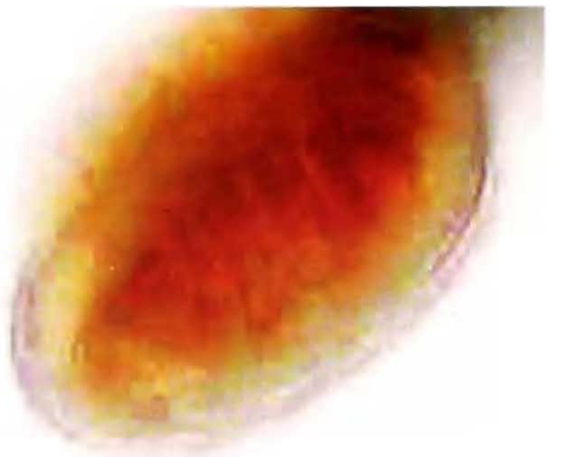
Fig. 291. Cross section :oblong (200x)

Fig. 292-294. Cuticular architecture : distal (Fig. 292) SP Irregular wave, SM smooth, DS near, proximal (Fig. 293) SP transitional type, SM smooth (slightly rippled) DS near and mid (Fig. 294) SP Irregular wave, SM rippled, DS near 200.x

Tail



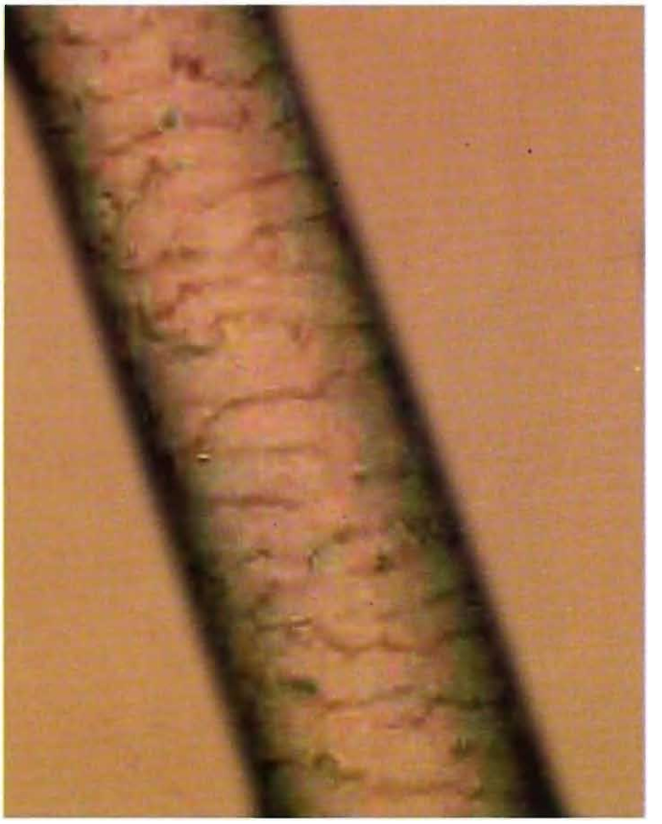
295



296



297



298

Figs. 295-298. Photomicrographs through compound light microscope
Fig. 295. Medulla type : wide aeriform lattice with indentations (200x)
Fig. 296. Cross section : oblong, large sized medulla 200x
Fig. 297-298. Cuticular pattern at mid (Fig. 297) SP regular wave, SM rippled, DS near (200x), at distal (Fig. 298) SP regular wave, SM rippled, DS near (200x)

Plate 14a. ***Tamiops macclellandi*** (Horsfield, 1840), Himalayan stripped squirrel

Photomicrographs

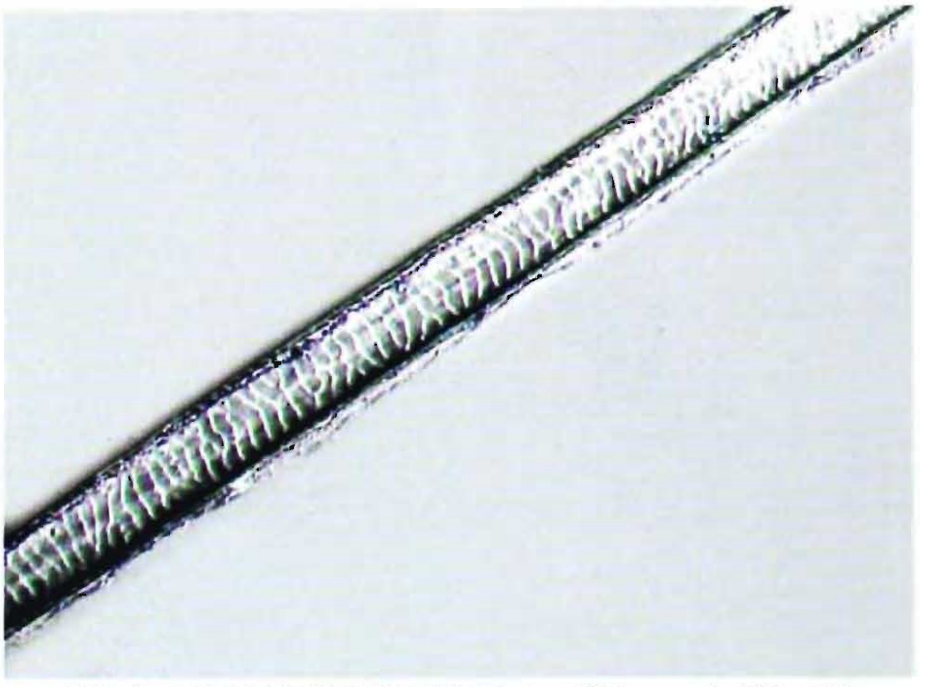
Dorsal



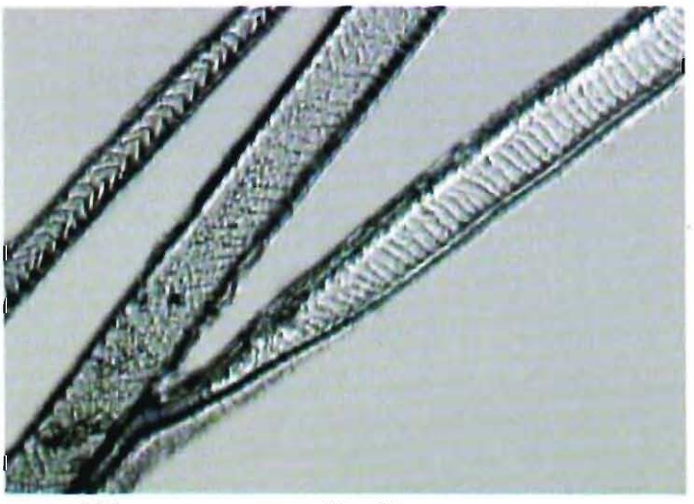
299. Medulla : Multiserial



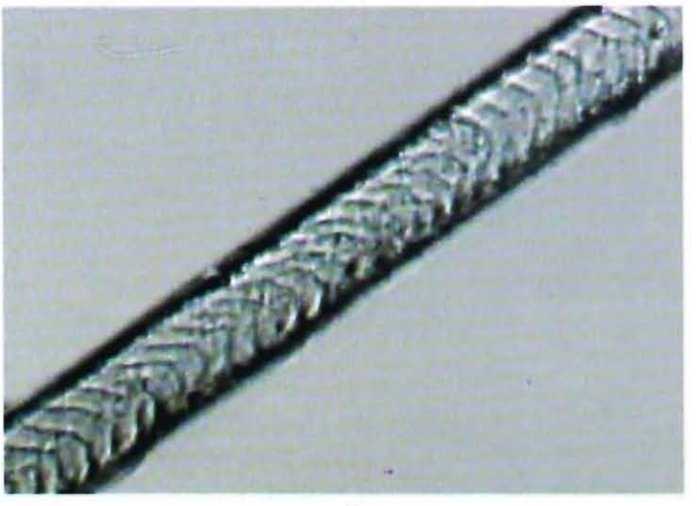
300. Cross section : oblong



301. Cuticular at mid (SP regular wave, SM smooth, DS near)



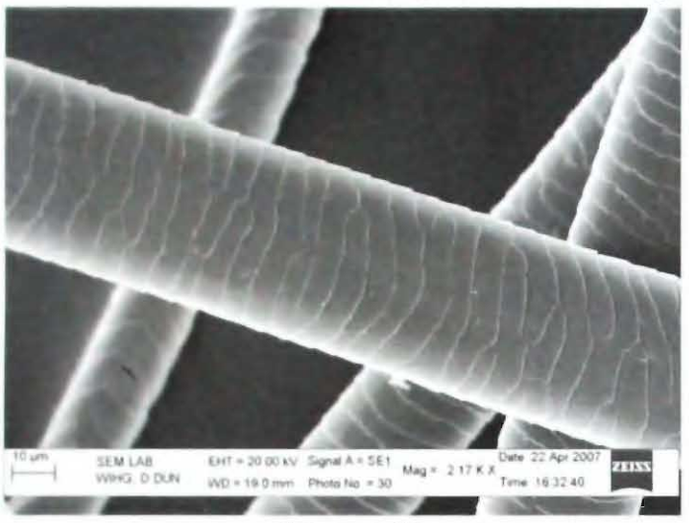
302. Cuticular at mid, distal and proximal



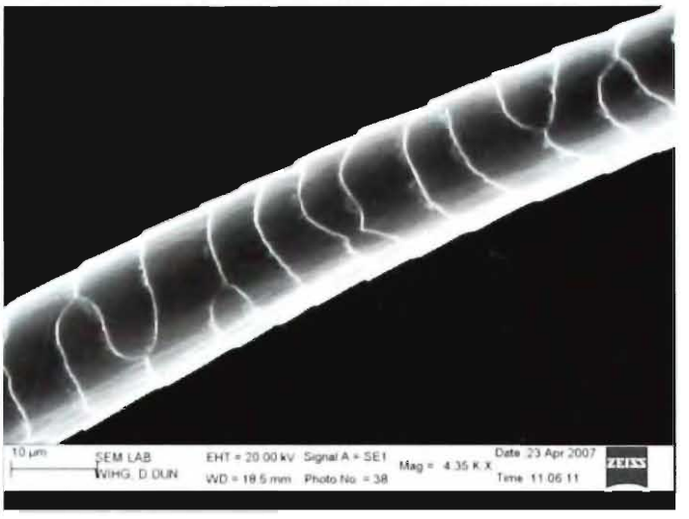
303. Cuticular at mid

Dorsal

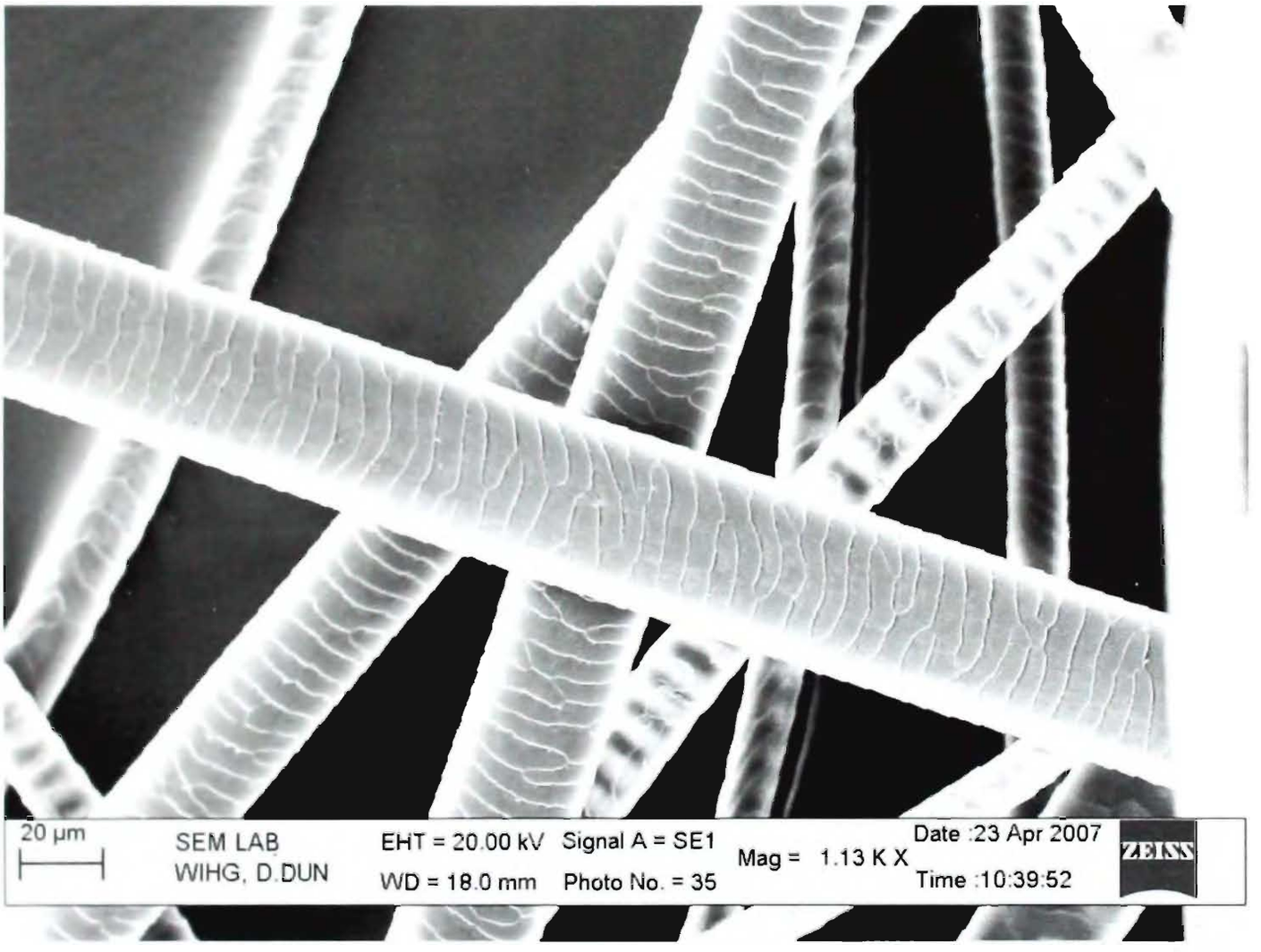
Scanning Electron Micrographs (Cubicula architectures)



304. At mid

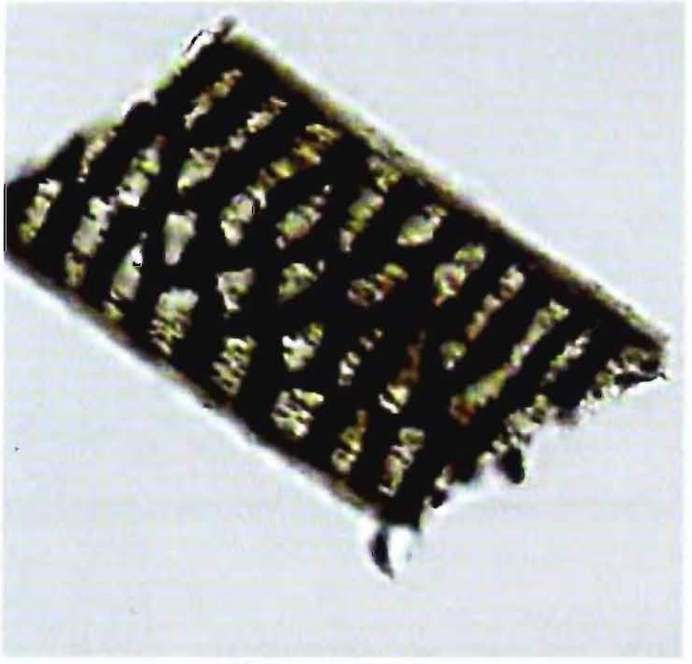


305. At distal



306. Hair at mid, proximal and distal

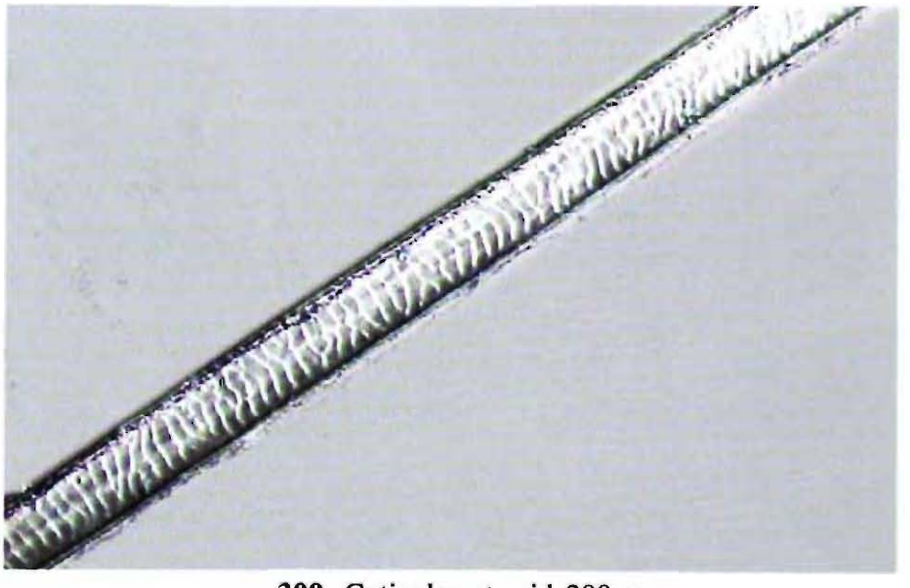
Plate 14b. ***Tamiops macclellandi*** (Horsfield, 1840), Himalayan stripped squirrel
Ventral
Photomicrographs (Figs. 307-325)



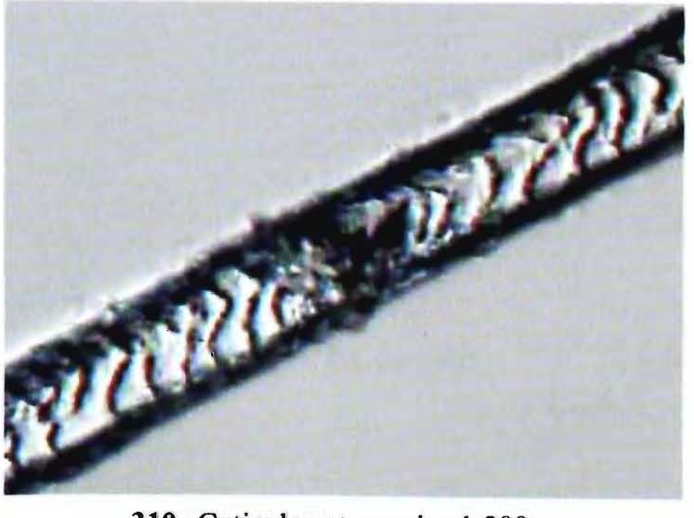
307. Medulla 400 x



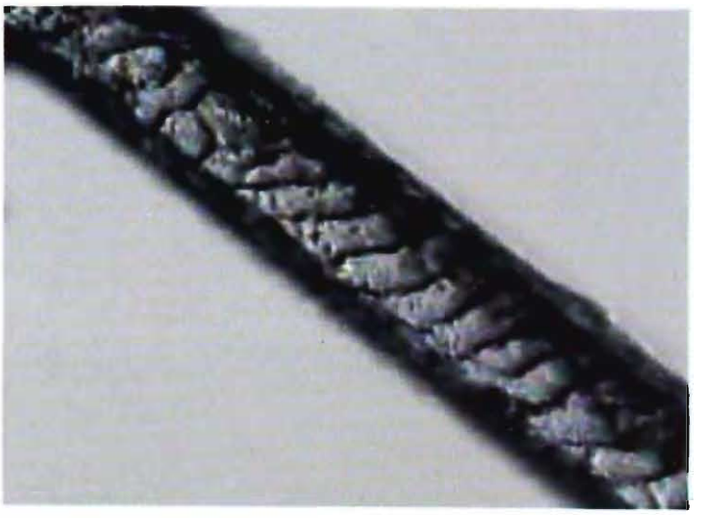
308. Cross ection (dumbled with divided medulla) 400 x



309. Cuticular at mid 200 x



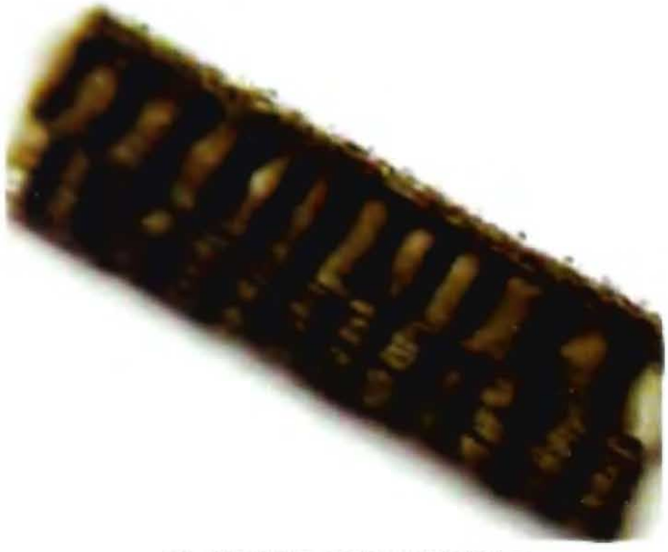
310. Cuticular at proximal 200 x



311. Cuticular at distal 200 x

Head

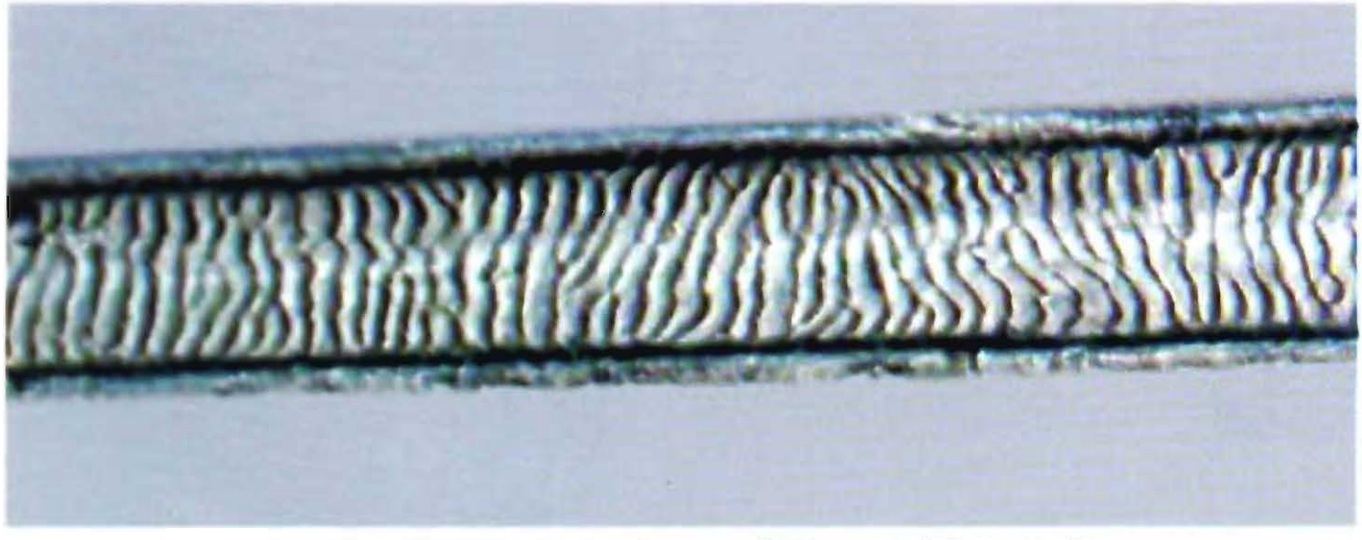
Photomicrographs (Figs. 312-316)



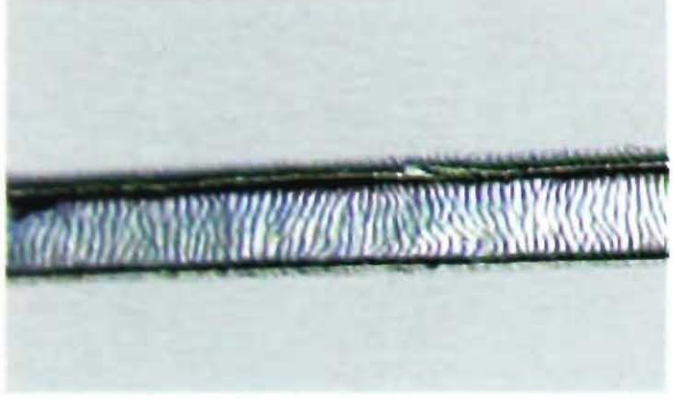
312. Medulla multiserial 400x



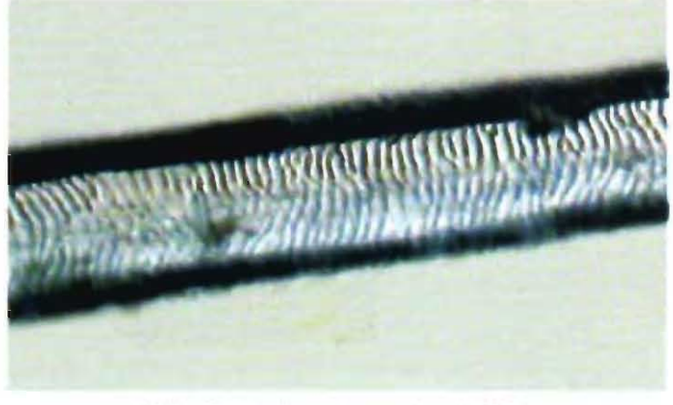
313. Cross section oblong 400x



314. Cuticular at mid (SP regular wave, SM smooth, DS close) 200x



315. Cuticular at distal 200x

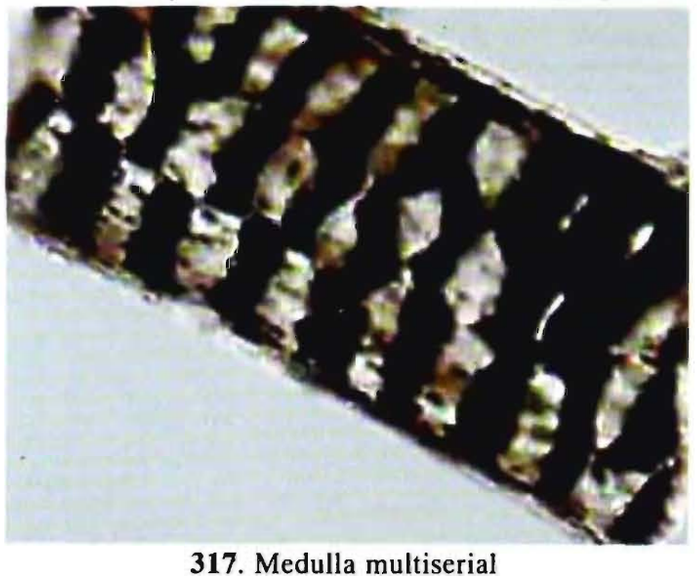


316. Cuticular at proximal 200x

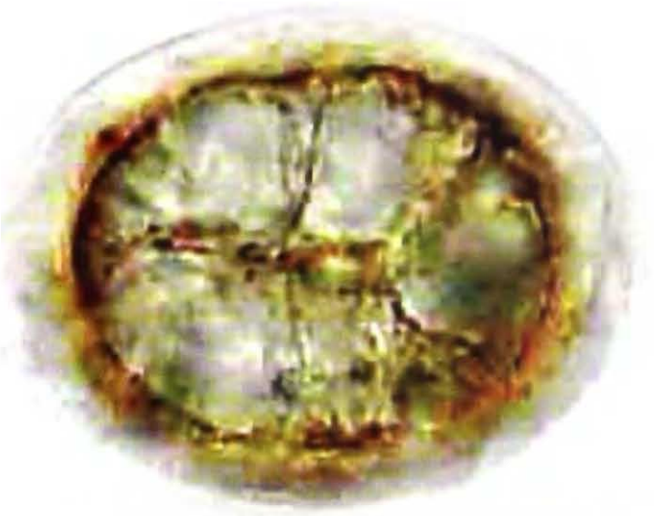
Plate 14d. ***Tamiops macclellandi*** (Horsfield, 1840), Himalayan stripped squirrel

Tail

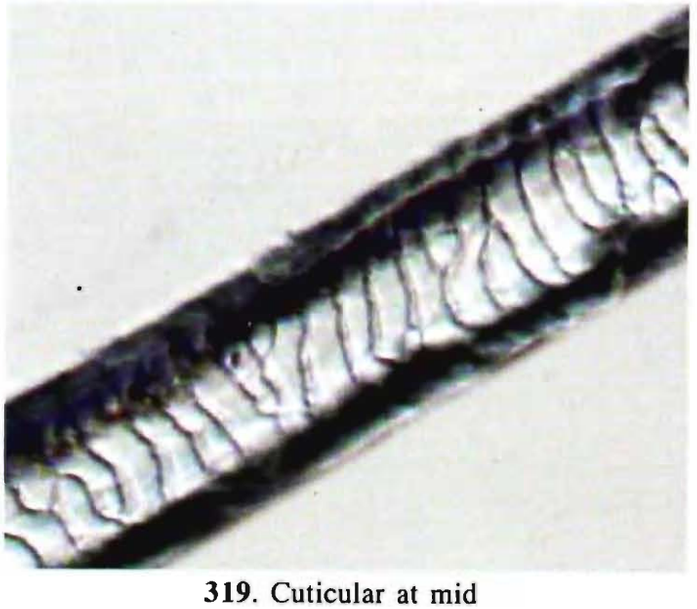
Photomicrographs (Figs. 317-321, mag 400x)



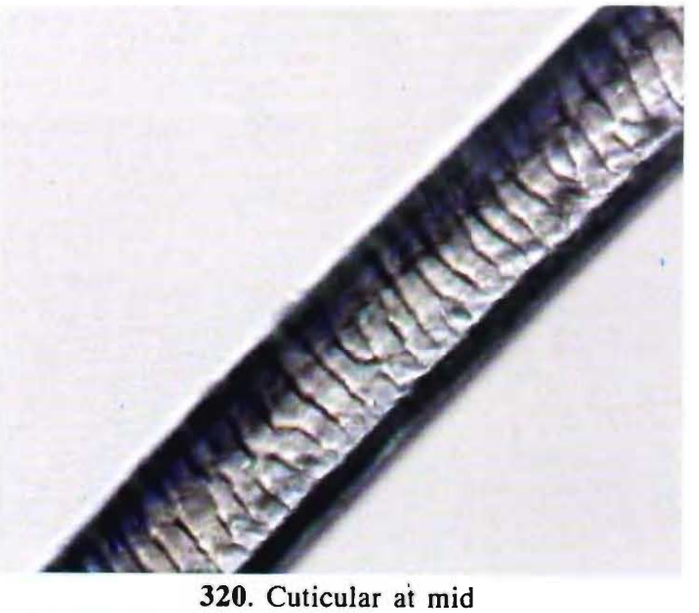
317. Medulla multiserial



318. Cross ection Circular with large size medulla



319. Cuticular at mid



320. Cuticular at mid



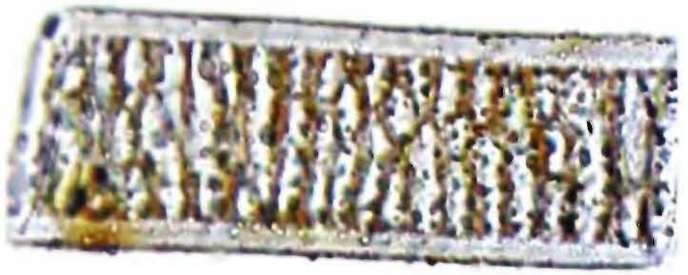
321. Cuticular at distal

Figs. 319-321. SP regular wave, SM smooth, DS near

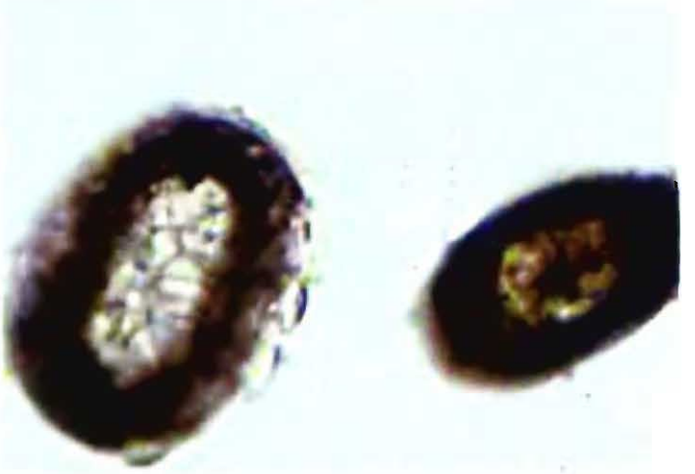
Plate 15a. ***Belomys pearsonii*** (Gray, 1842), Hairy footed flying squirrel

Dorsal

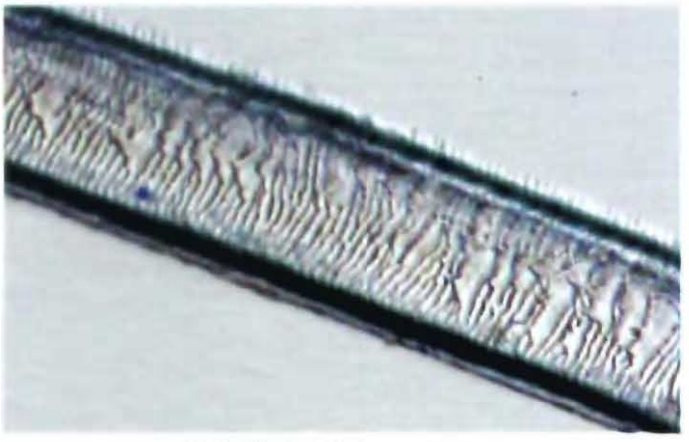
Photomicrographs (Figs. 322-326, mag 200x)



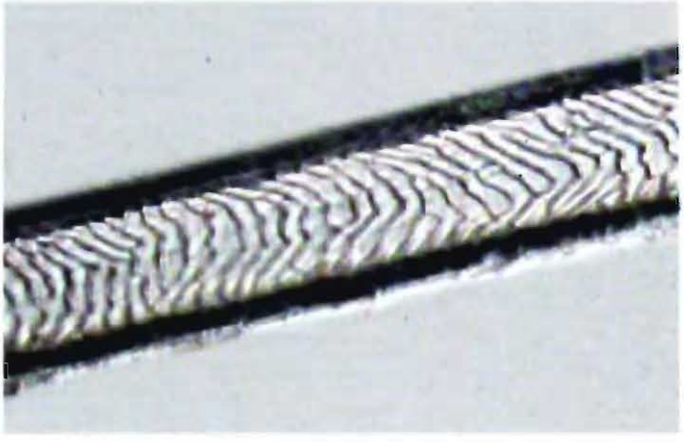
322. Medulla mutiserial



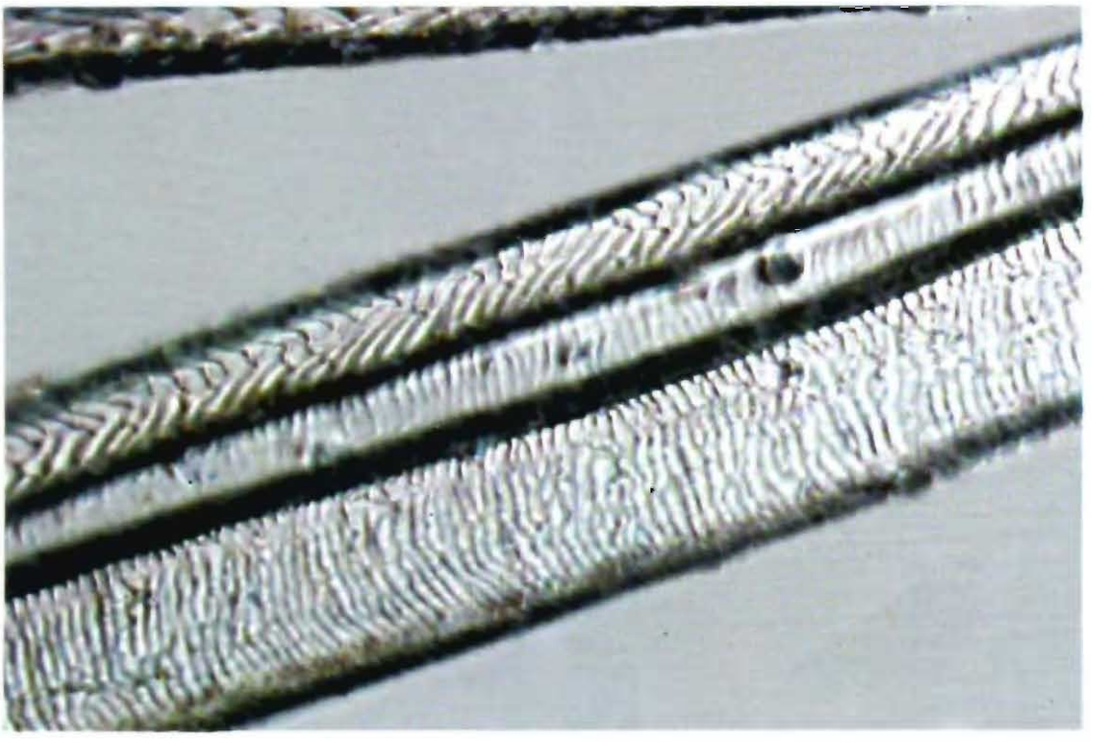
323. Cross section oblong (divided medulla)



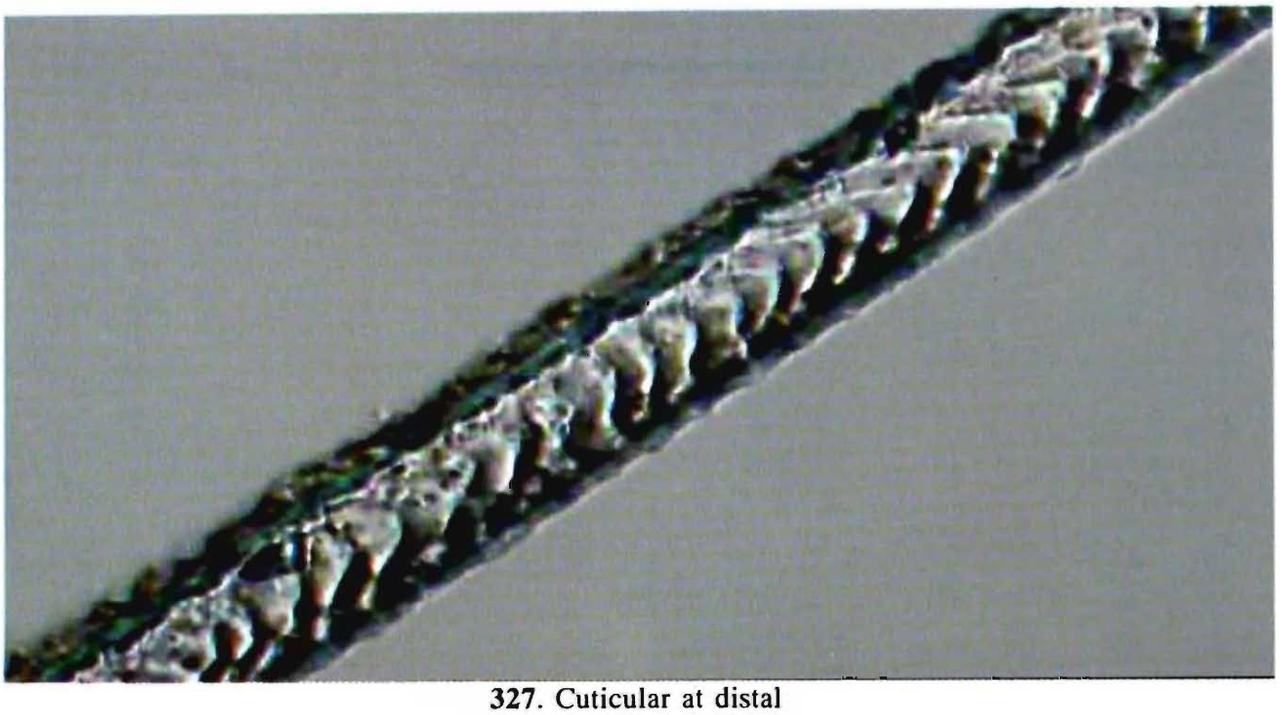
324. Cuticular (DS close)



325. Cuticular at distal (SP single chevron)

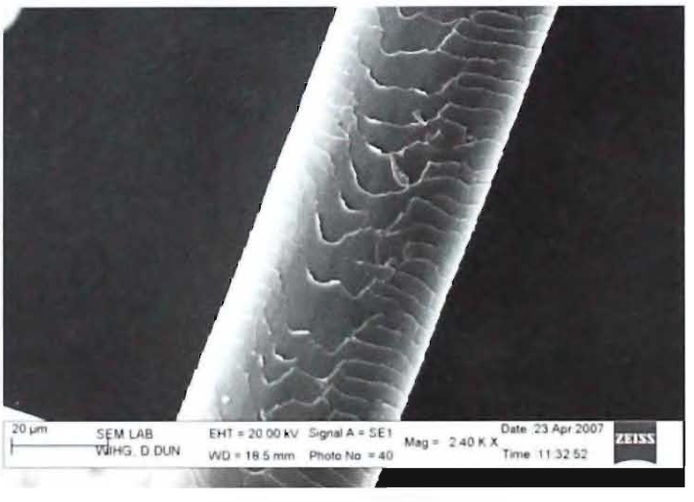


326. Cuticular at different regions of hair

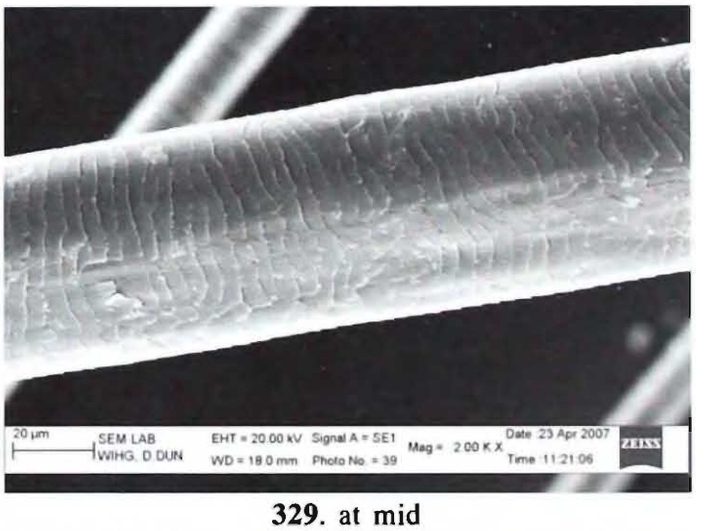


327. Cuticular at distal

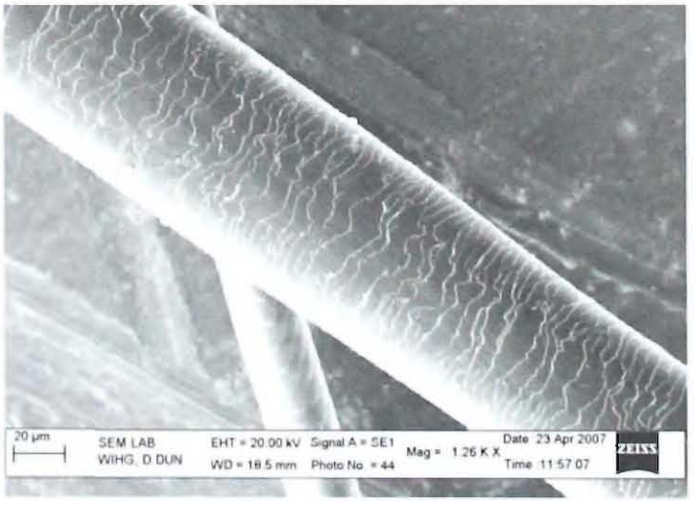
Dorsal
Scanning Electron Micrographs
(Cuticular architecture)



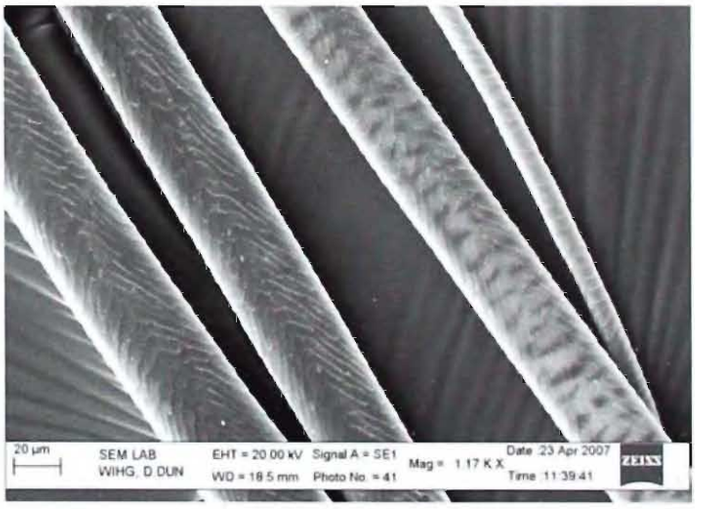
328. at mid



329. at mid



330. towards proximal

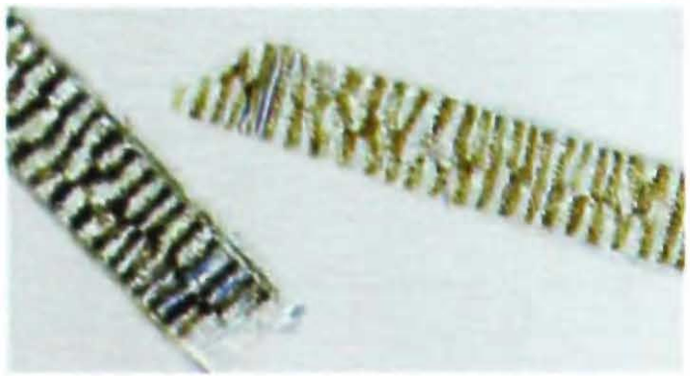


331. towards distal

Plate 15b. ***Belomys pearsonii*** (Gray, 1842), Hairy footed flying squirrel

Ventral

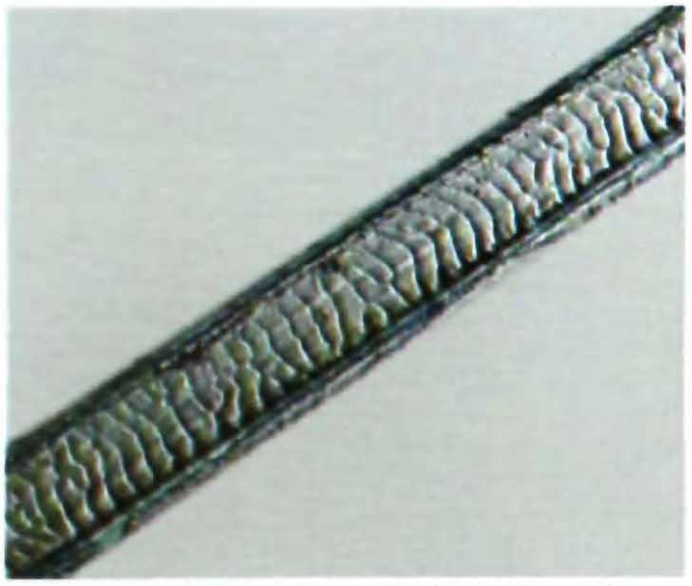
Photomicrographs (Figs. 332-337, mag 200x)



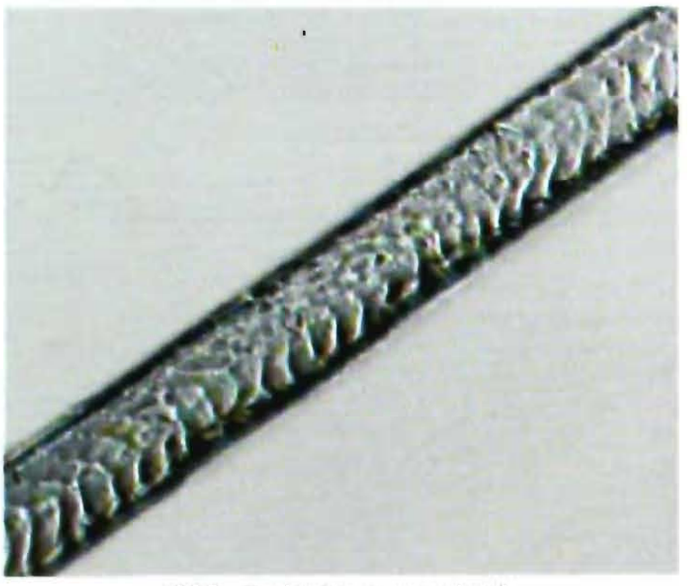
332. Medulla multiserial ladder



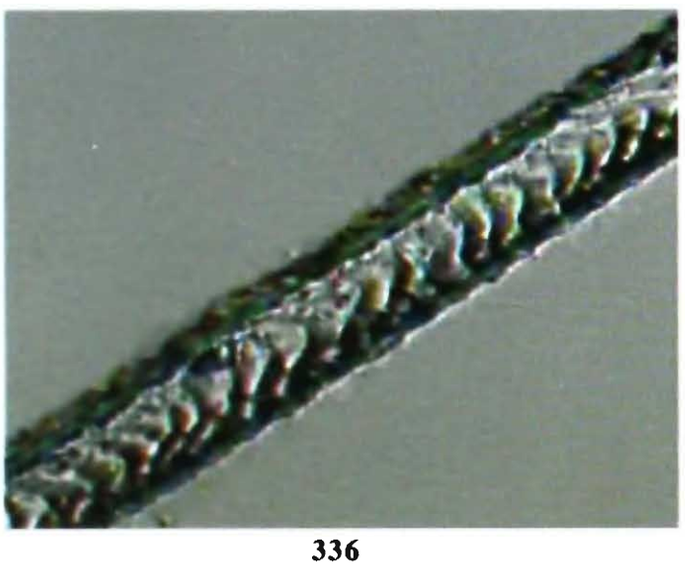
333. cross section oblong



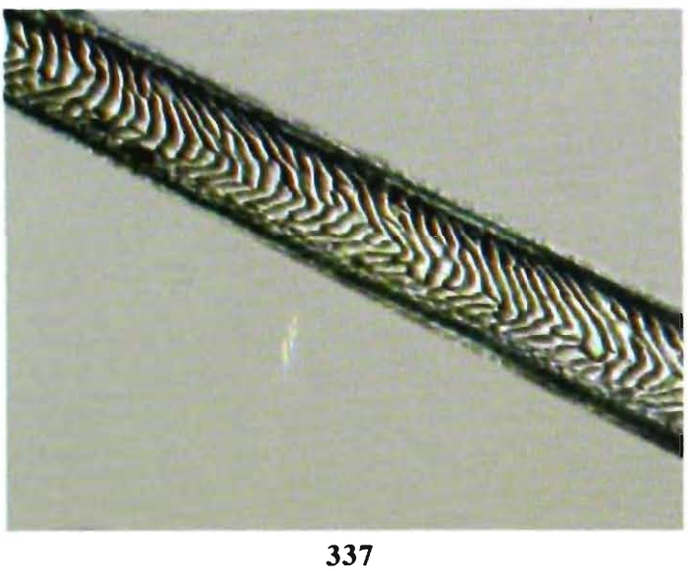
334. Cuticular at distal (SP single chevron)



335. Cuticular at proximal



336



337

Fig. 336-337. Cuticular at mid (single chevron) to regular wave

Plate 15c. ***Belomys pearsonii*** (Gray, 1842), Hairy footed flying squirrel

Head

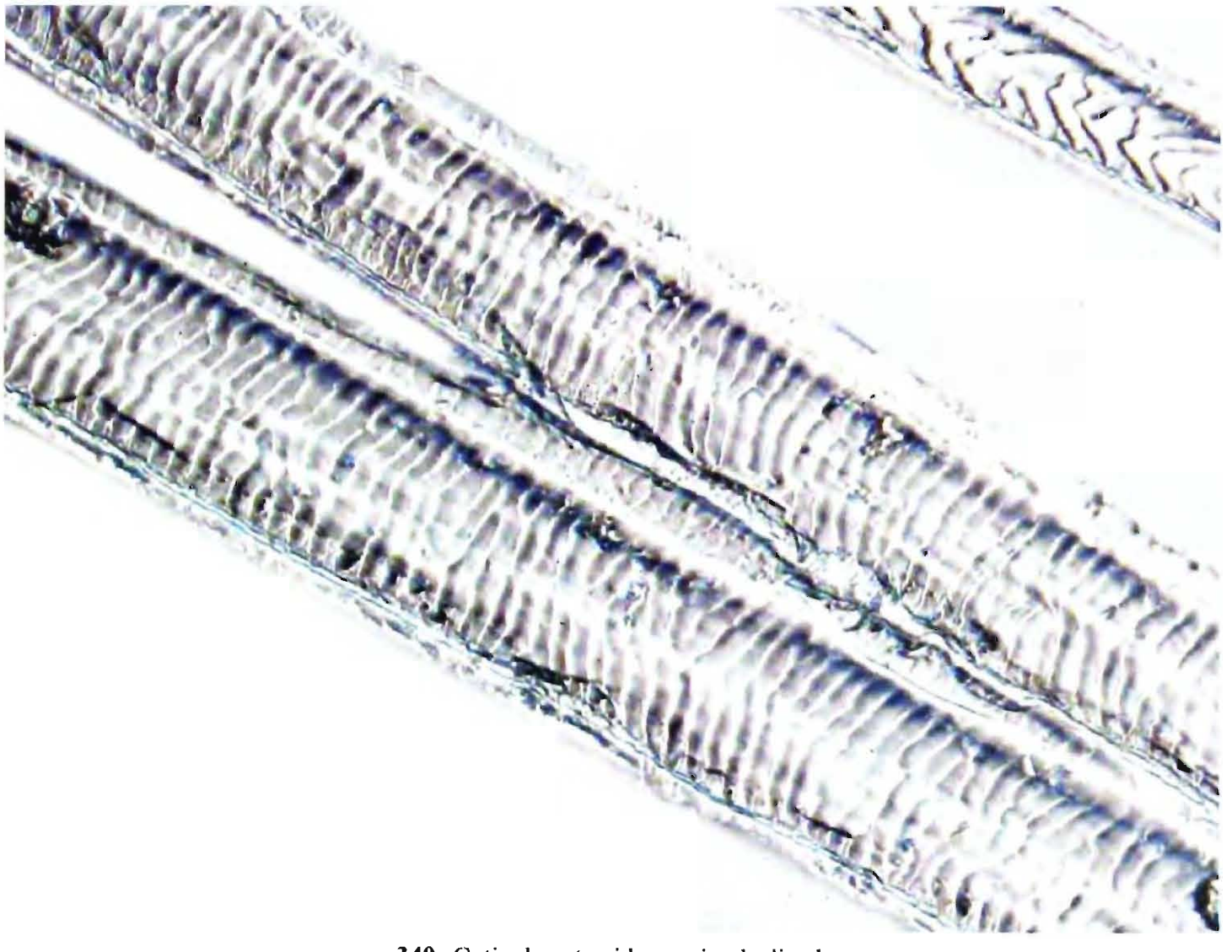
Photomicrographs (Figs. 388-340, 400x)



338. Medulla wideaeriform



339. Cross section oblong large medulla

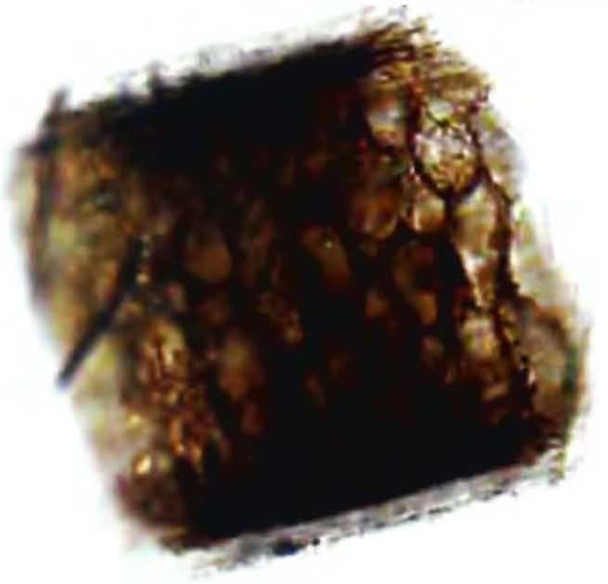


340. Cuticular at mid, proximal, distal

Plate 15d. ***Belomys pearsonii*** (Gray, 1842), Hairy footed flying squirrel

Tail

Photomicrographs (Figs. 341-344, mag 400x)



341. Medulla Wideaeriform

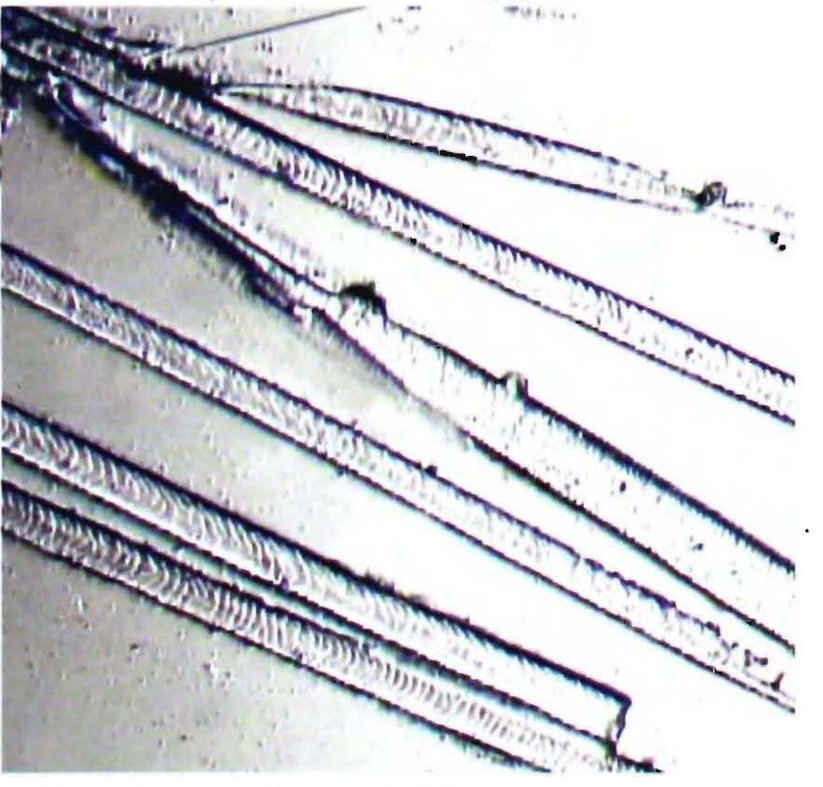


342. Cross section Circular (divided medulla)



343

344

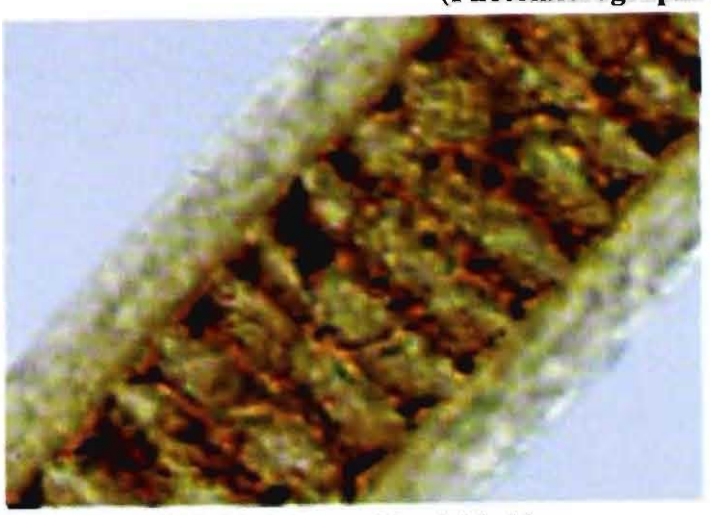


Figs. 343, 344 : Cuticular : SP regular wave, SM smooth, DS close

Plate 16a. ***Hylopetes alboniger*** (Hodgson, 1836) Particoloured flying squirrel

Dorsal

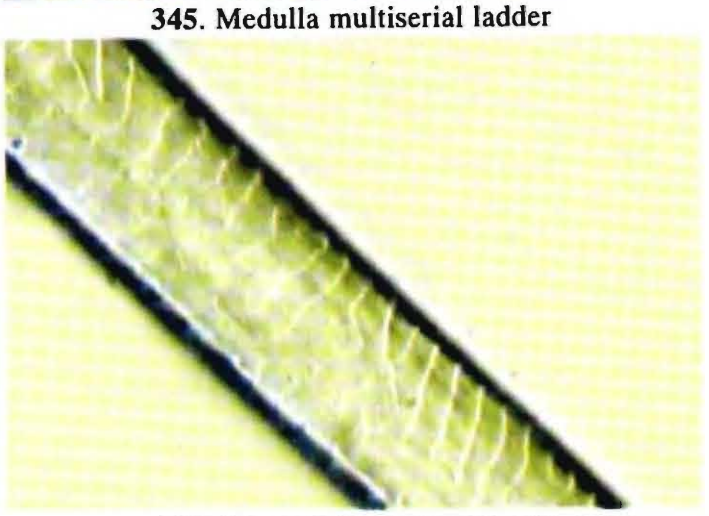
(Photomicrographs Figs. 345-349, 200x)



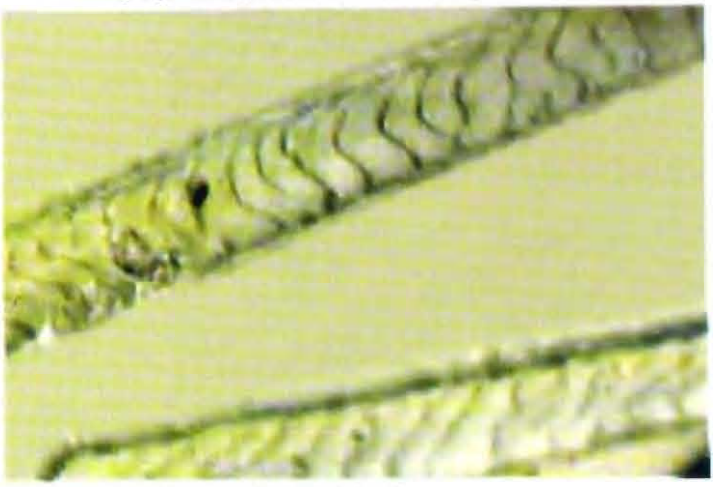
345. Medulla multiserial ladder



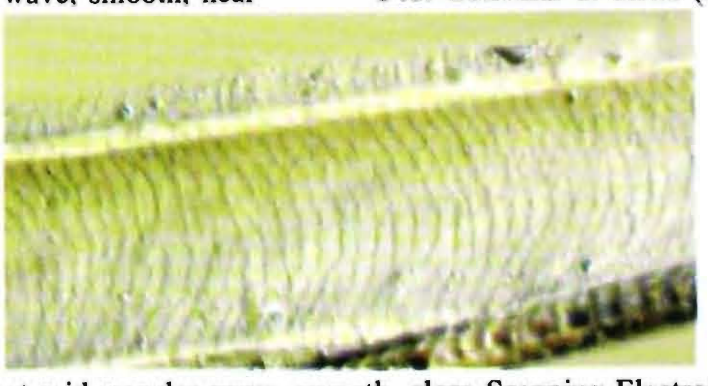
346. Cross section circular, reniform



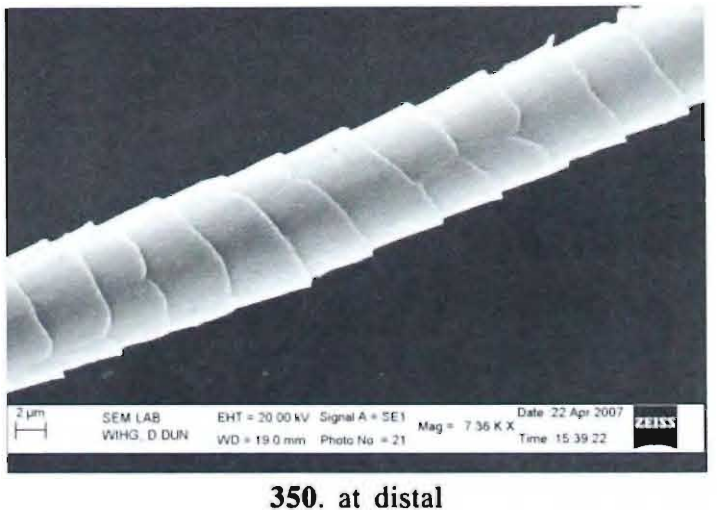
347. Cuticular regular wave, smooth, near



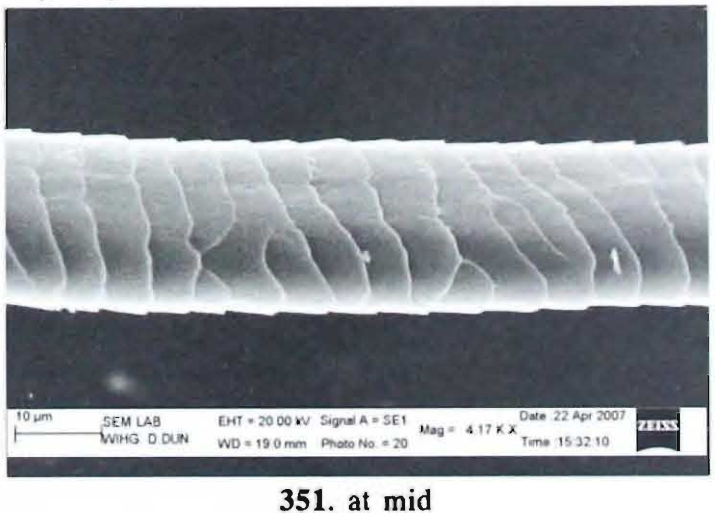
348. Cuticular at distal (single chevron) at proximal



349. Cuticular at mid, regular wave, smooth, close Scanning Electron Micrographs (Cuticular architecture) At proximal



350. at distal

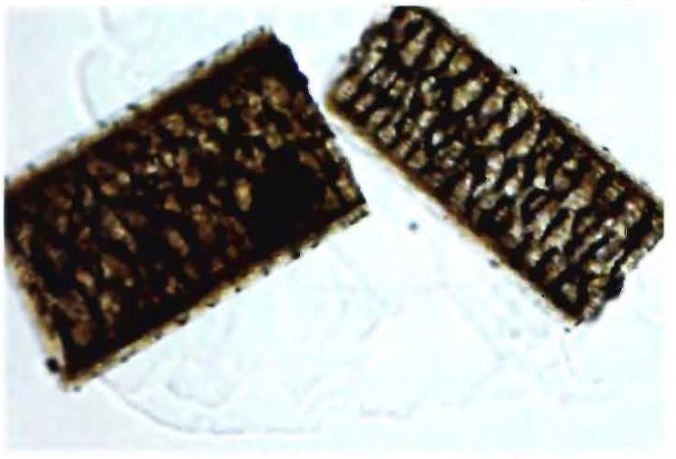


351. at mid

Plate 16b. ***Hylopetes alboniger*** (Hodgson, 1836), Particoloured flying squirrel

Ventral

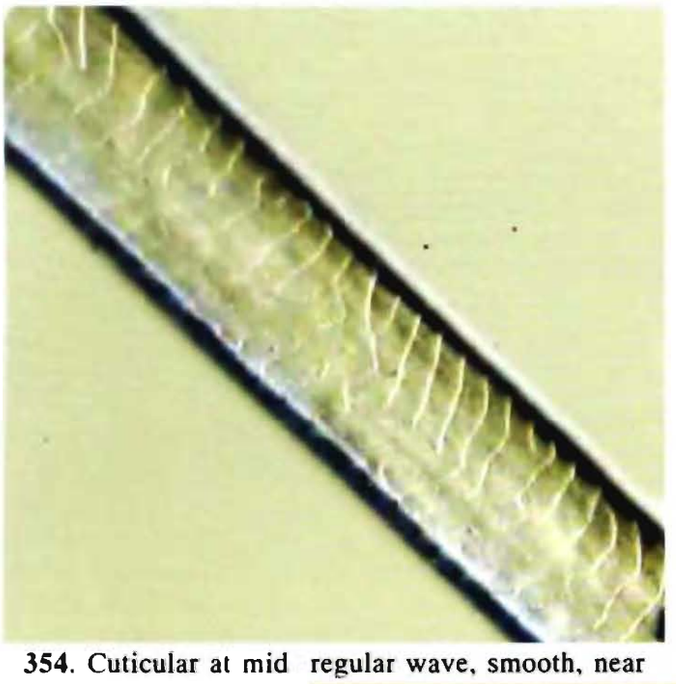
(Photomicrographs Figs. 352-356, 200x)



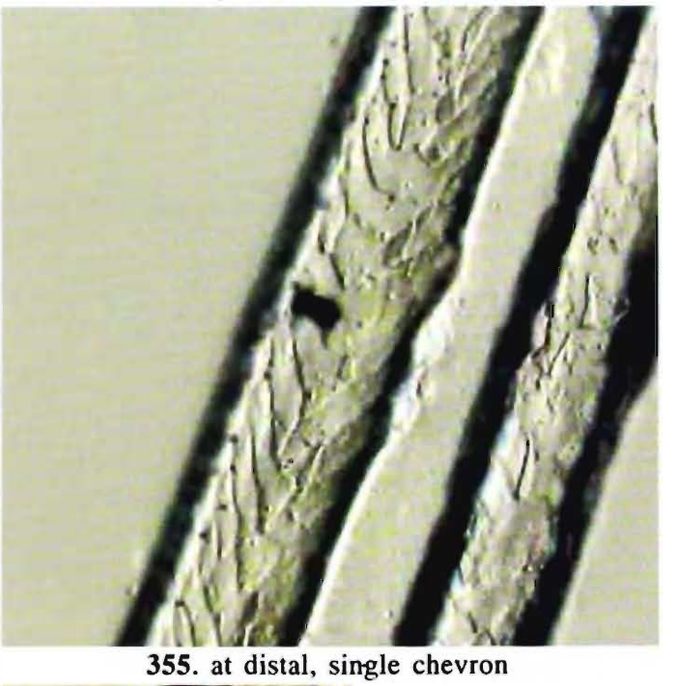
352. Medulla multiserial ladder



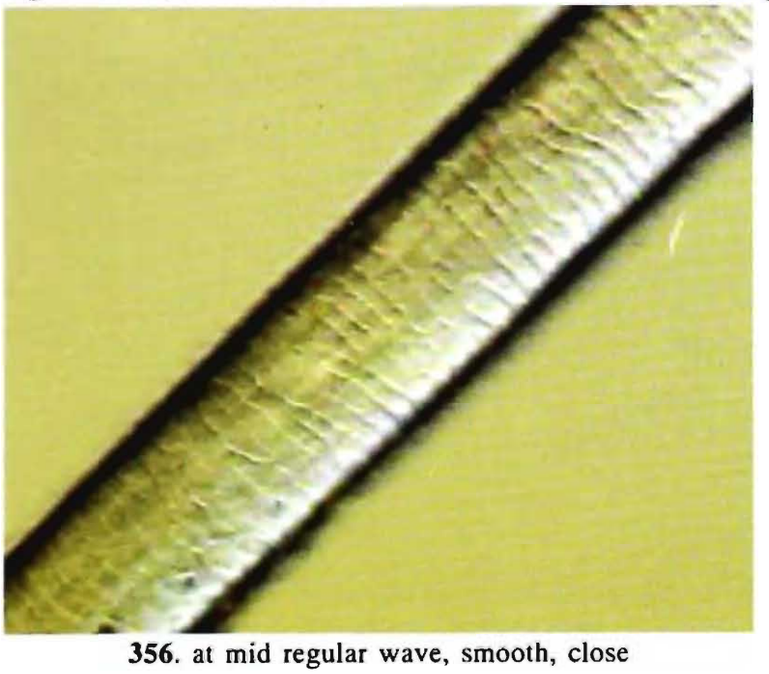
353. Cross ection circular, large medulla



354. Cuticular at mid regular wave, smooth, near



355. at distal, single chevron

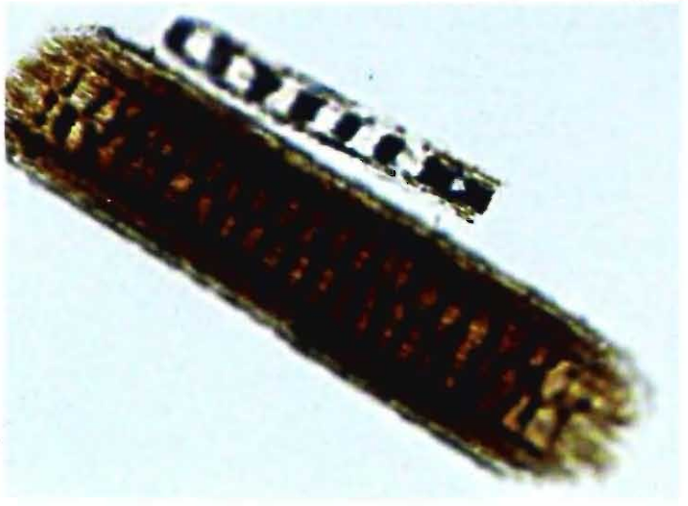


356. at mid regular wave, smooth, close

Plate 16c. ***Hylopetes alboniger*** (Hodgson, 1836), Particoloured flying squirrel

Head

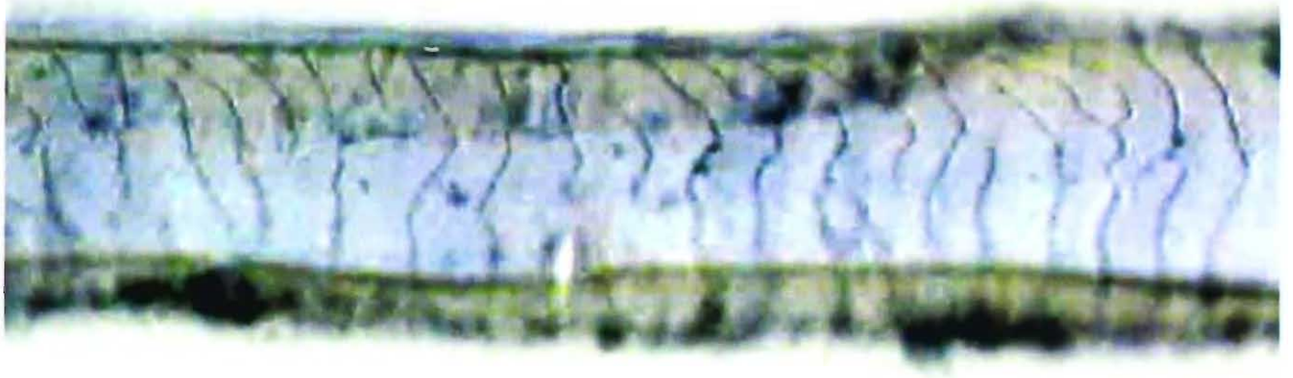
(Photomicrographs, Figs. 357-360)



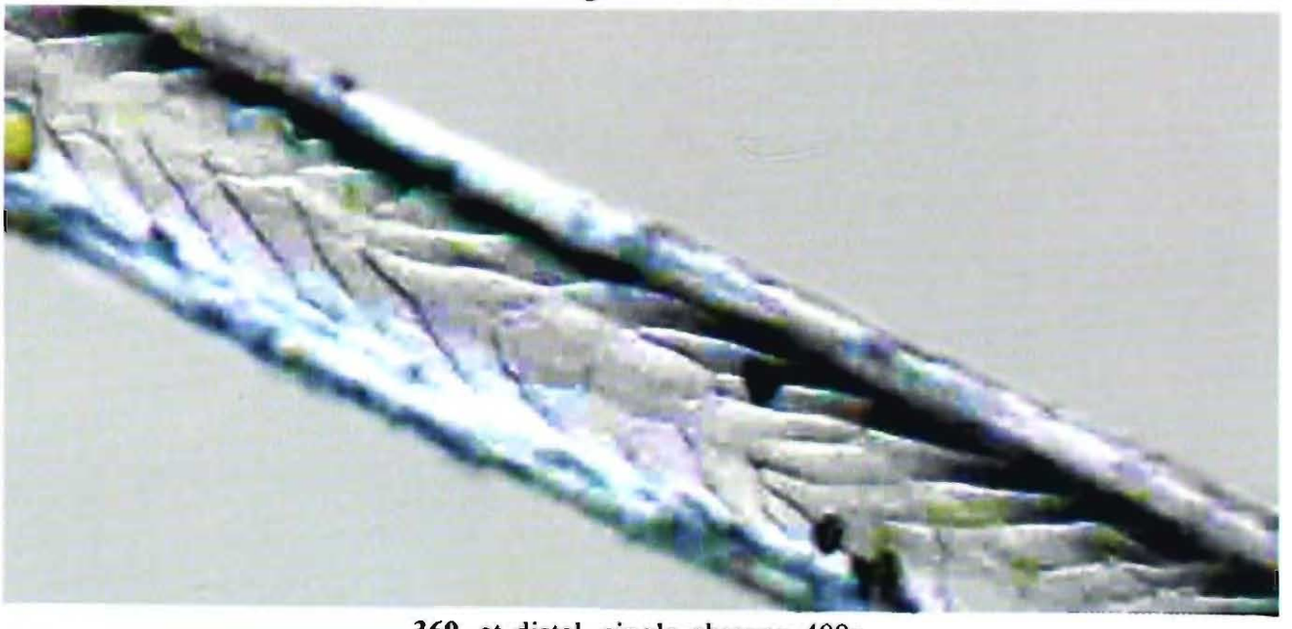
357. Medulla multiserial 200x



358. Cross section reniform 400x



359. Cuticular at mid regular wave, smooth, distant 400x



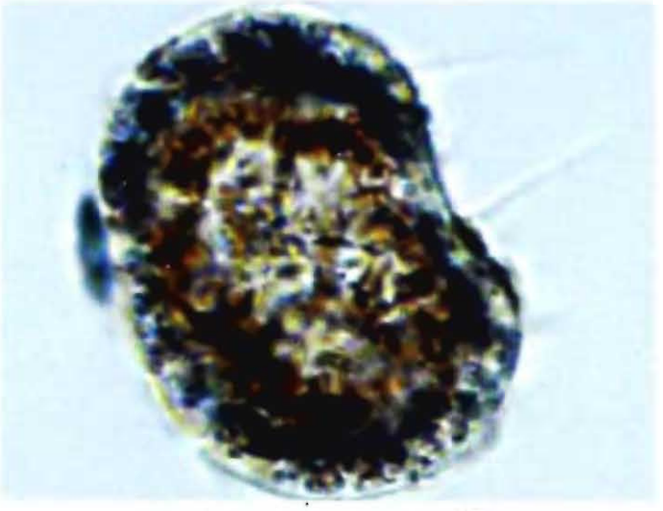
360. at distal, single chevron 400x

Tail

(Photomicrographs, Figs. 361-365)



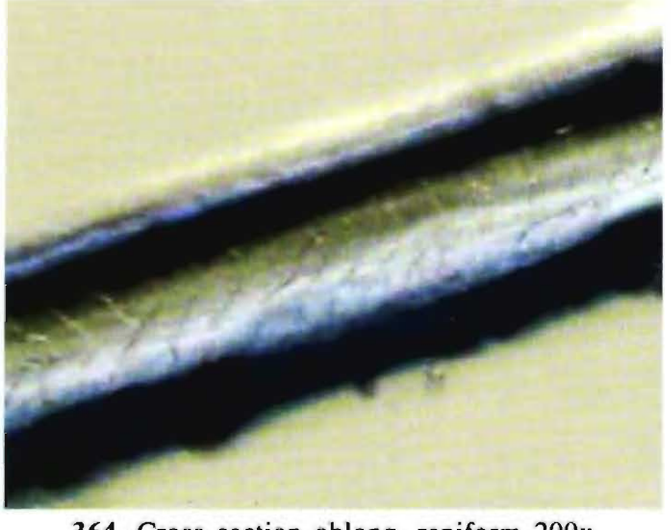
361. Cross section reniform 200x



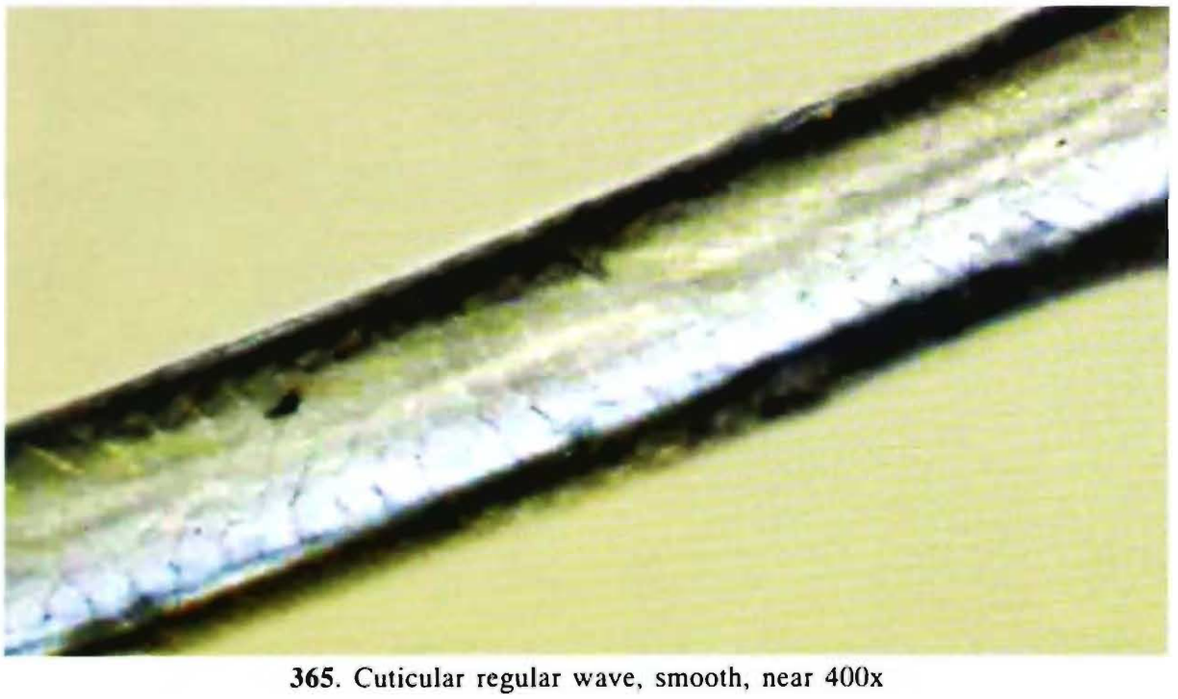
362. Medulla multiserial 400x



363. Cuticular regular wave, smooth, near 200x



364. Cross section oblong, reniform 200x

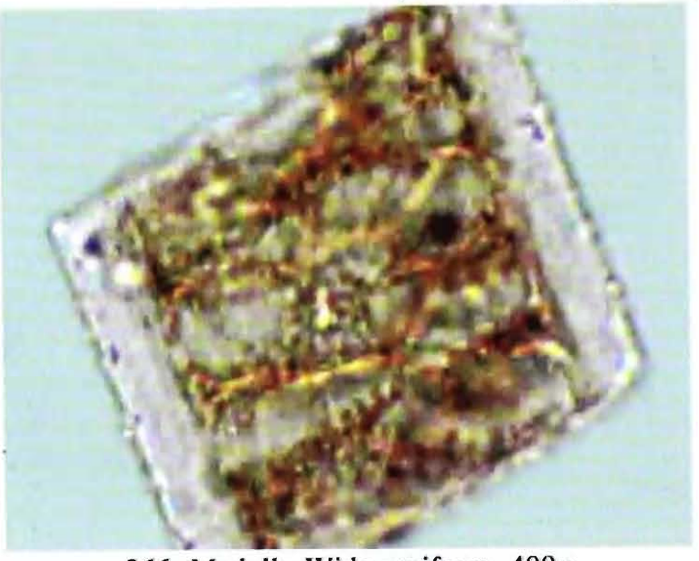


365. Cuticular regular wave, smooth, near 400x

Plate 17a. ***Hylopetes barberi barberi*** (Blyth, 1847)

Dorsal

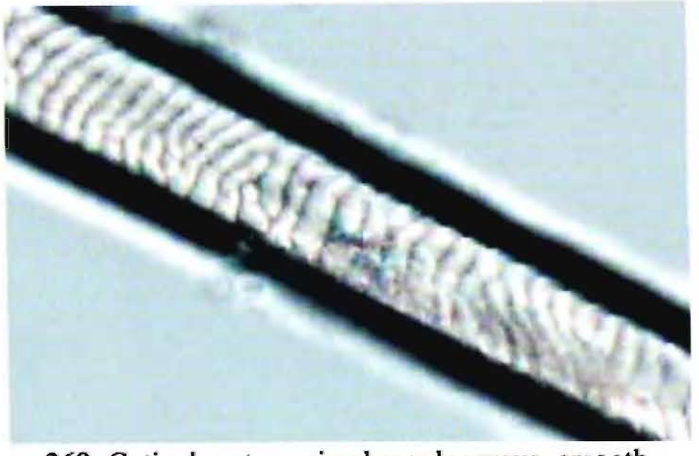
(Photomicrographs Fig. 366-370, 400x, 200x)



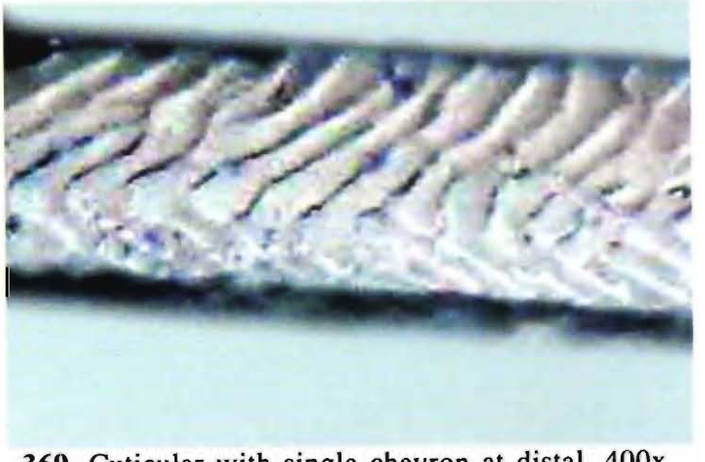
366. Medulla Wide aeriform, 400x



367. Cross section : oblong, 400x



368. Cuticular at proximal regular wave, smooth, near, 200x

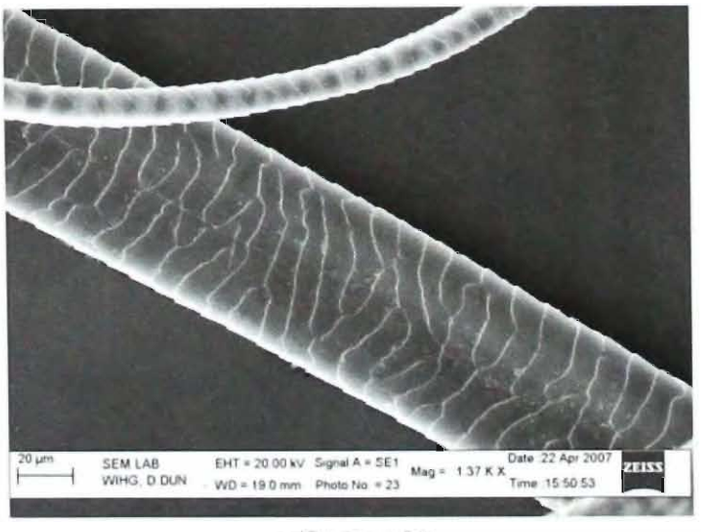


369. Cuticular with single chevron at distal, 400x

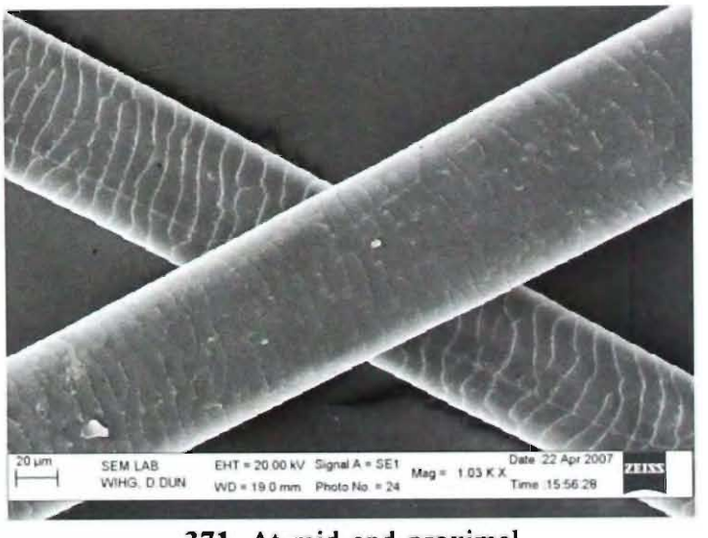
Dorsal

Scanning Electron Micrographs

(Cuticular architeture)



370. At mid

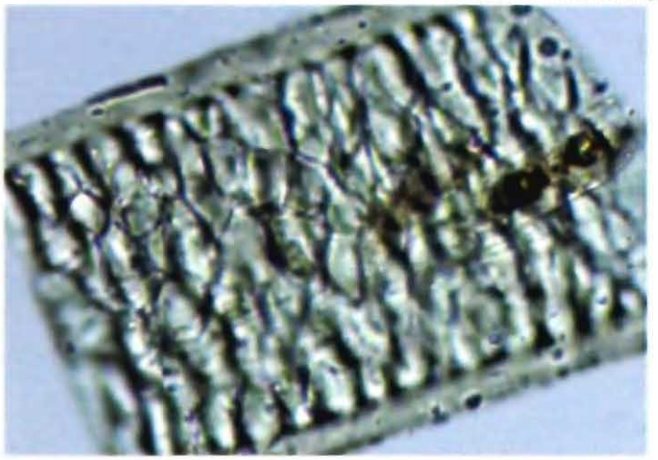


371. At mid and proximal

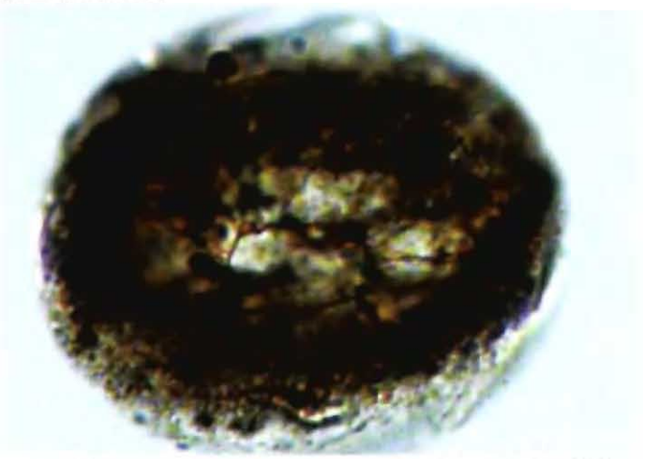
Plate 17b. ***Hylopetes barberi barberi*** (Blyth, 1847)

Ventral

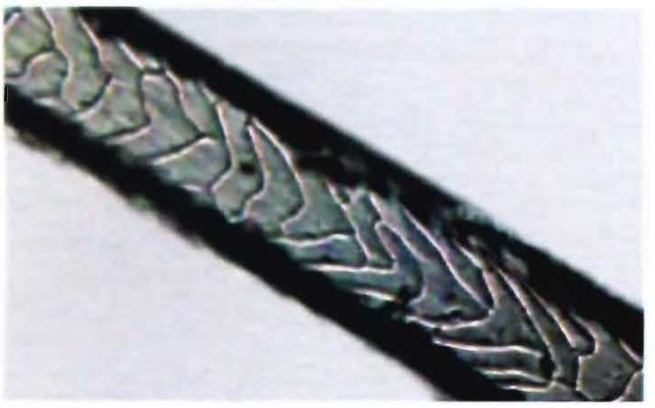
(Phototmicrographs 372-376)



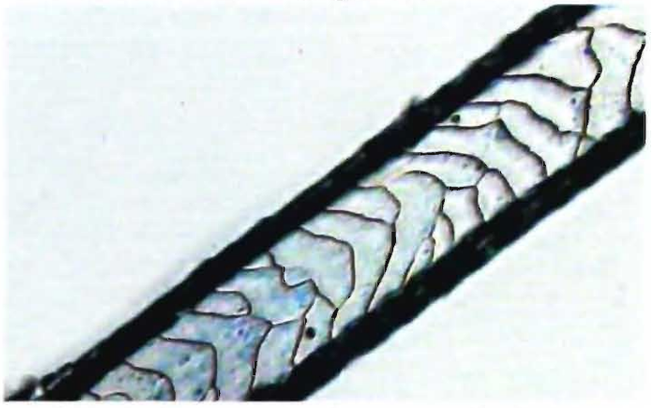
372. Medulla wideaeriform 400x



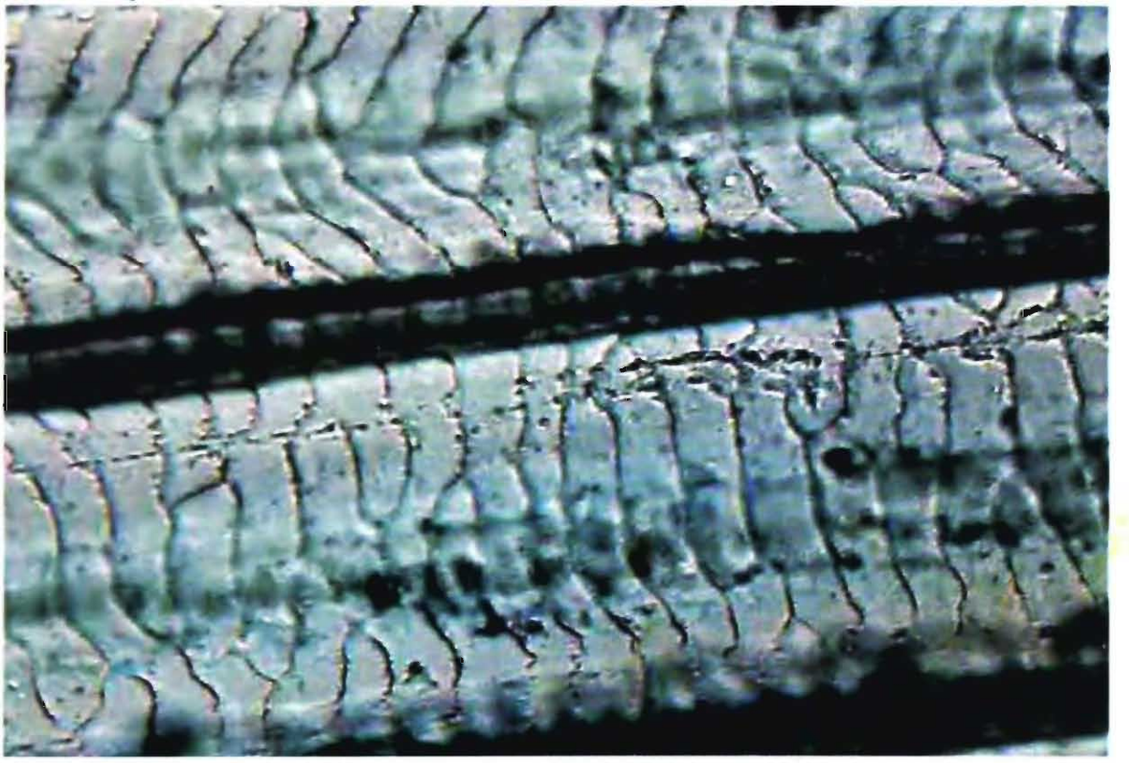
373. Cross section : oblong, medium medulla 400x



374. Cuticular singlechevron, smooth, near, at proximal 200x



375. Cuticular single chevron, at distal 200x

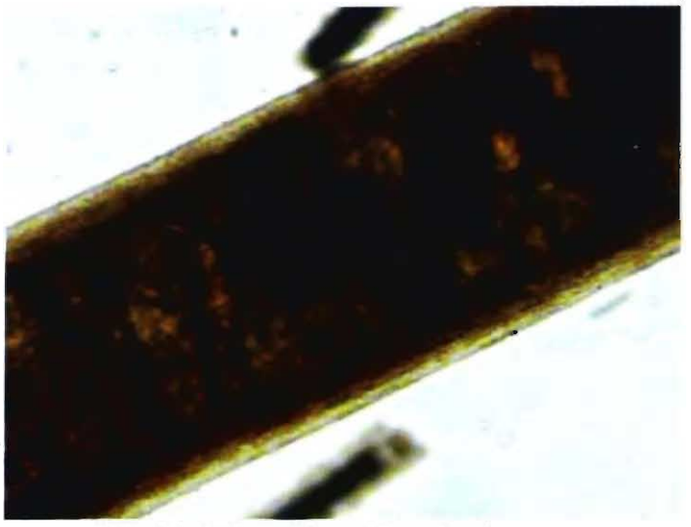


376. Cuticular at mid, regular wave,smooth, near 200x

Plate 17c. *Hylopetes barberi barberi* (Blyth, 1847)

Head

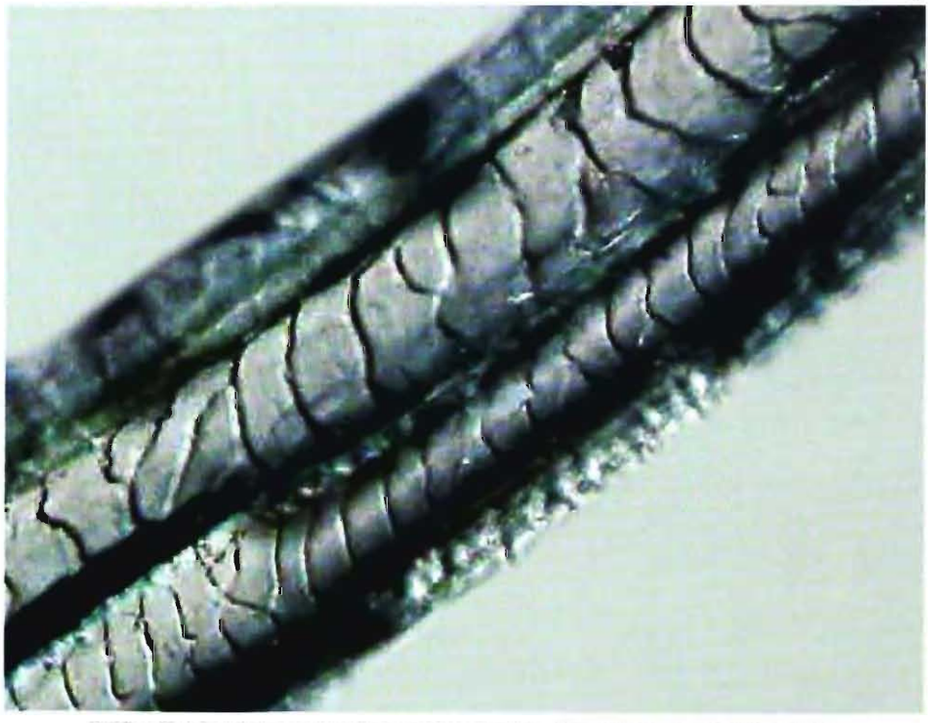
(Photomicrographs 377-381)



377. Medulla wideaeriform lattice 400x



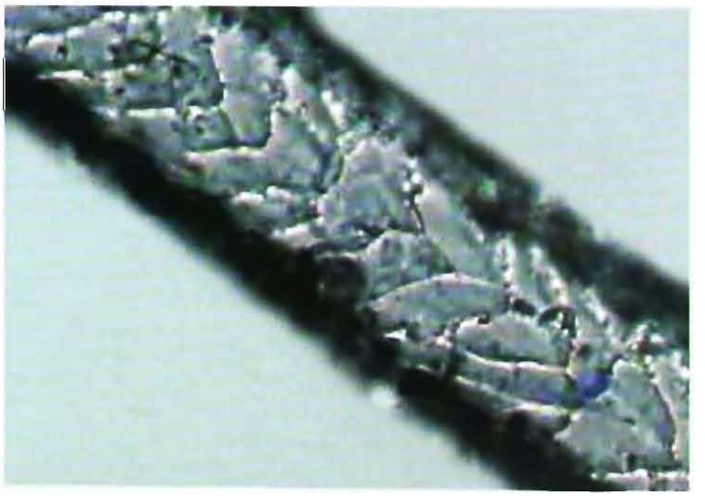
378. Cross section Oblong,large medulla 400x



379. Cuticular : regular wave, smooth, near at distal 200x



380. Cuticular reguar wave, smooth, near at distal and proximal 200x

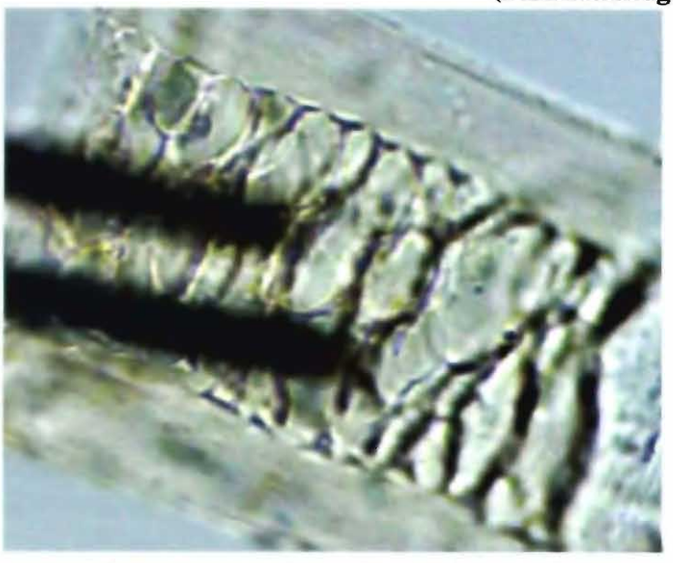


381. Cuticular regular wave, slightly rippled, near 200x

Plate 17d. ***Hylopetes barberi barberi*** (Blyth, 1847)

Tail

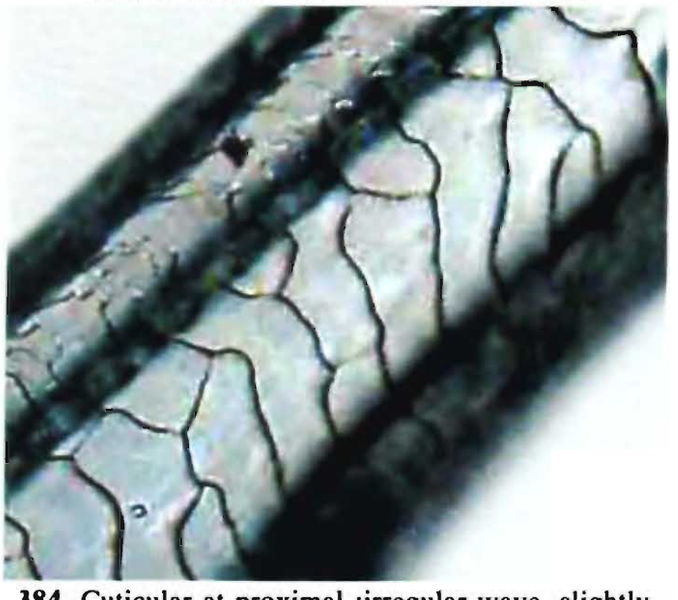
(Photomicrographs 382-386)



382. Medulla Wideaeriform lattice 400x



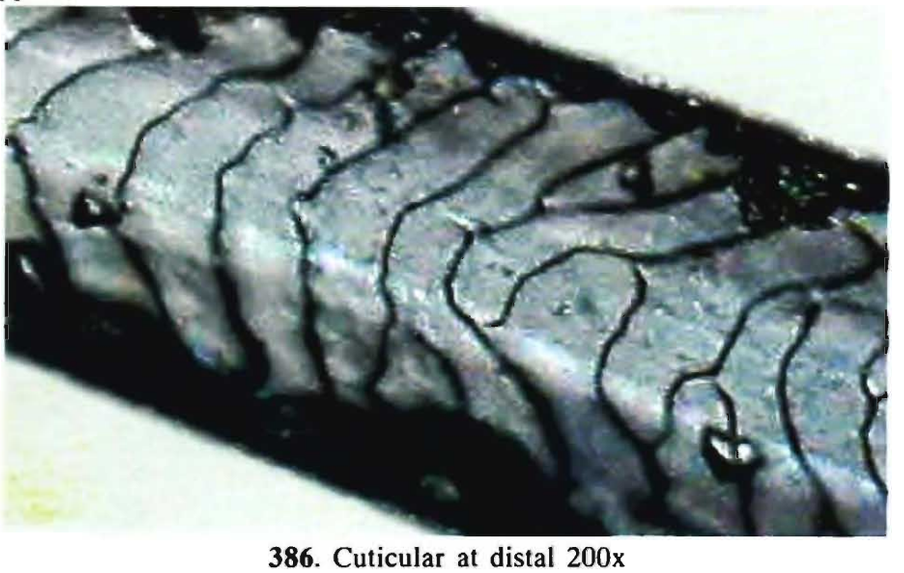
383. Medulla of fur and secondary guard hair 400x



384. Cuticular at proximal :irregular wave, slightly rippled, near 200x

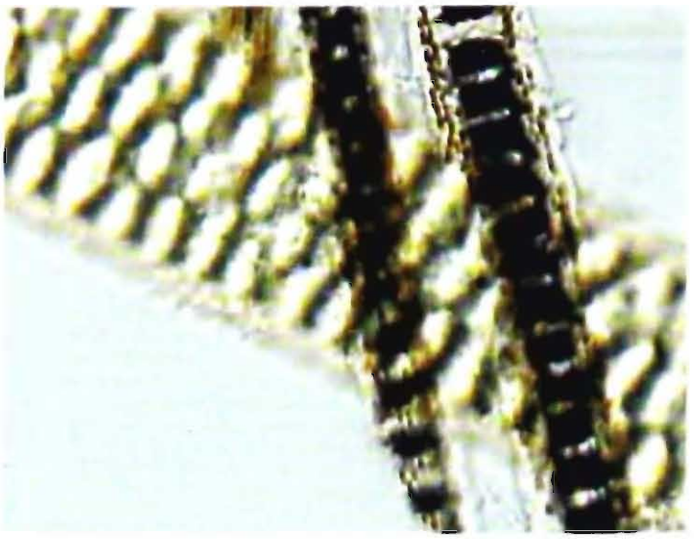


385. Cuticular single chevron, smooth, near at mid 400x



386. Cuticular at distal 200x

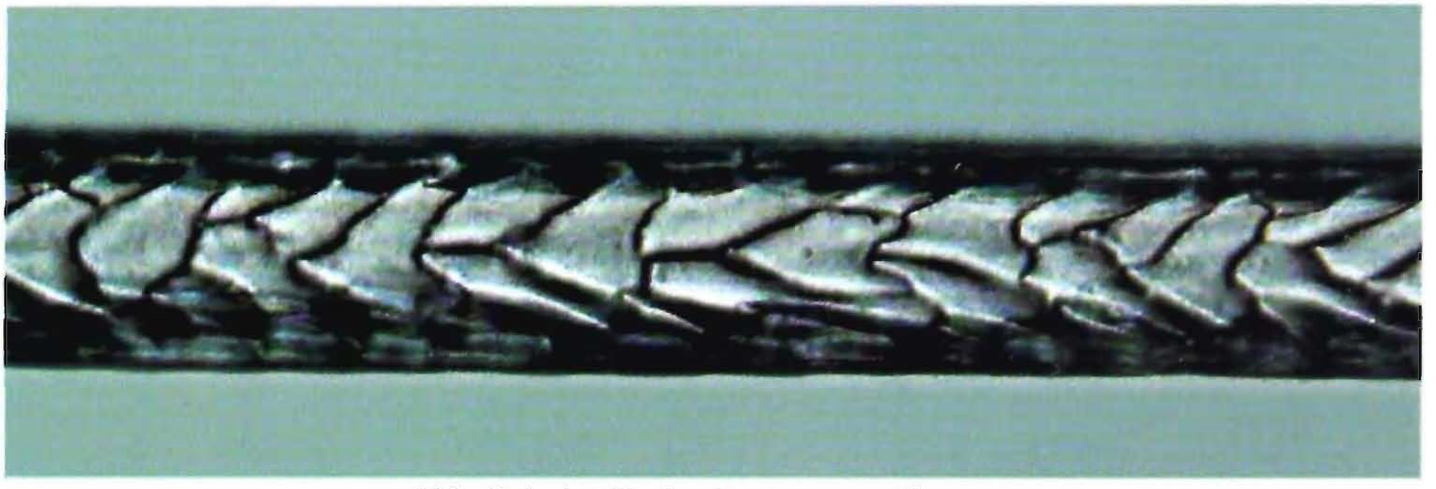
Plate 18a. ***Hylopetes fimbriatus*** (Gray, 1837)
Dorsal
(Photomicrographs 387-391, 400x)



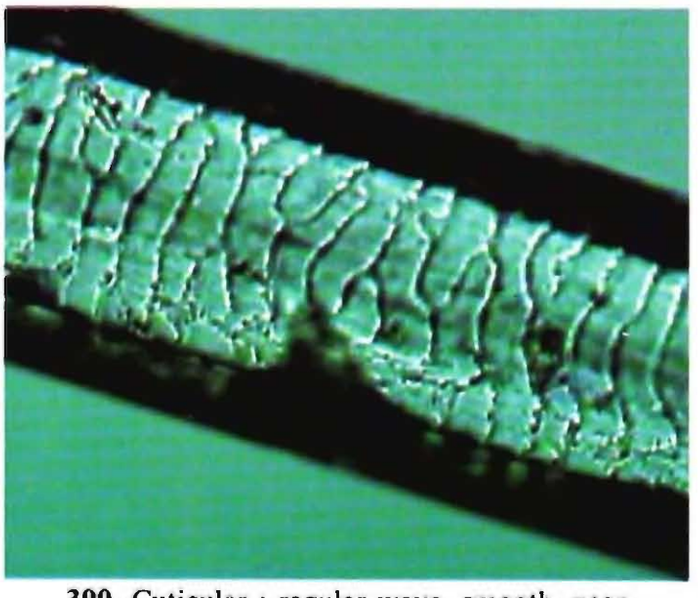
387. Medulla multiscrial ladder



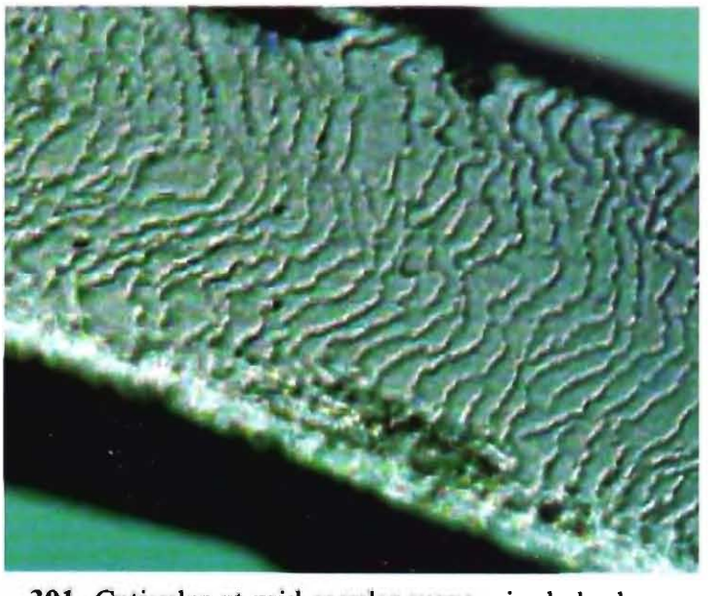
388. Cross section oblong with large medulla



389. Cuticular Single chevron, smootyh, near



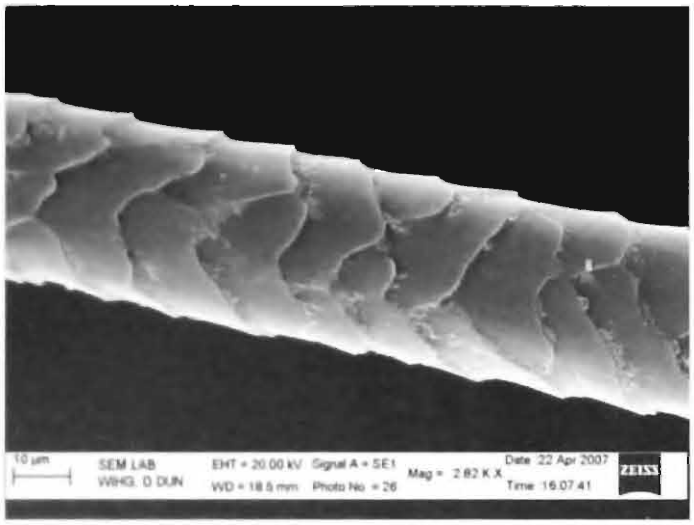
390. Cuticular : regular wave, smooth, near



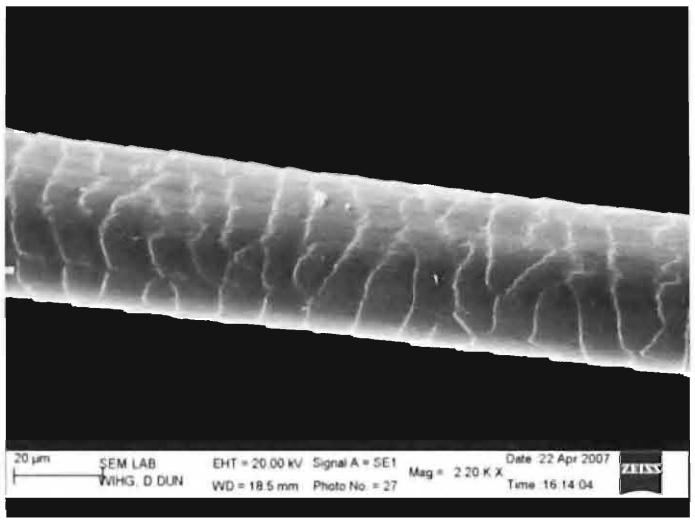
391. Cuticular at mid regular wave, rippled, close

Dorsal

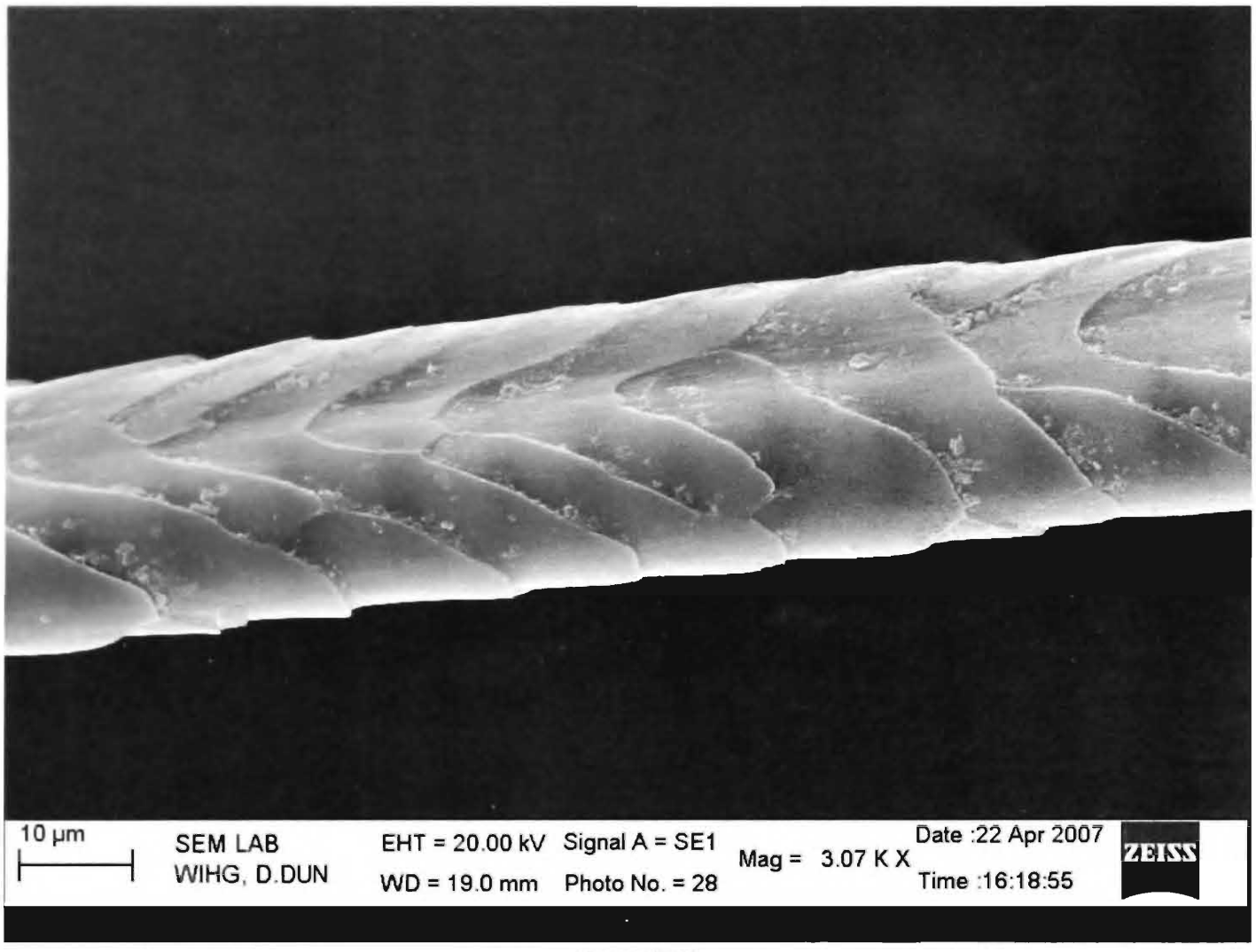
Scanning Electron Micrographs
(Cuticular architeture



392. at mid



393. at proximal

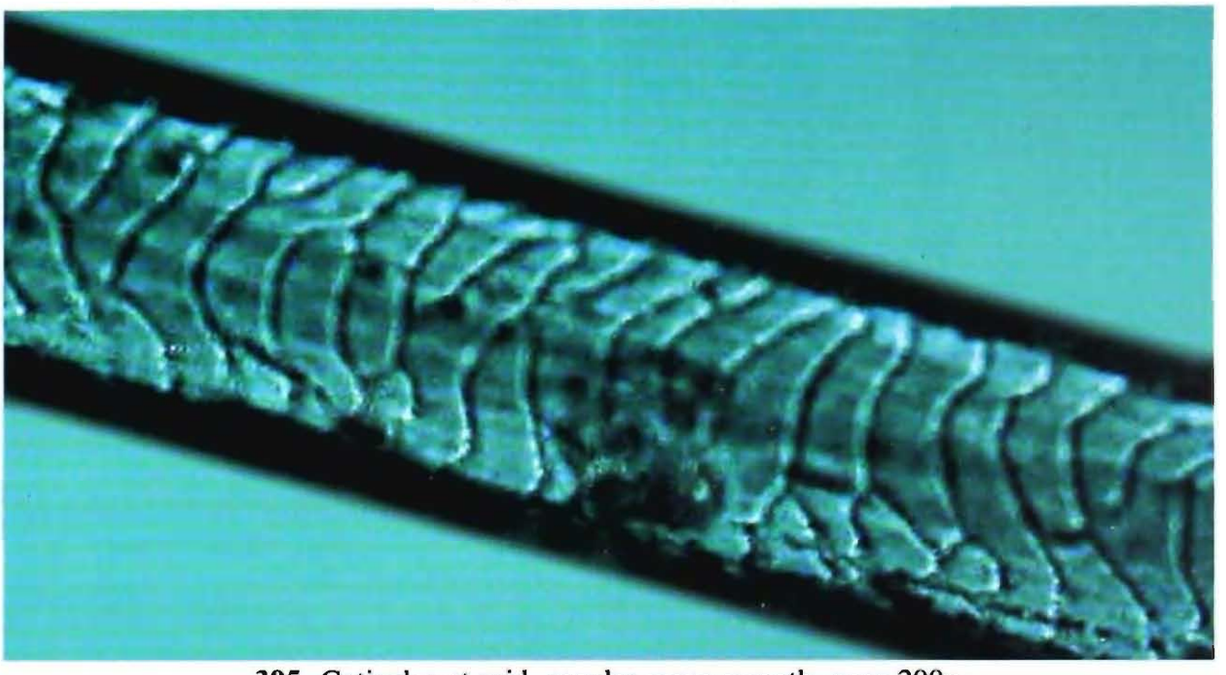


394. at distal

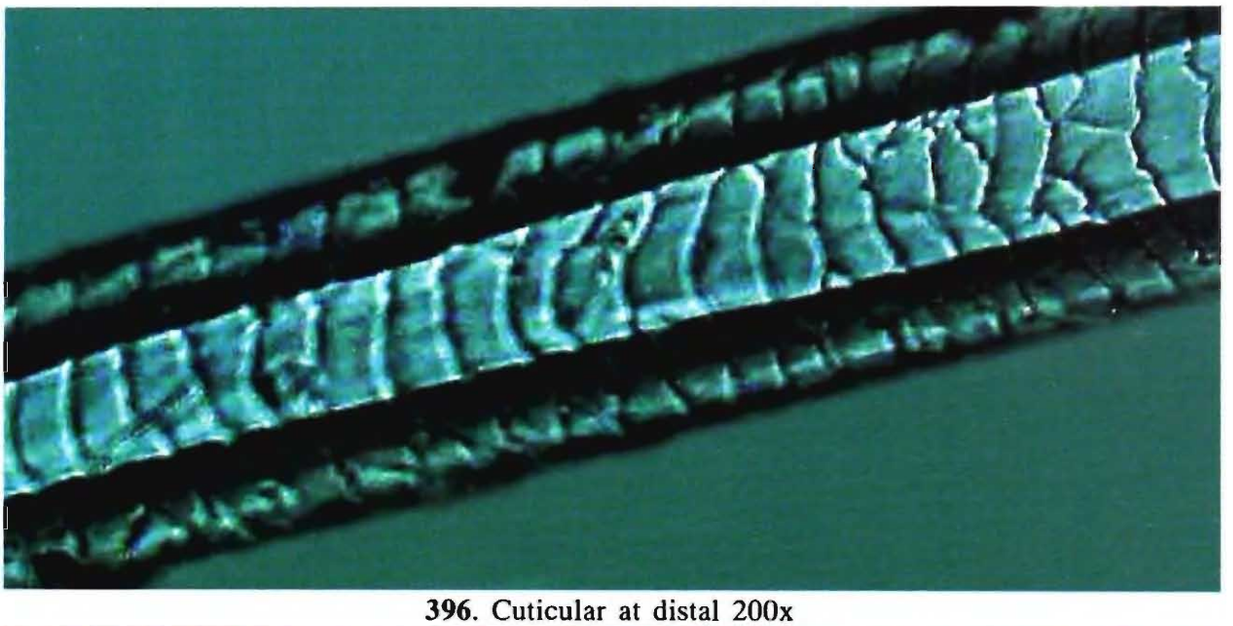
Plate 18b. ***Hylopetes fimbriatus*** (Gray, 1837)

Ventral

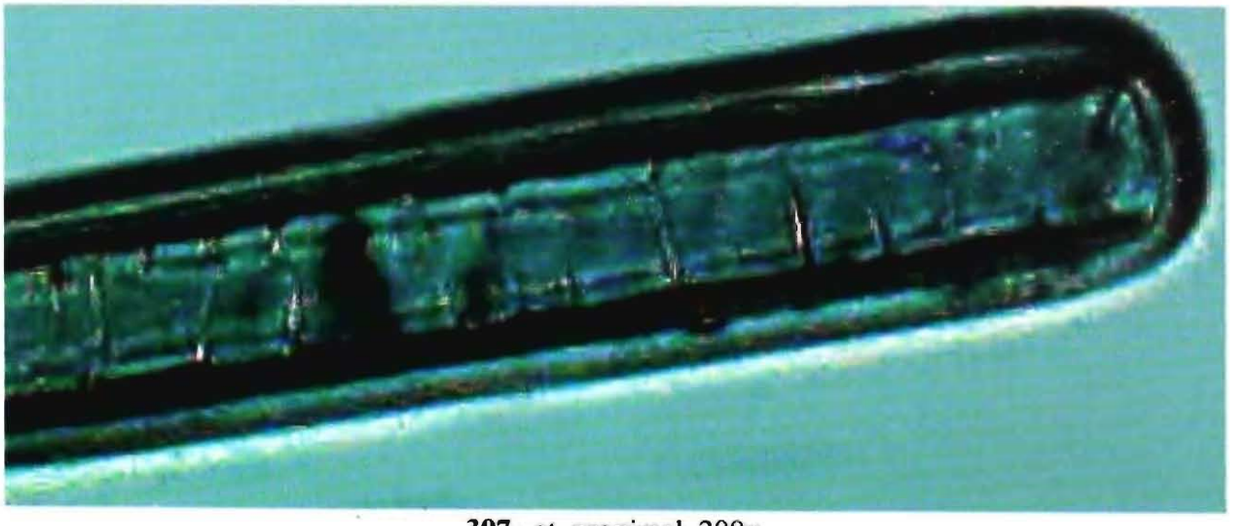
(Figs 395-397, 400x)



395. Cuticular at mid, regular wave,smooth, near 200x



396. Cuticular at distal 200x

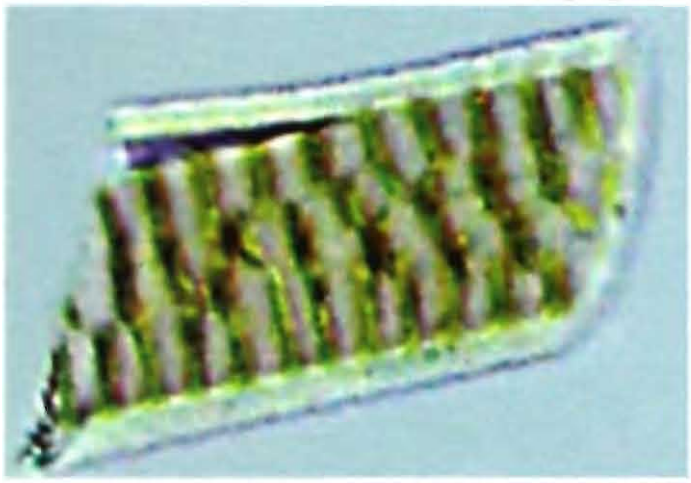


397. at proximal 200x

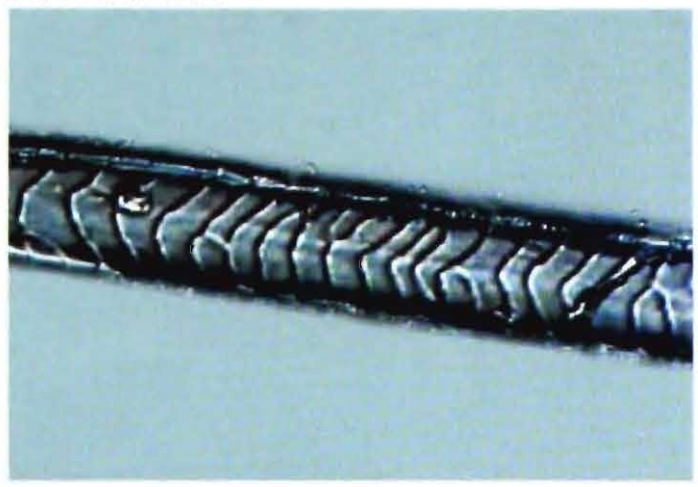
Plate 18c. ***Hylopetes fimbriatus*** (Gray, 1837)

Head

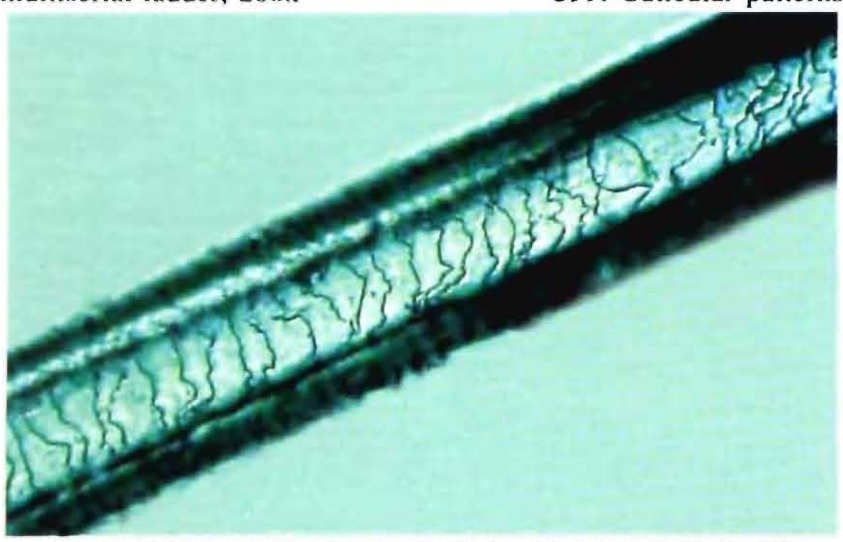
(Photomicrographs Figs. 398-402, 400x, 200x)



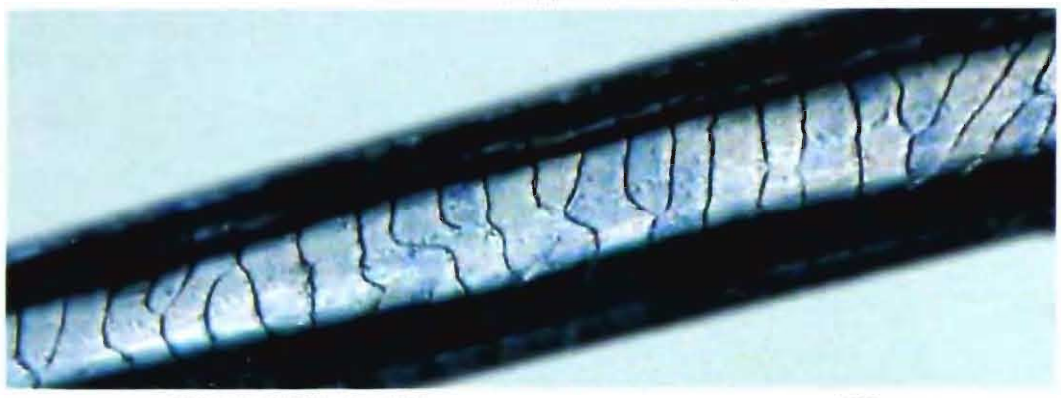
398. Medulla multiserial ladder, 200x



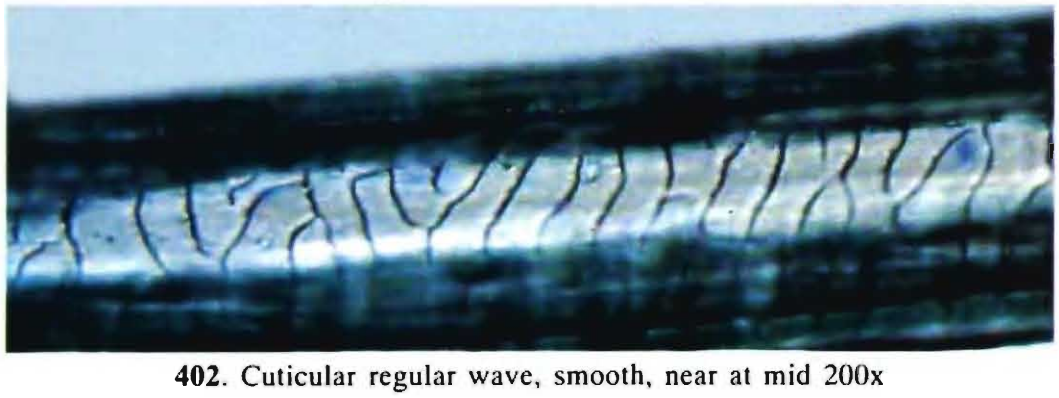
399. Cuticular patterns towards mid



400. Cuticular regular wave, rippled, near, at proximal, 200x



401. cuticular regular wave, smooth, near at distal, 200x



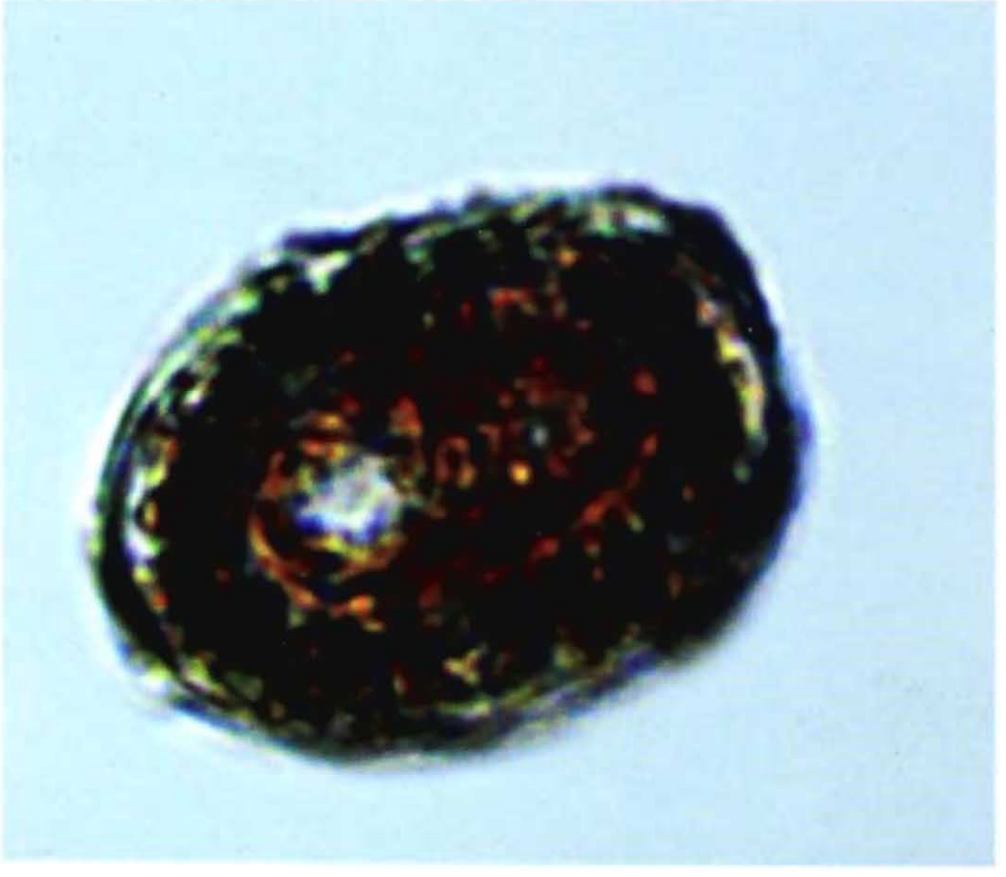
402. Cuticular regular wave, smooth, near at mid 200x

Plate 18d. ***Hylopetes fimbriatus*** (Gray, 1837)

Tail

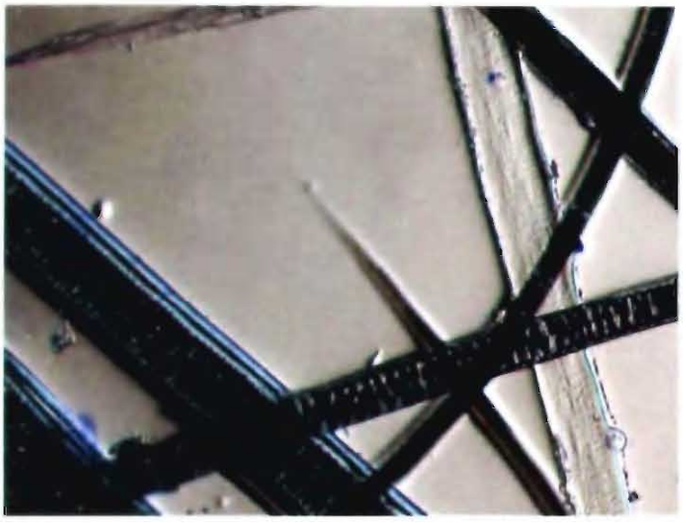


403. Medulla multiserial ladder, 400x



404. Cross section oblong,large 400x

Dorsal



405. Medulla multiserial

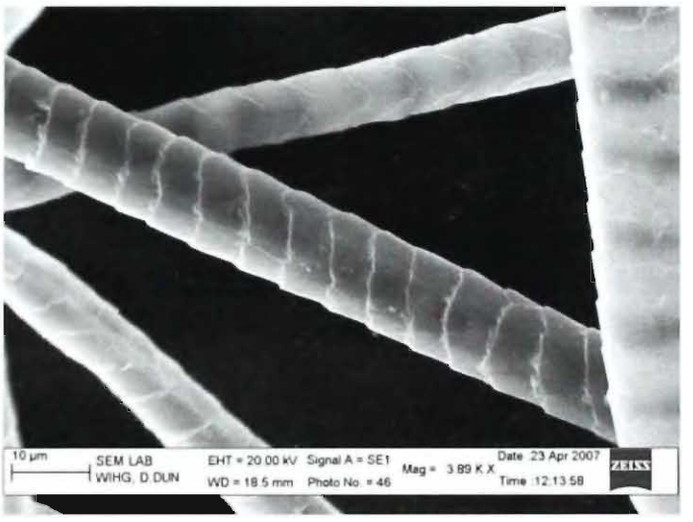


406. Cross section oblong,medium medulla 400x

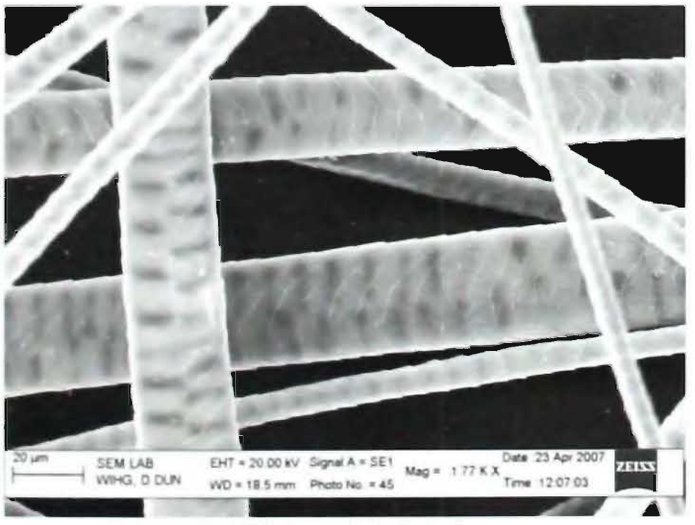
Dorsal
Scanning Electron Micrographs
(Cuticular architeture)



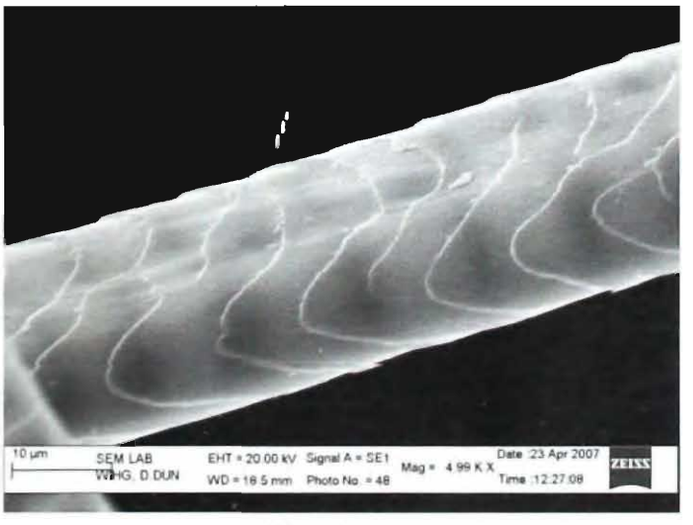
407. At mid



408. At distal



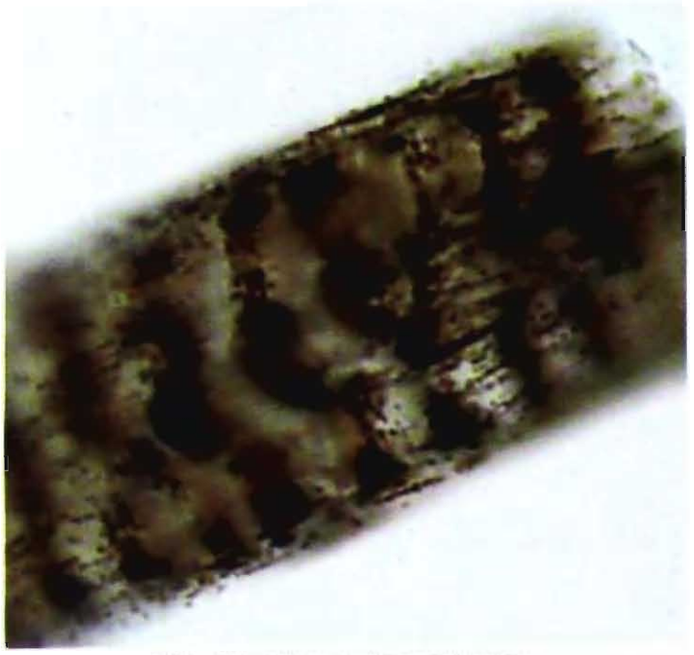
409. At mid, distal



410. At mid

Plate 19b. ***Hylopetes phyayeri*** (Blyth, 1859), Phayer's flying squirrel

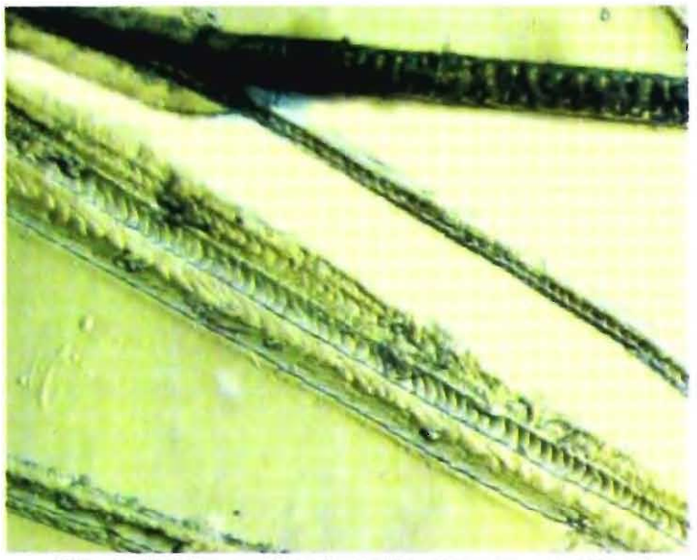
Ventral



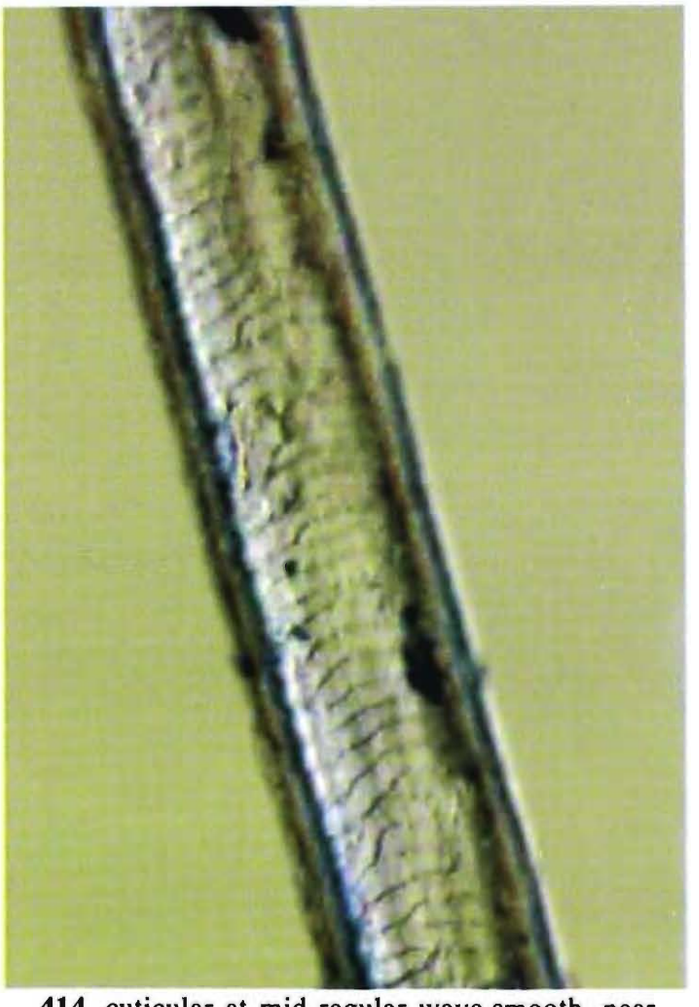
411. Medulla multiserial 400x



412. Cross section oblong, large 400x



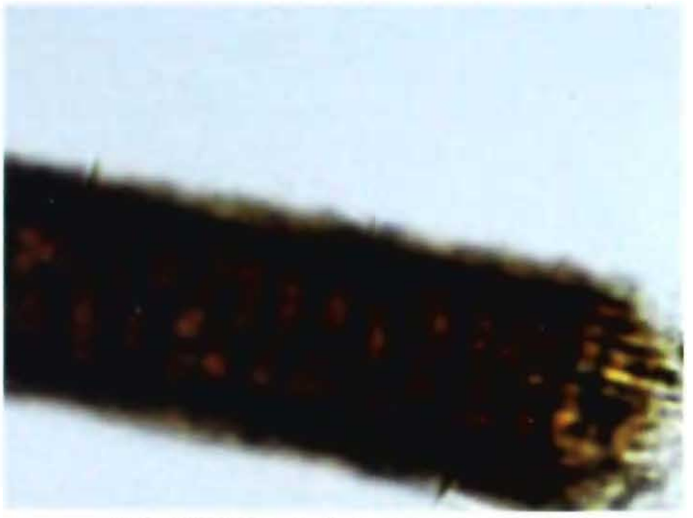
413. cuticular at distal single chevron, at distal regular wave, smooth, near 200x



414. cuticular at mid regular wave,smooth, near 400x

Plate 19c. ***Hylopetes phyayeri*** (Blyth, 1859), Phayer's flying squirrel

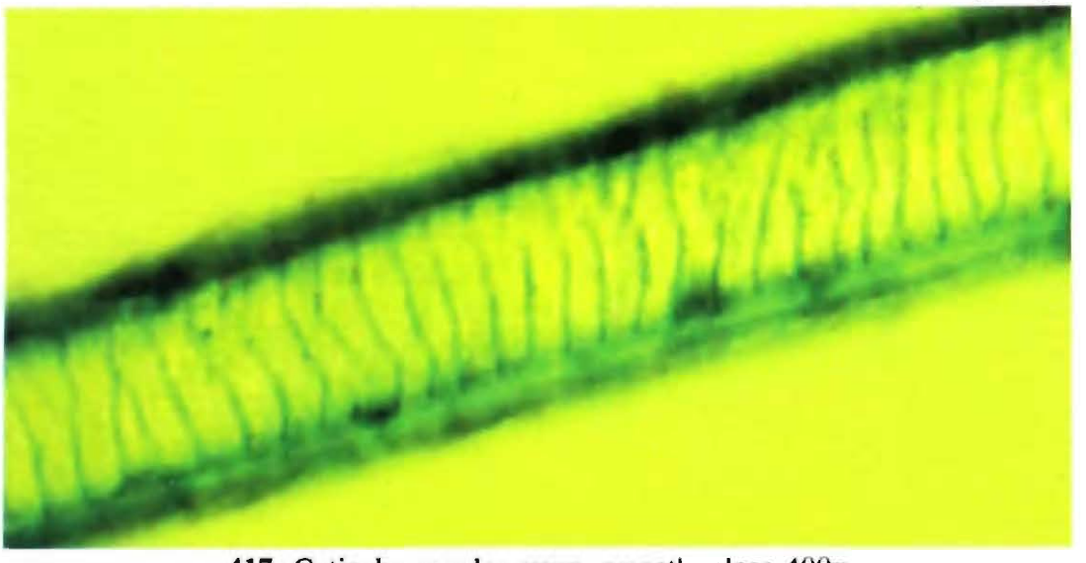
Head



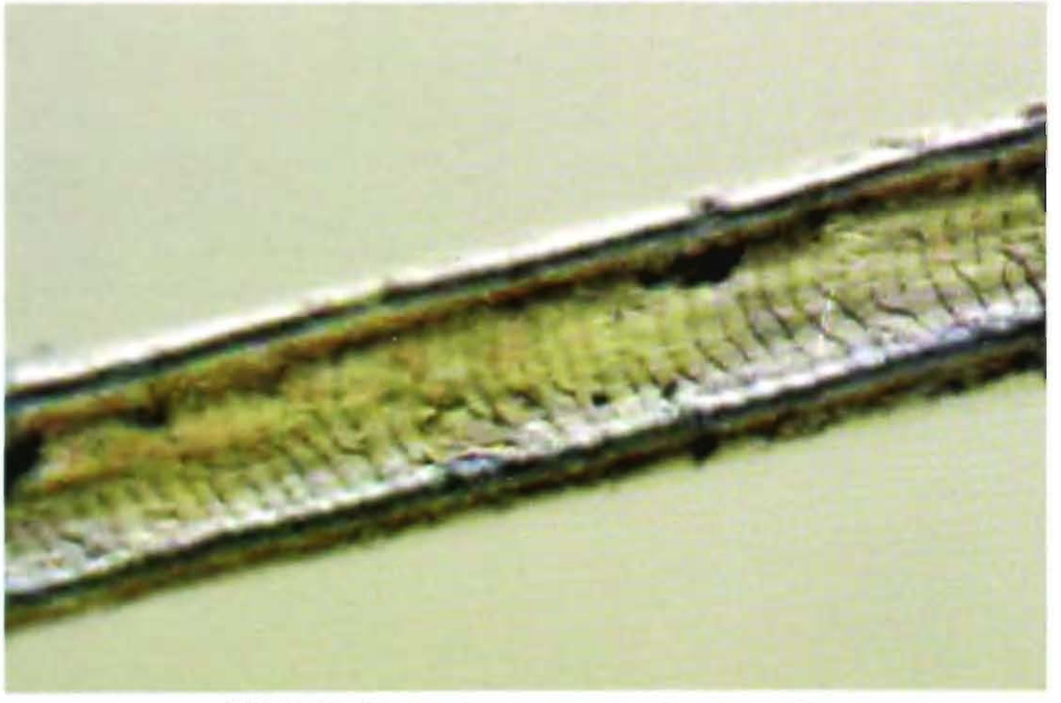
415. Medulla multiserial ladder 400x



416. Cross section oblong, large 400x



417. Cuticular regular wave, smooth, close 400x



418. Cuticular regular wave, smooth, close 400x

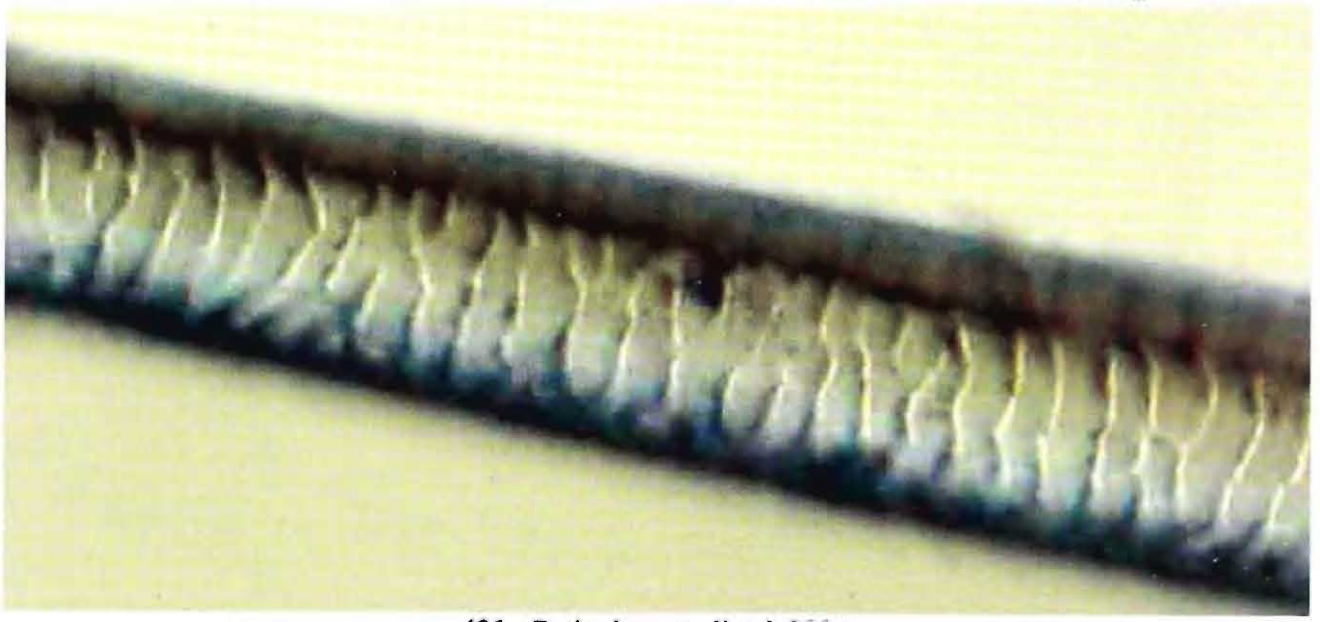
Plate 19d. *Hylopetes phyayeri* (Blyth, 1859), Phayer's flying squirrel
Tail



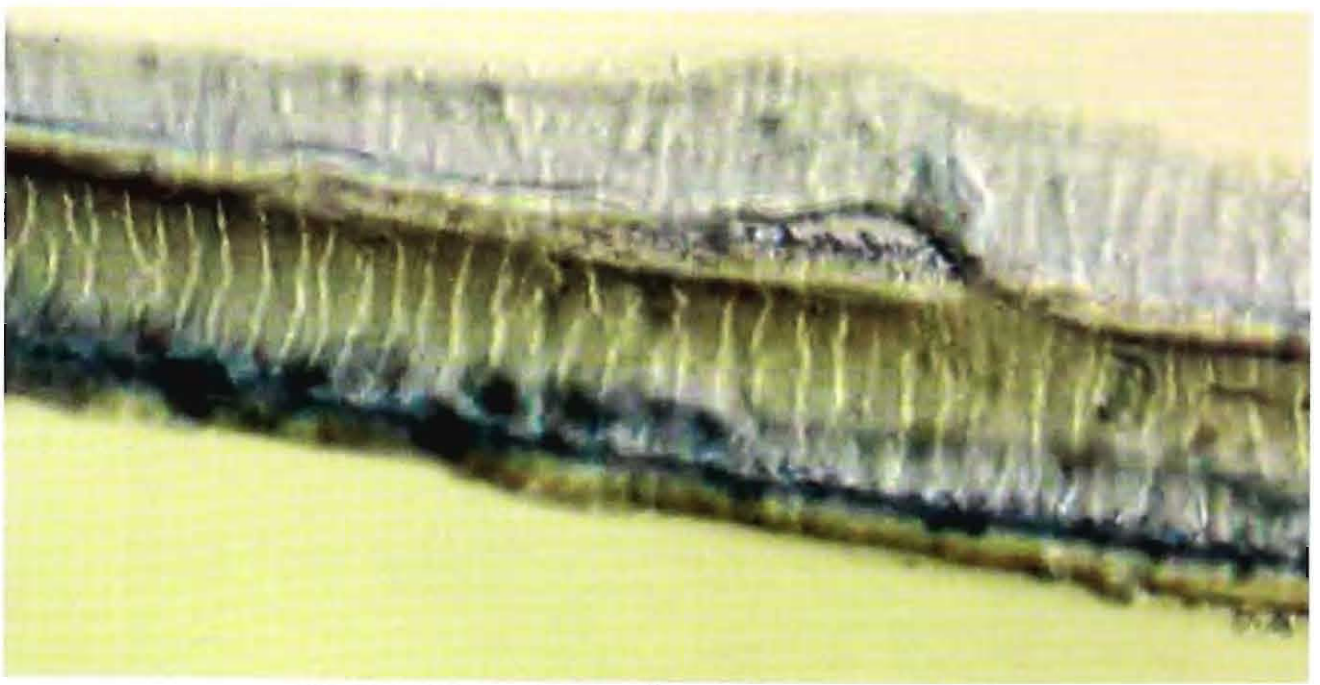
419. Medulla wide aeriform lattice 200x



420. Cross section reniform, large medulla 400x



421. Cuticular at distal 200x

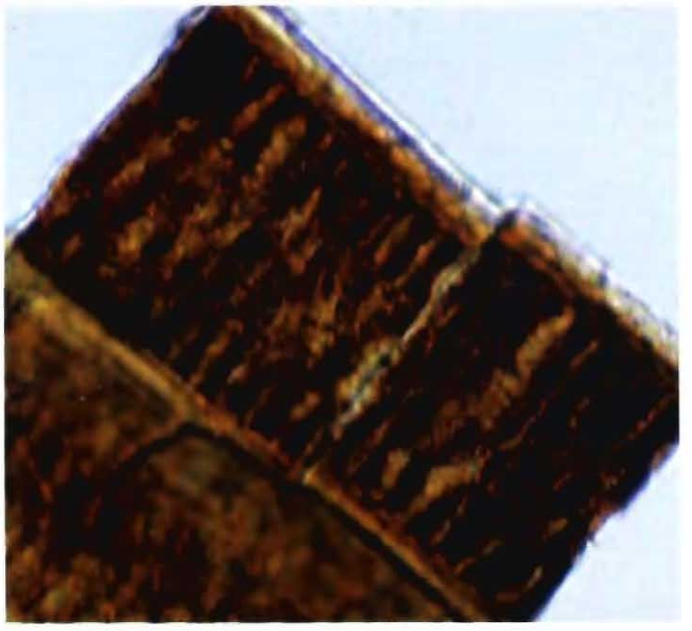


422. Cuticular at mid (regular wave, smooth, near) 200x

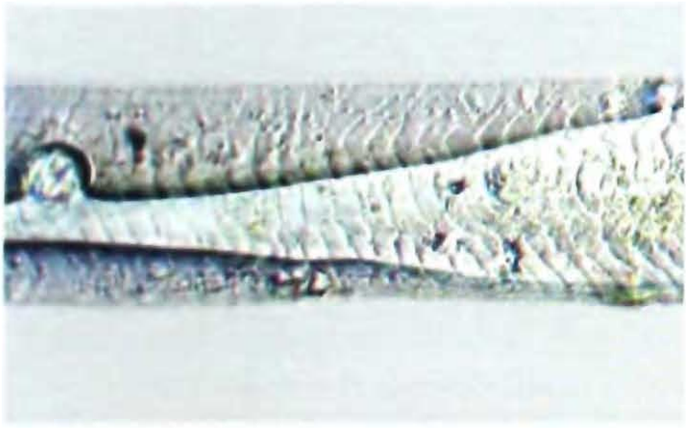
Dorsal



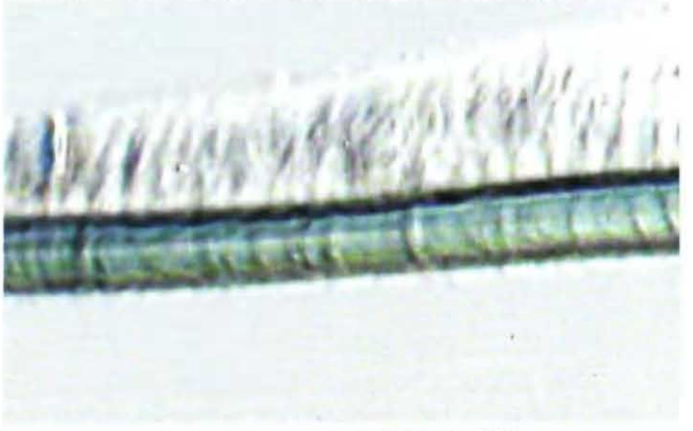
423. Medulla Multiserial ladder 400x



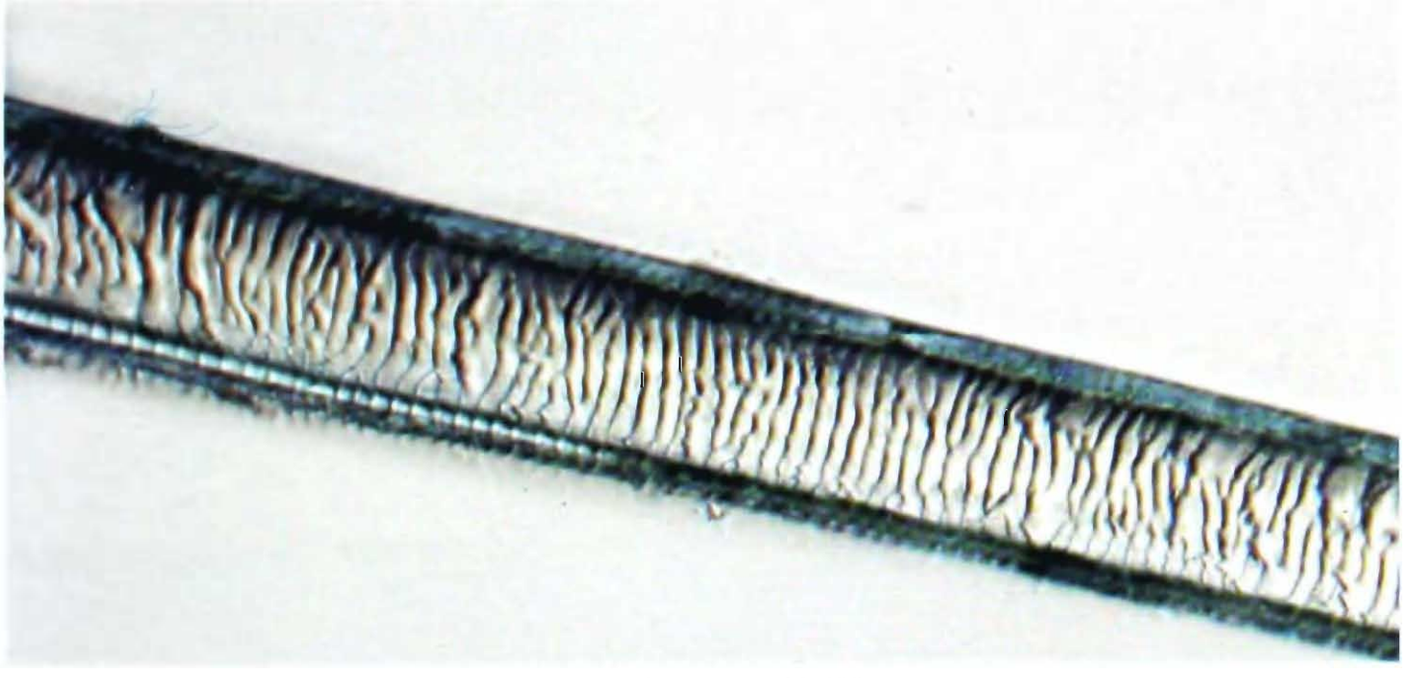
424. Cross section : concavoconvex, large 200x



425. Cuticular pattern regular wave, smooth, close 200x



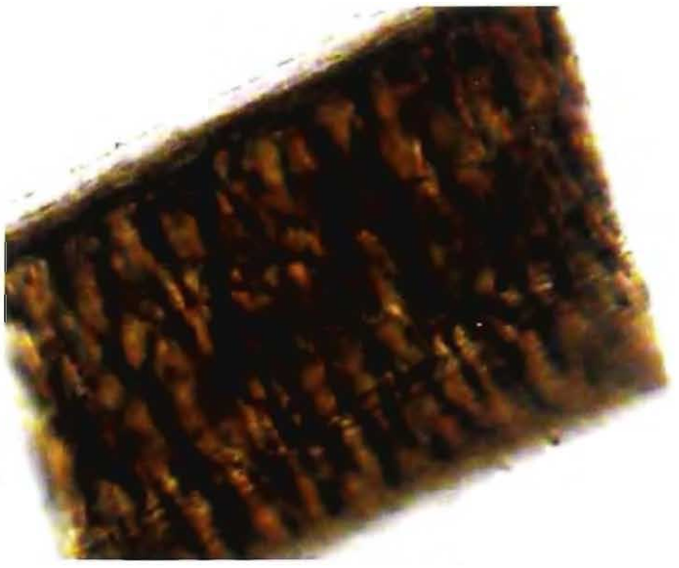
426. Cuticular at distal x400



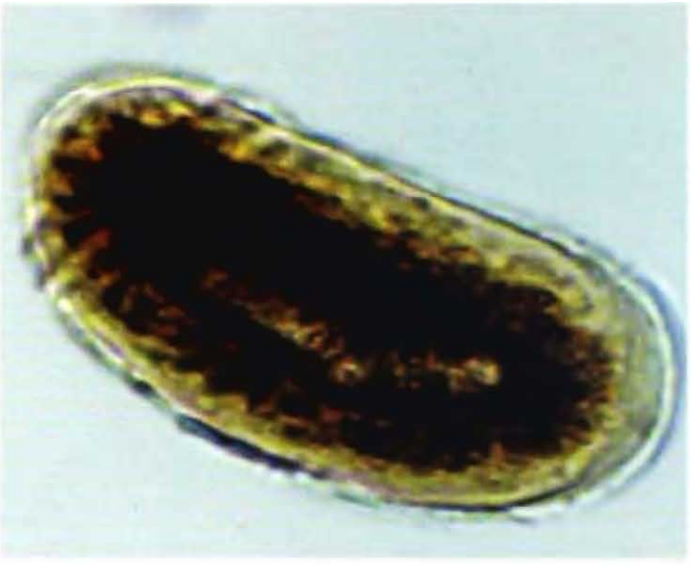
427. Cuticular at mid 400x

Plate 20b. ***Petaurista magnificus hodgsoni*** (Hodgson, 1836), Hodgsoni's flying squirrel

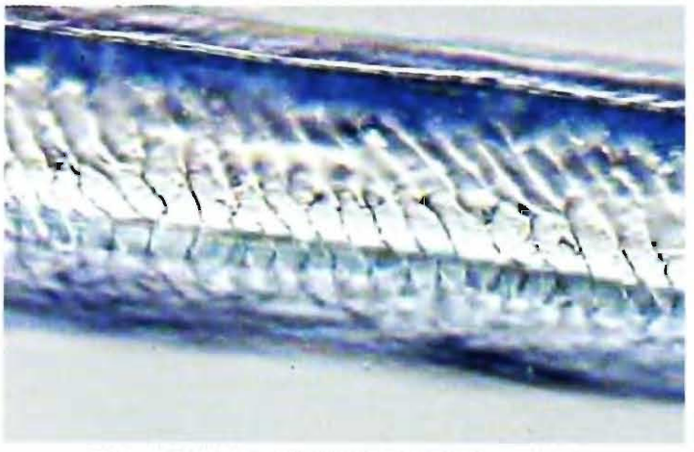
Ventral



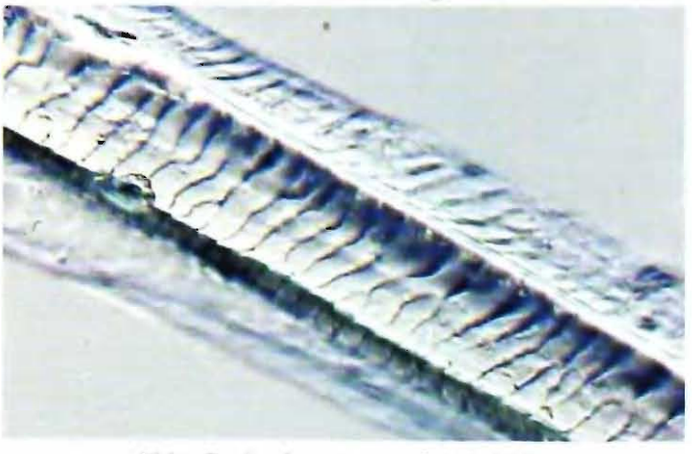
428. Medulla : wide aeriform lattice 200x



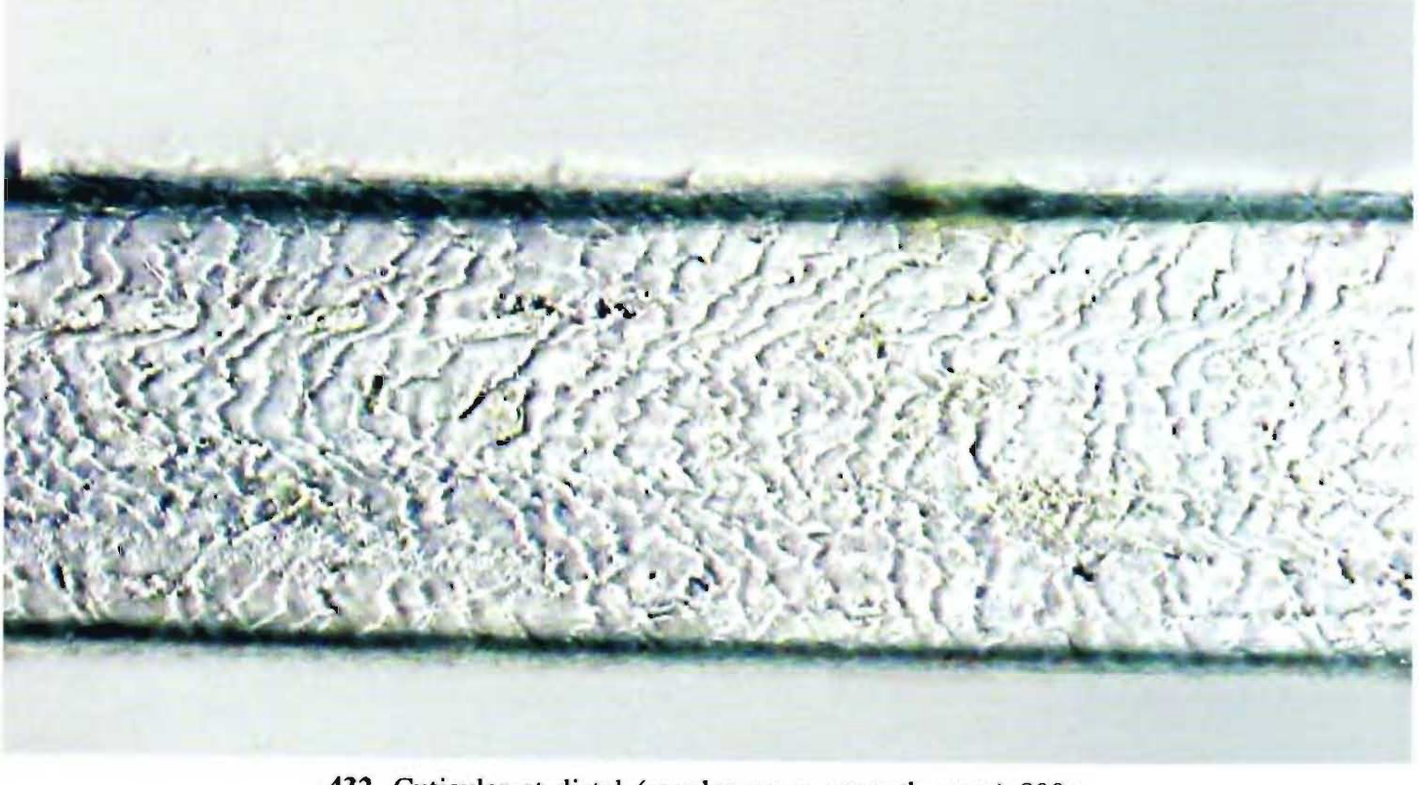
429. Cross section reniform, large medulla 400x



430. Medulla wideaeriform lattice 200x



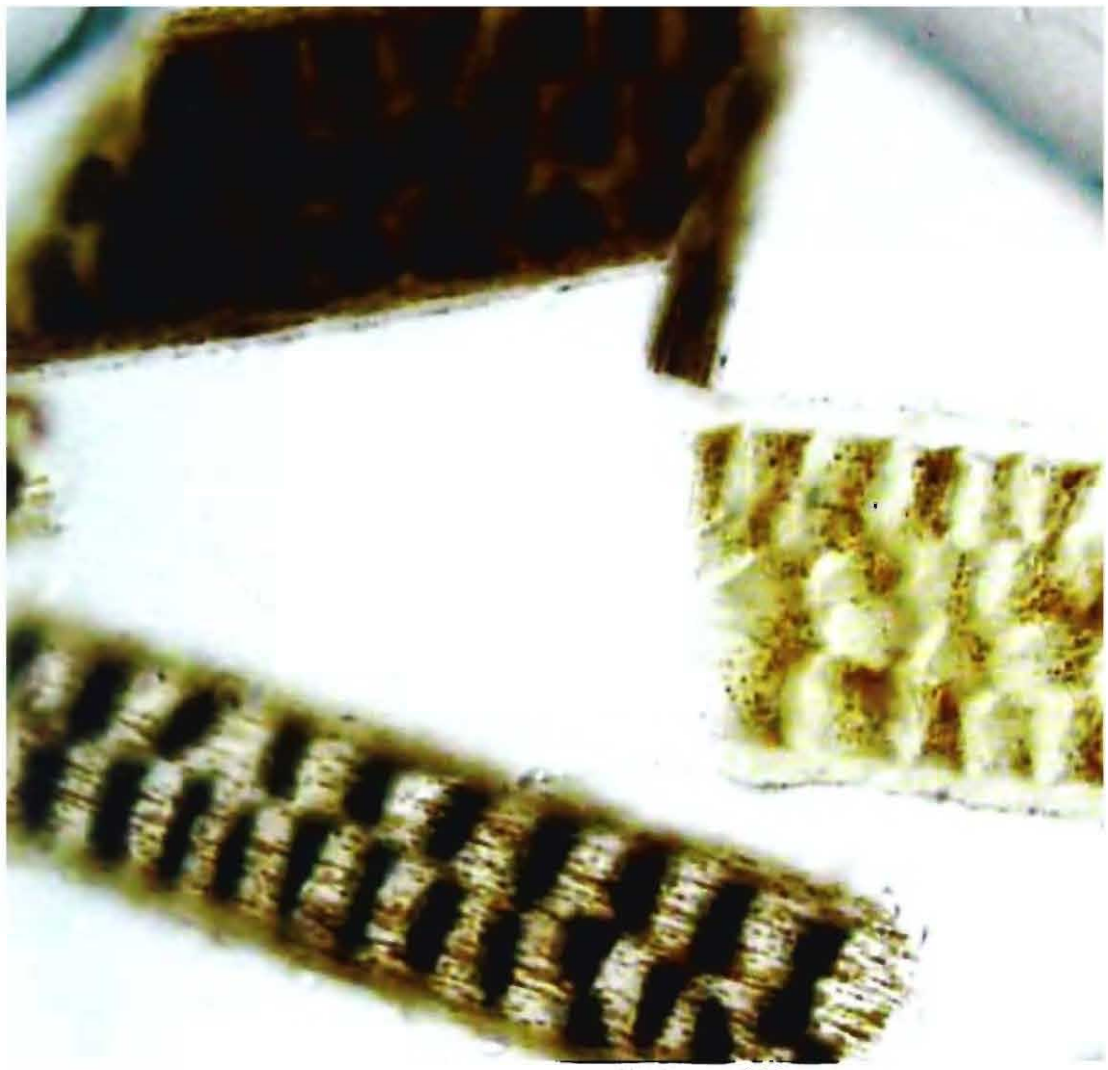
431. Cuticular at proximal 200x



432. Cuticular at distal (regular wave, smooth, near) 800x

Plate 20c. ***Petaurista magnificus hodgsoni*** (Hodgson, 1836), Hodgsoni's flying squirrel

Head



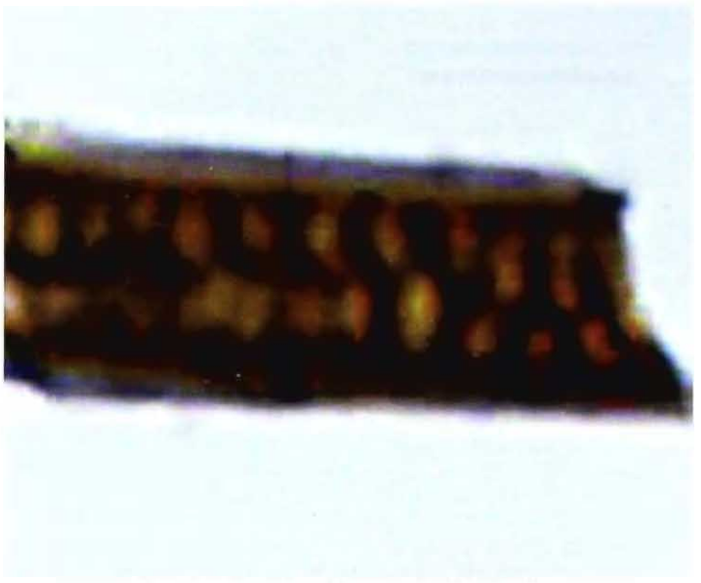
433. Medulla wide medulla latice 800x



434. Cross section 800x

Plate 20d. ***Petaurista magnificus hodgsoni*** (Hodgson, 1836), Hodgsoni's flying squirrel

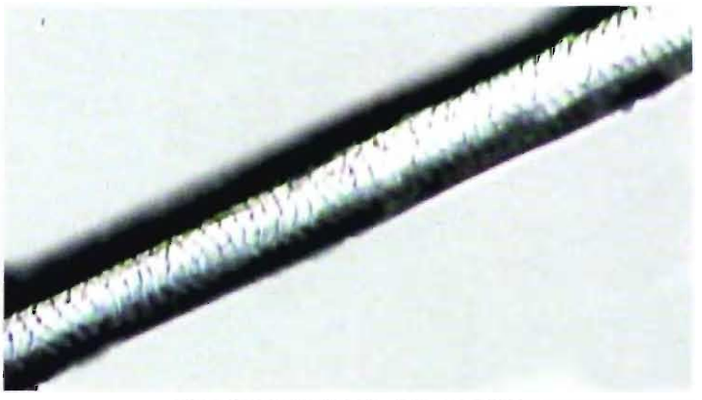
Tail



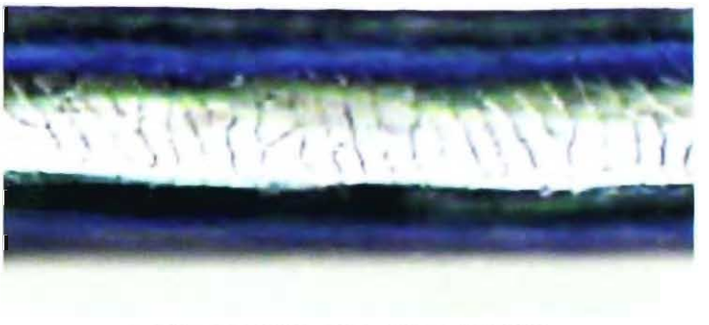
435. Medulla wide medulla lattice



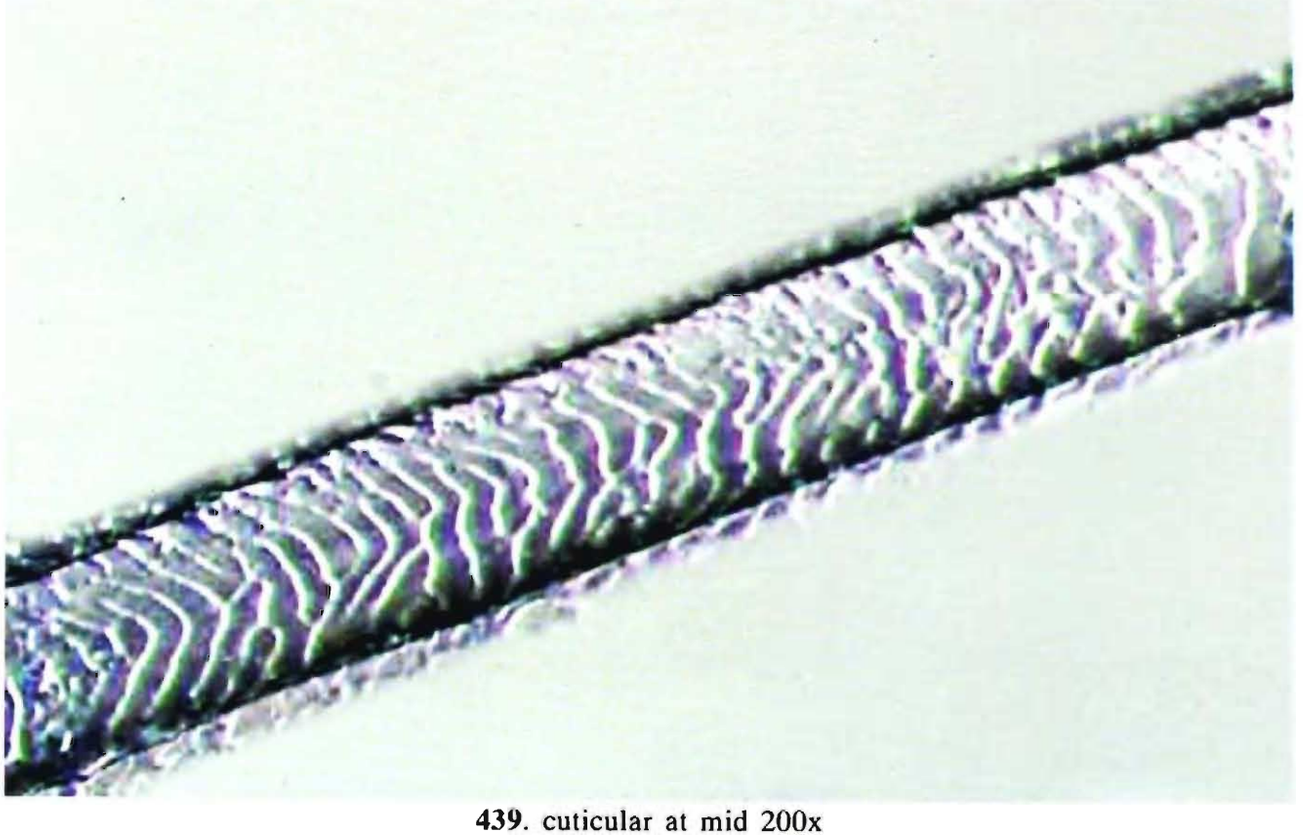
436. Cross section oblong, large medulla 200x



437. Cuticular at distal 200x



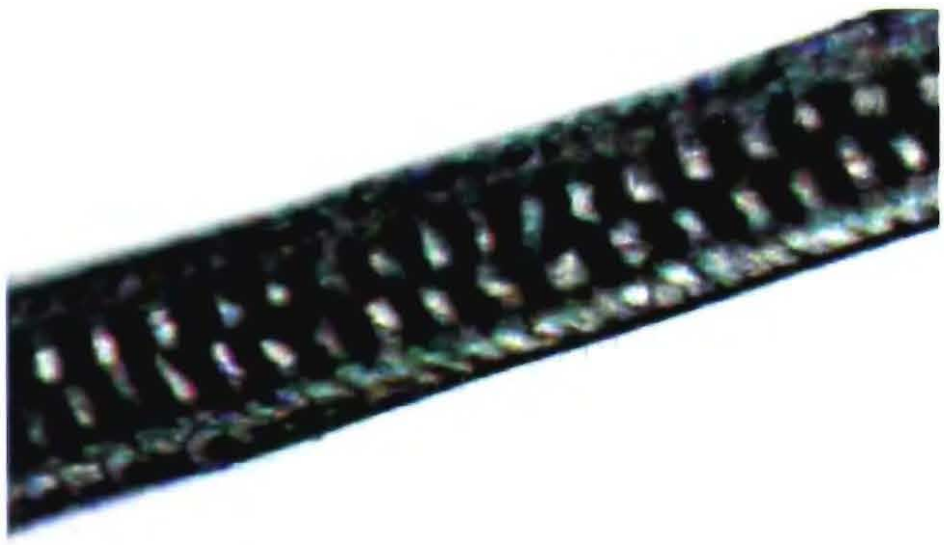
438. Cuticular at proximal 200x



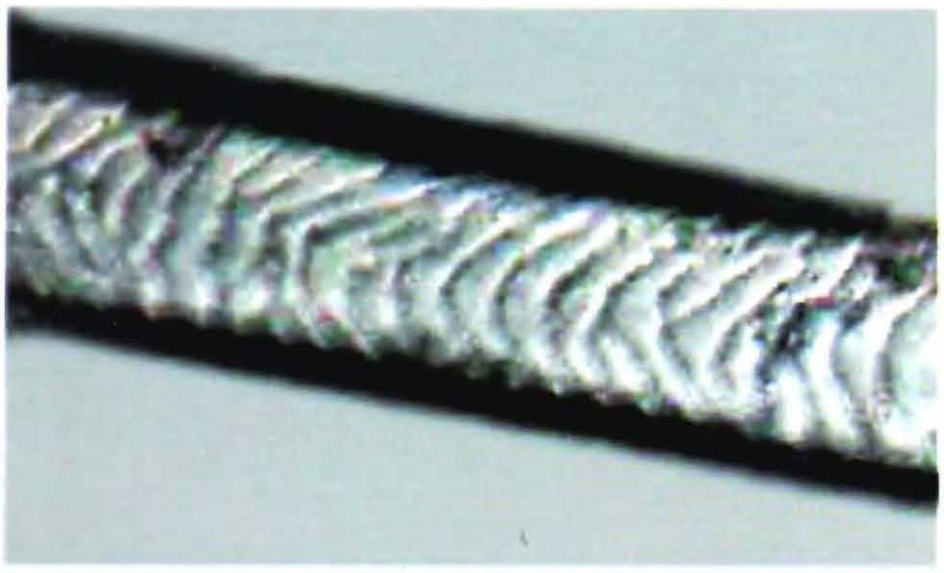
439. cuticular at mid 200x

Plate 21a. ***Petarista nobilis singheri*** (Gray)

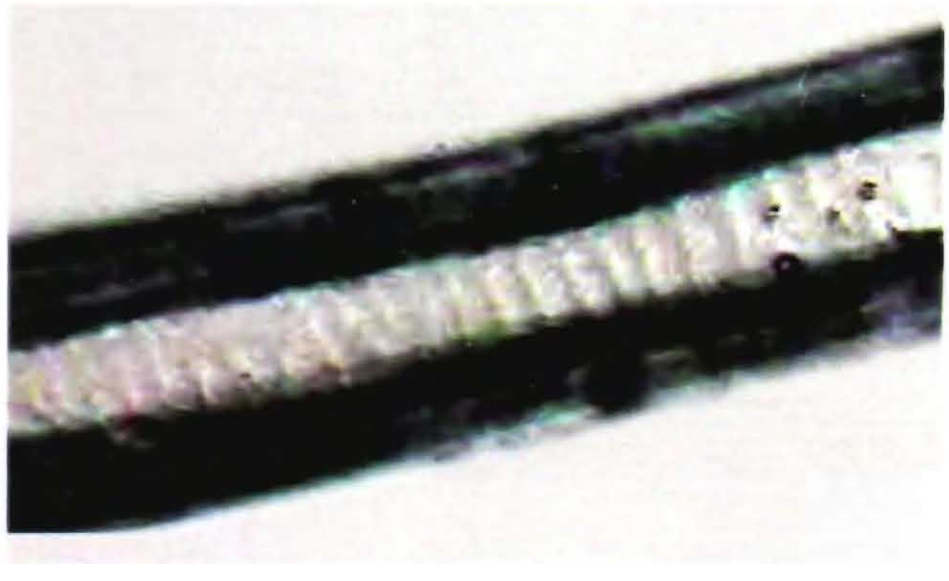
Dorsal



440. Medulla multiserial ladder 200x

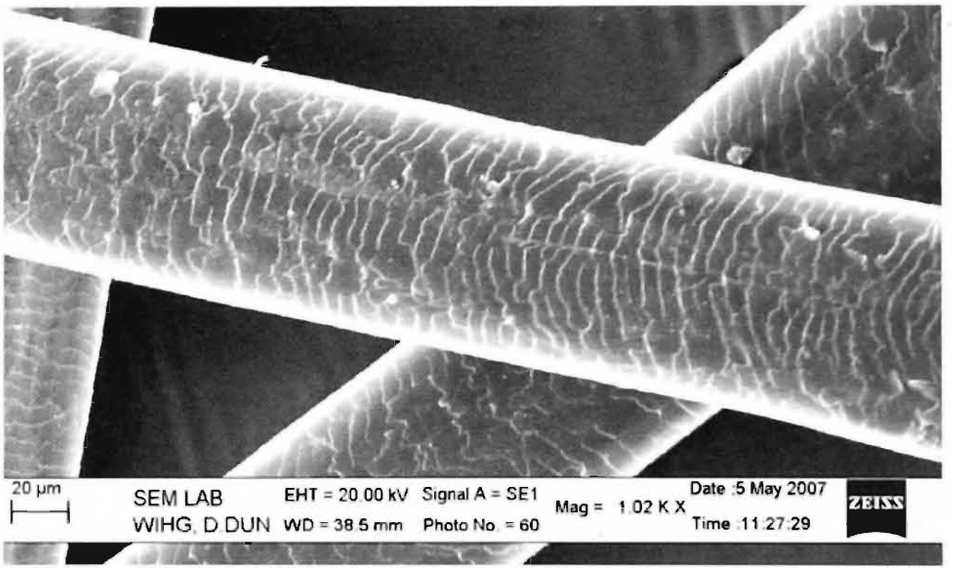


441. Multiserial ladder 200x

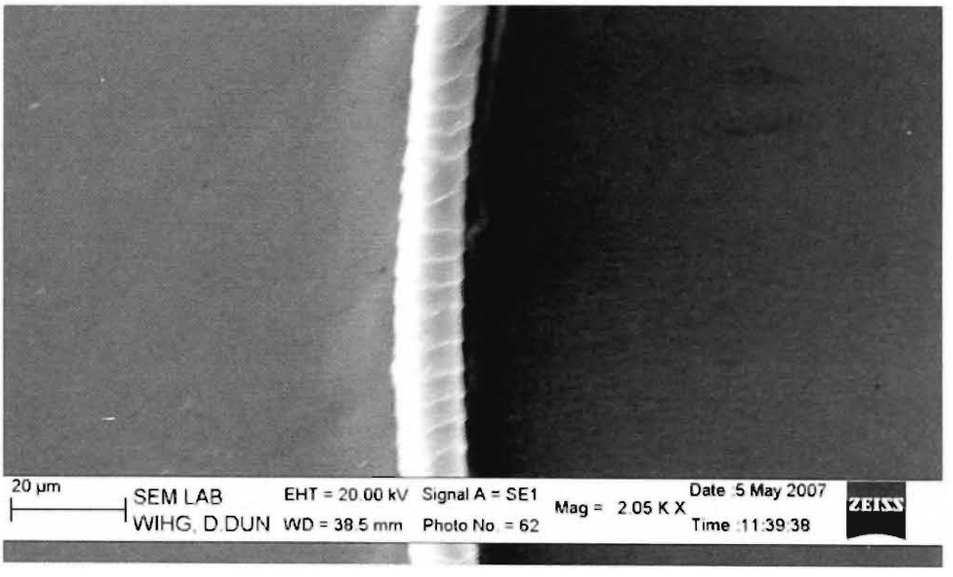


442. Cuticular at mid single chevron, smooth, close 200x

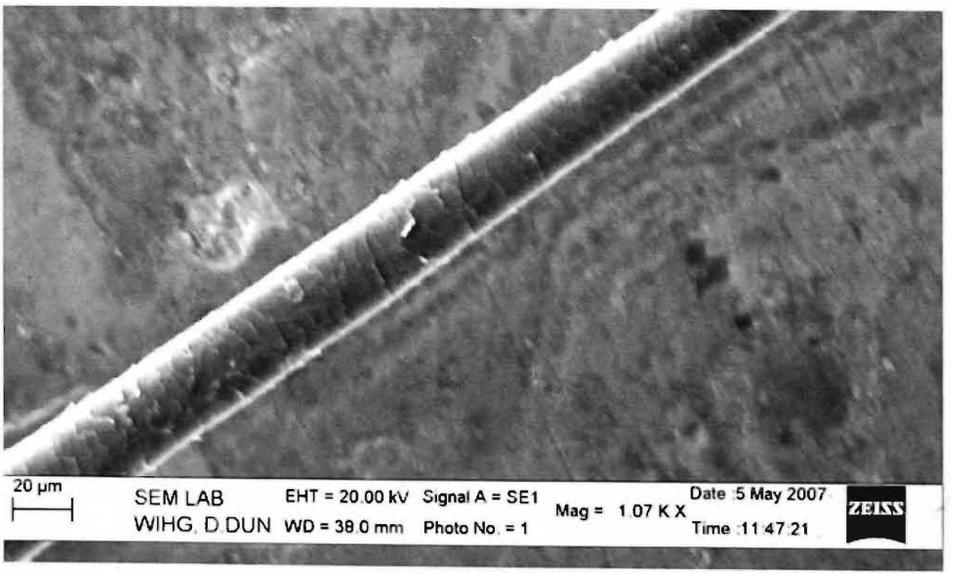
Scanning Electron Micrographs
(Cuticular architecture)



443. At mid



444. At distal



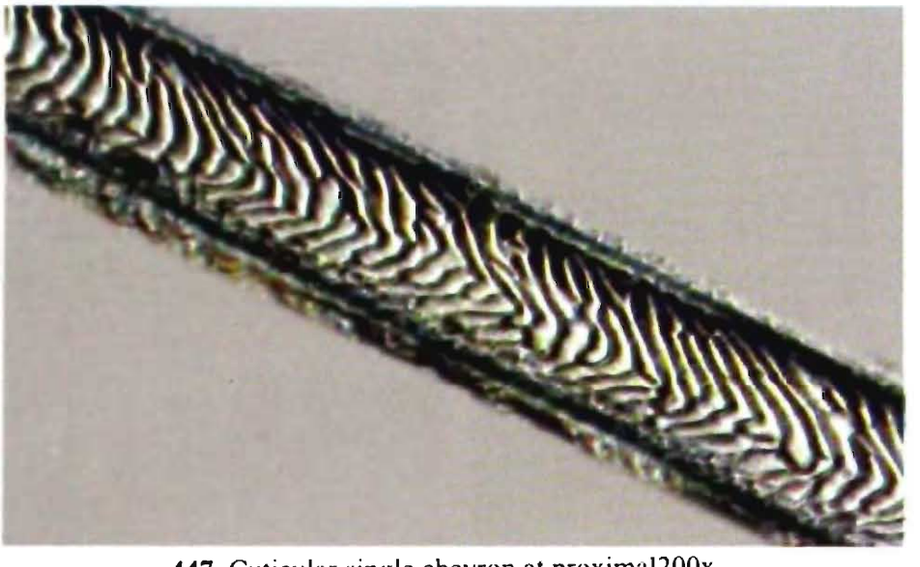
445. At proximal

Plate 21b. ***Petarista nobilis singheri*** (Gray)

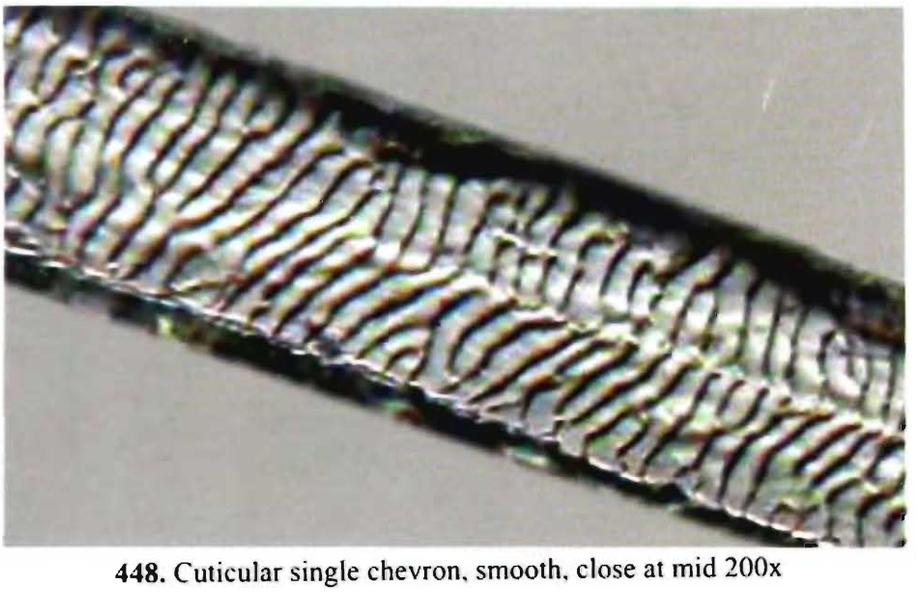
Ventral



446. Cuticular single chevron at distal 200x



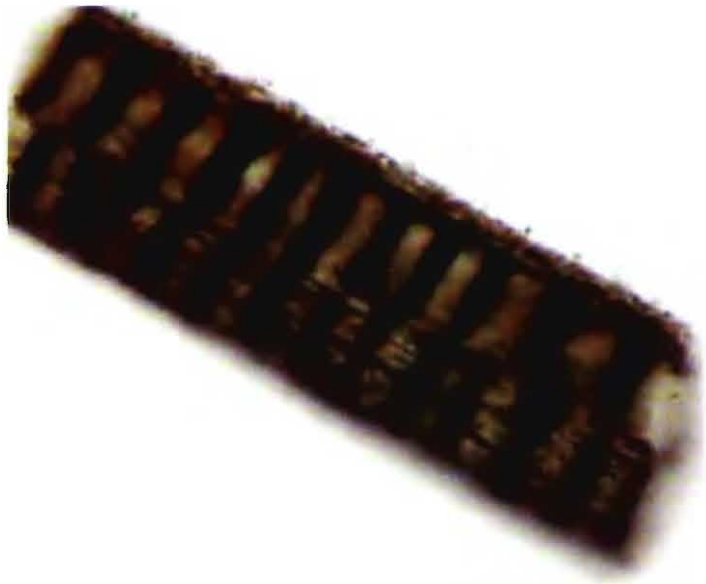
447. Cuticular single chevron at proximal200x



448. Cuticular single chevron, smooth, close at mid 200x

Plate 21c. ***Petarista nobilis singheri*** (Gray)

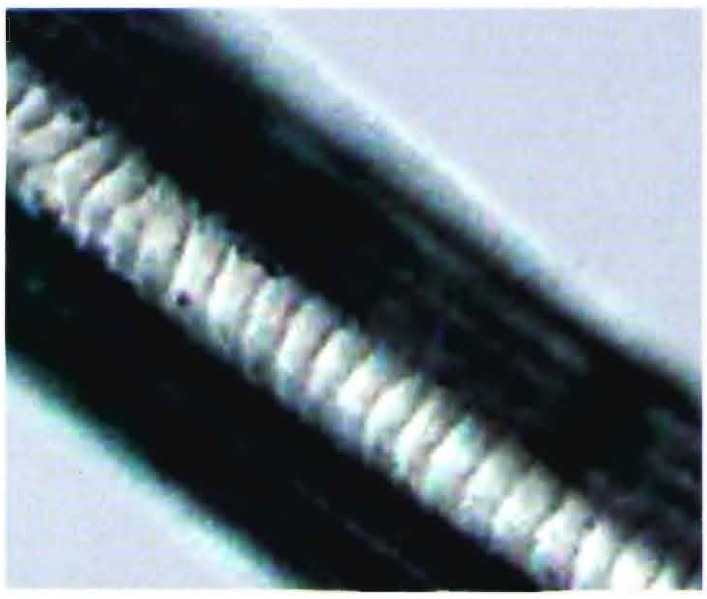
Head



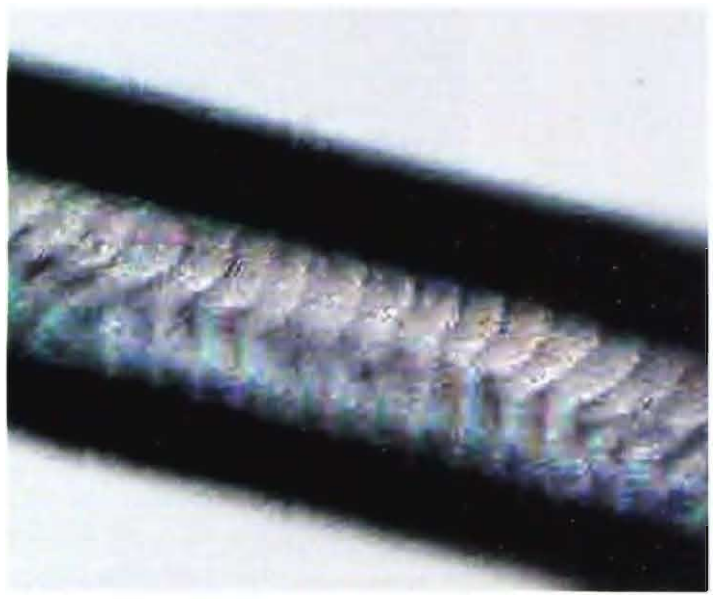
449. Medulla multiserial ladder 200x



450. Cross section reniform 200x



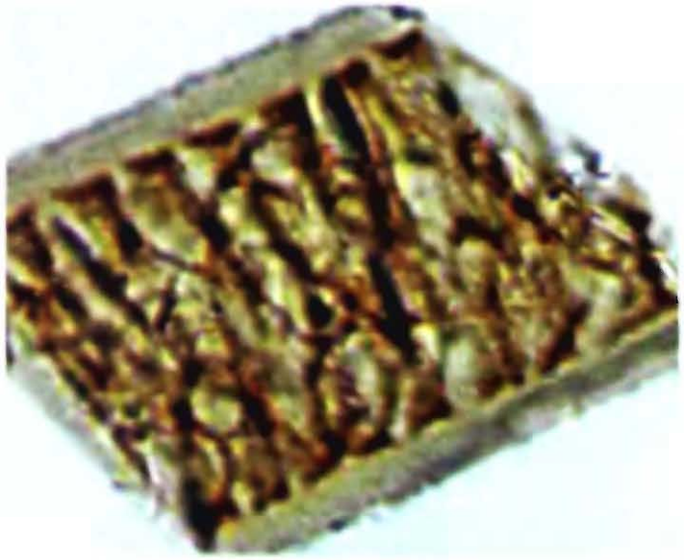
451. Cuticular at distal 200x



452. Cuticular at mid single chevron 400x

Plate 21d. ***Petarista nobilis singheri*** (Gray)

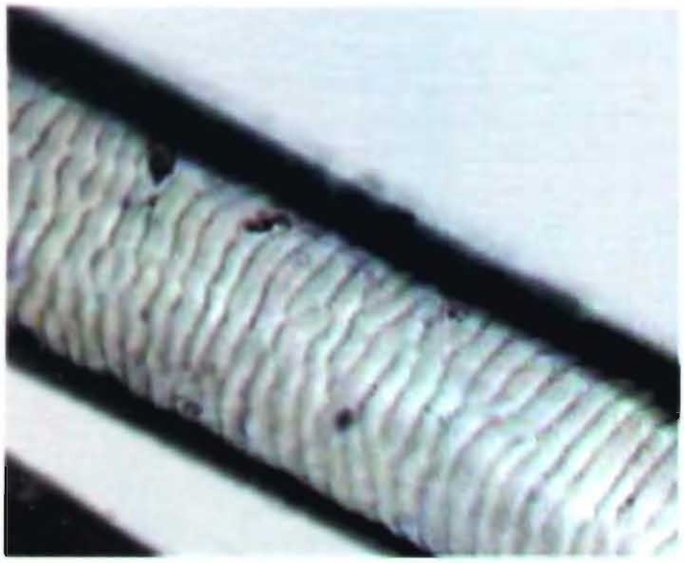
Tail



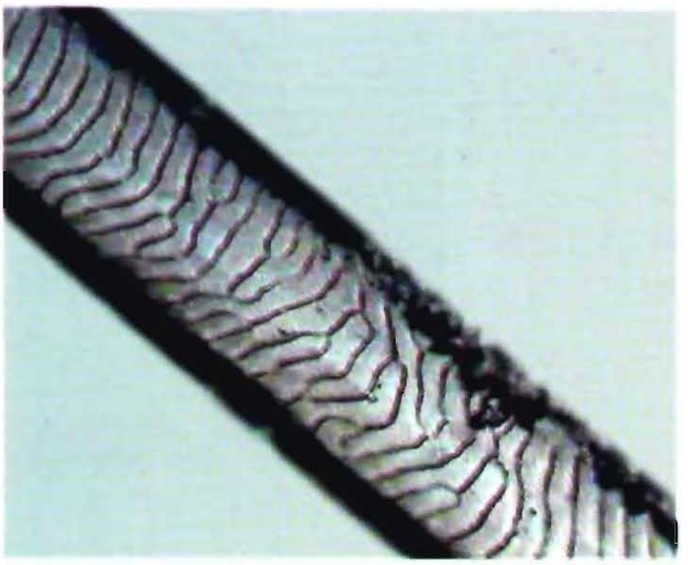
453. Medulla wide medulla lattice 400x



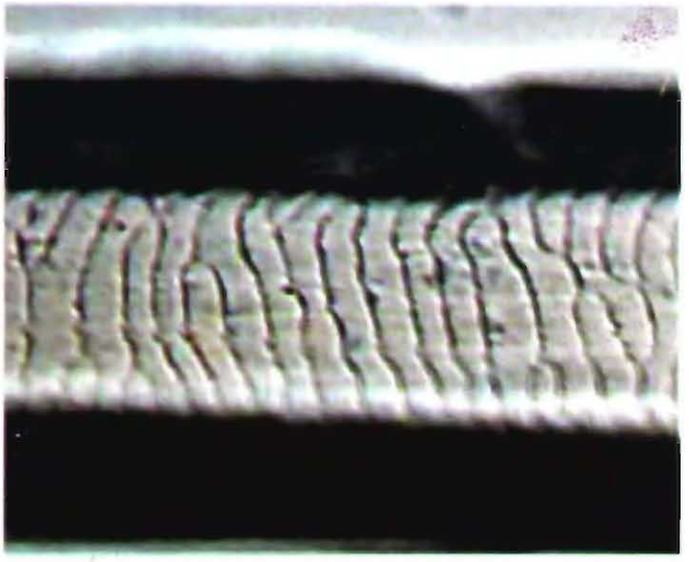
454. Cross eection circular 200x



455. Cuticular at mid regular wave, smooth, close 200x



456. Cuticular at distal single chevrn 200x



457. Cuticular at mid 200x

Plate 22a. ***Petaurista philippensis*** (Elliot, 1839) Indian Giant Flying squirrel

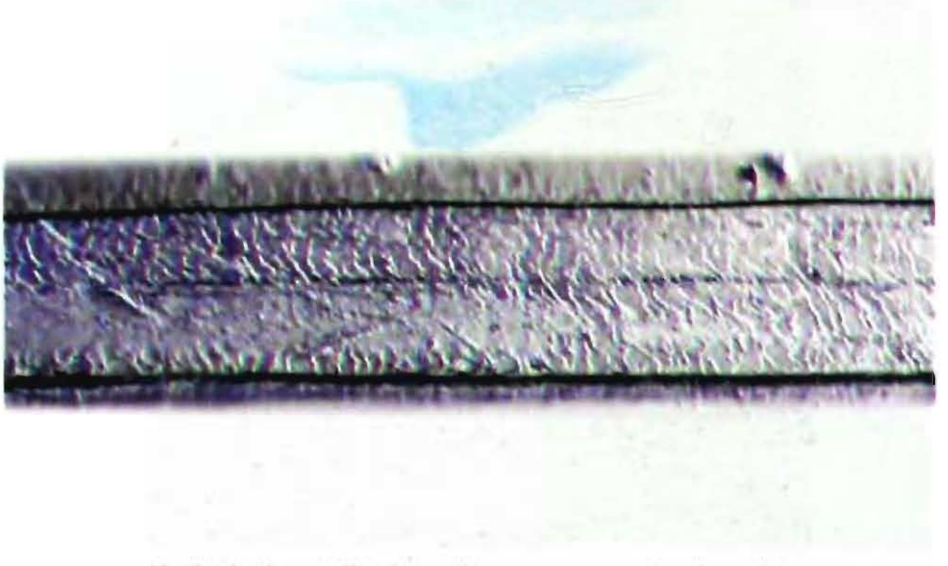
Dorsal



458. Medulla multiserial 200x

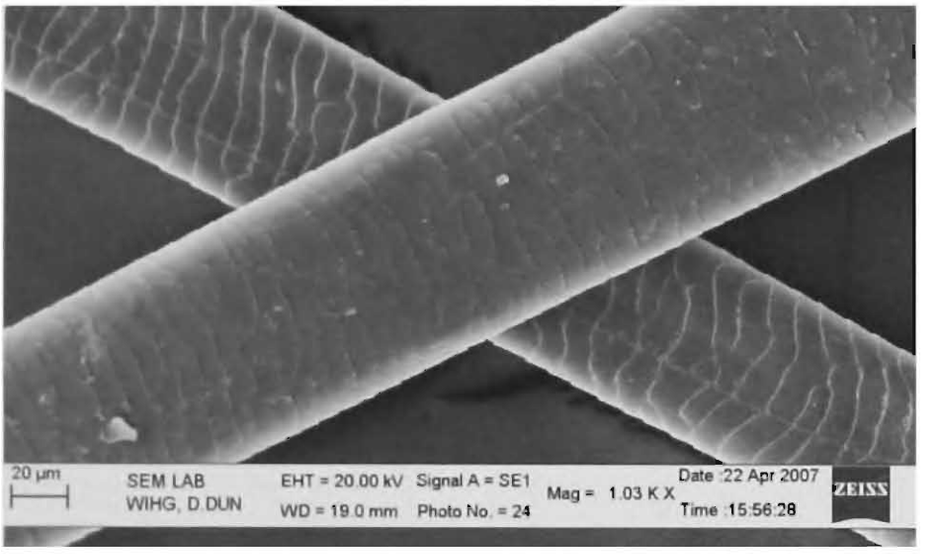


459. Cuticular at mid irregular wave, rippled, close 400x

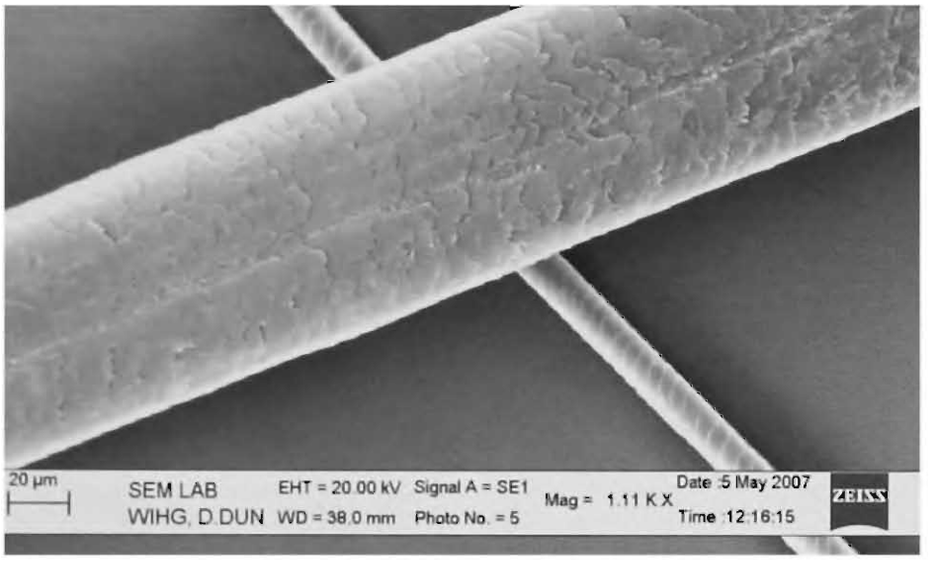


460. Cuticular at distal regular wave, smooth, close 400x

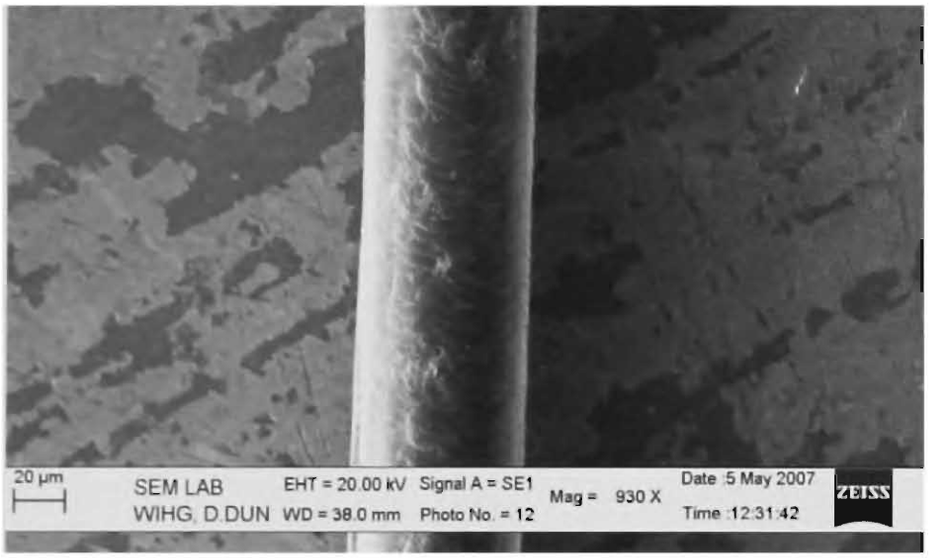
Scanning Electron Micrographs
(Cuticular architeture)



461. At mid



462. At mid and distal



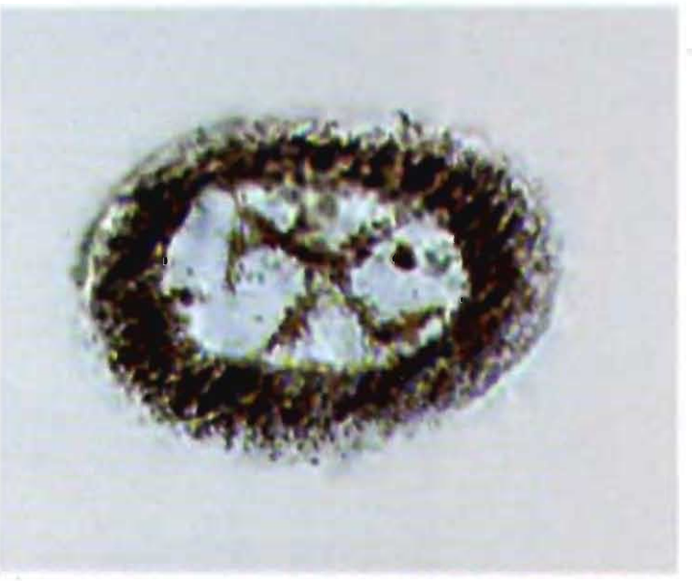
463. At proximal

Plate 22b. ***Petaurista philippensis*** (Elliot, 1839) Indian Giant Flying squirrel

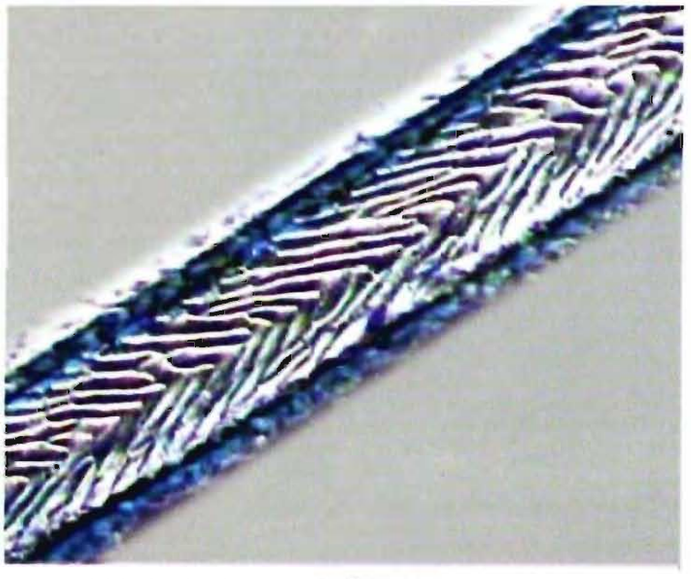
Ventral



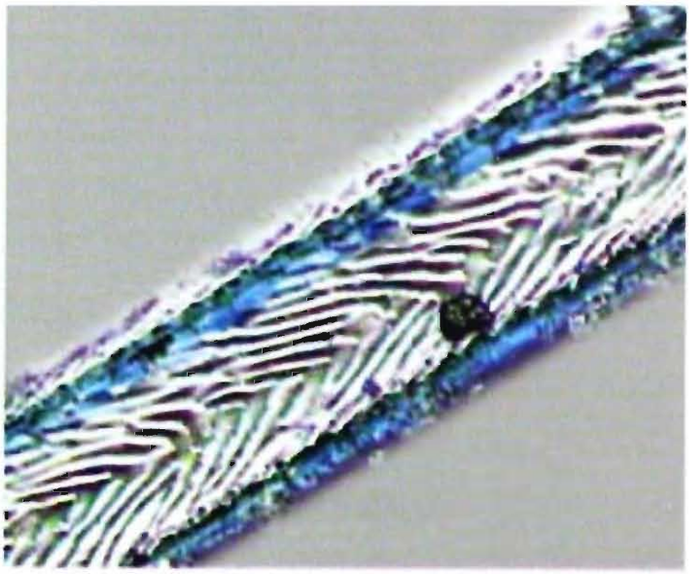
464. Medulla multiserial ladder 400x



465. Cross section oblong,large medulla 400x

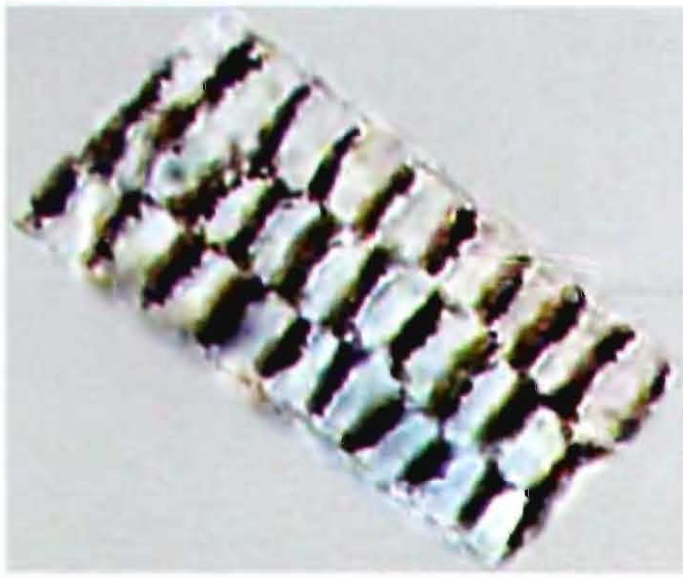


466. Cuticular single chevron at distal 200x

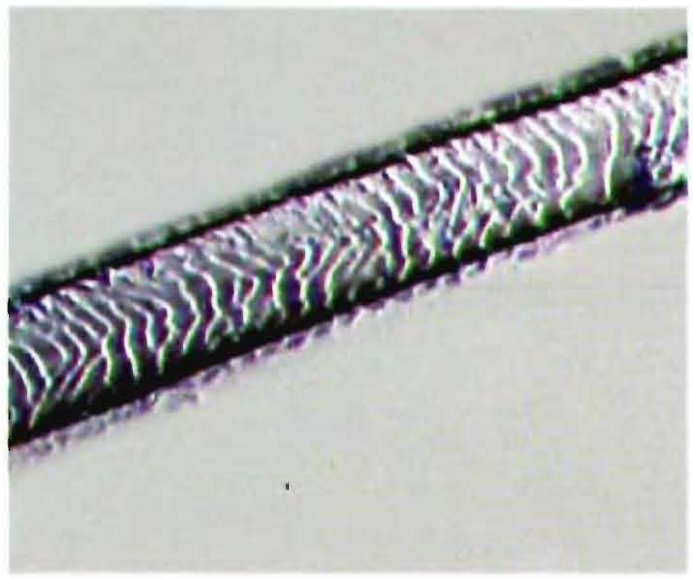


467. Cuticular single chevron at mid 200x

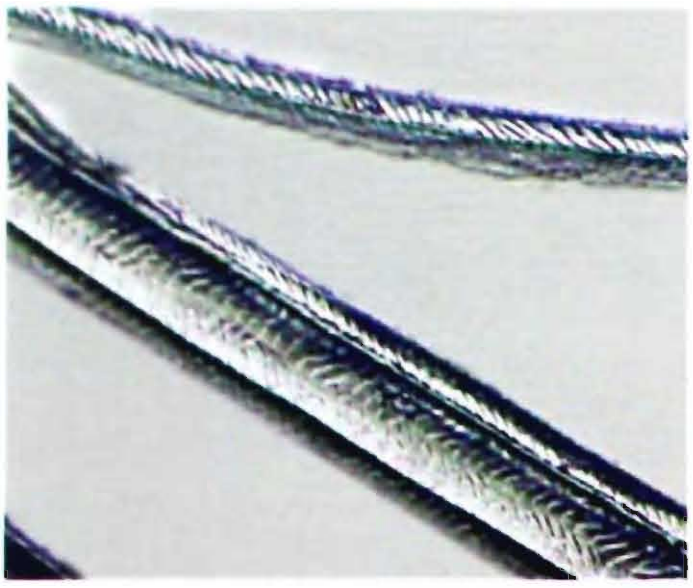
Head

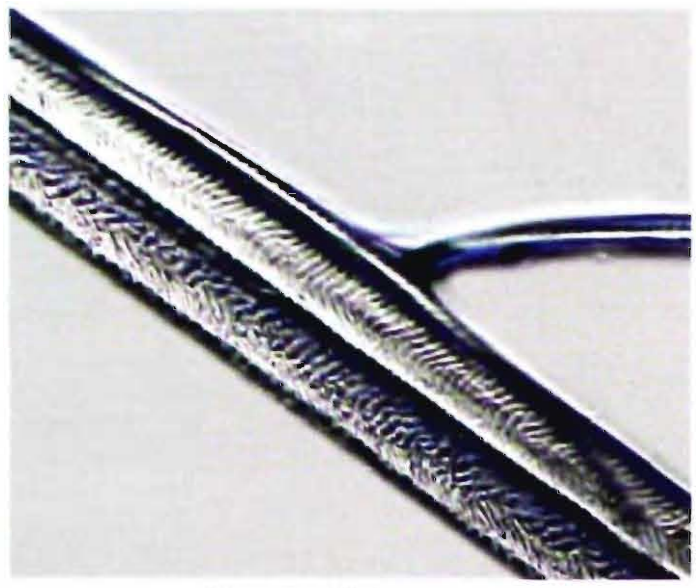


468. Medulla wmultiserial ladder 400x



469. Cuticular at mid single chevron, smooth, close 200x

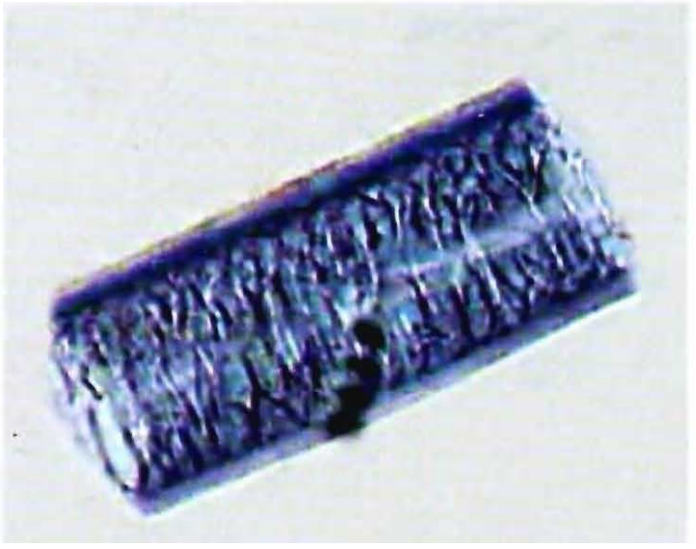




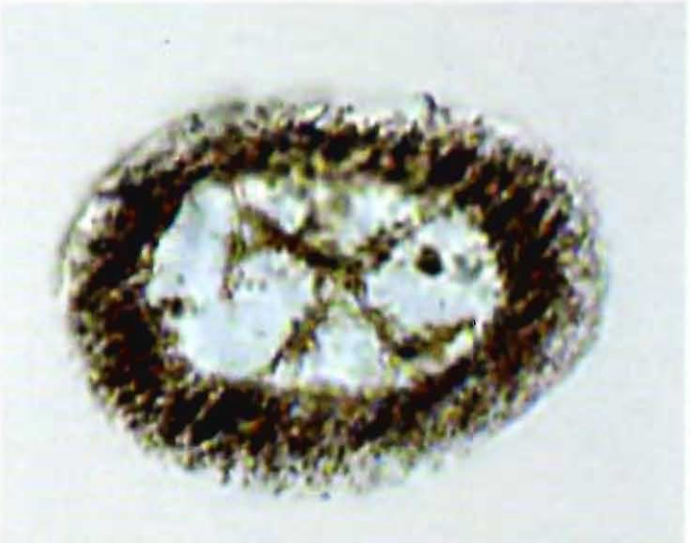
470, 471. Cuticular at mid single chevron, smooth, close throughout hair 200x

Plate 22d. ***Petaurista philippensis*** (Elliot, 1839) Indian Giant Flying squirrel

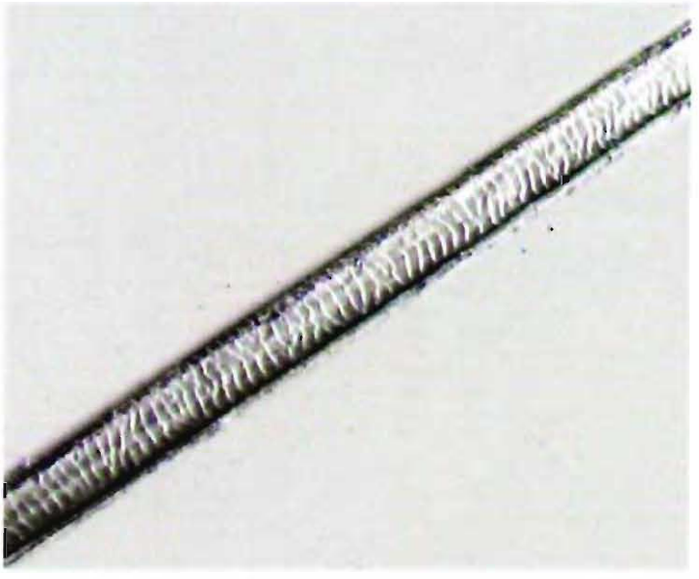
Tail



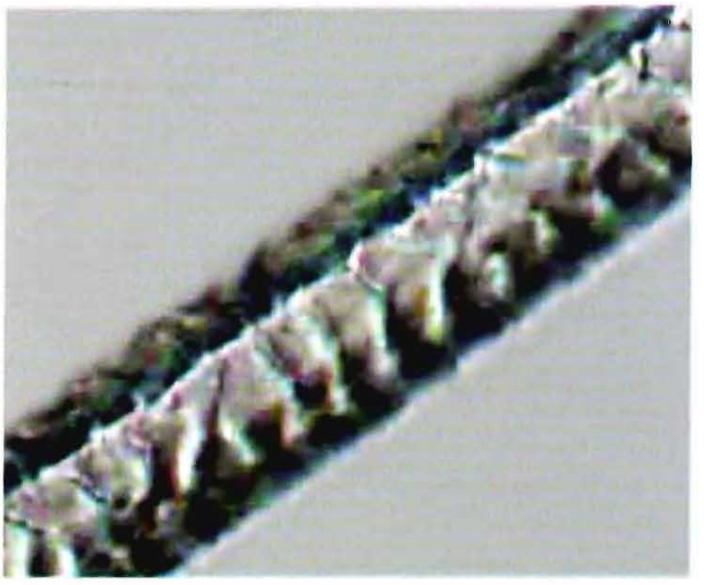
472. Medulla wide aeriform lattice 400x



473. Cross section oblong, large medulla 400x



474. Cuticular regular wave, smooth, near at mid 200x

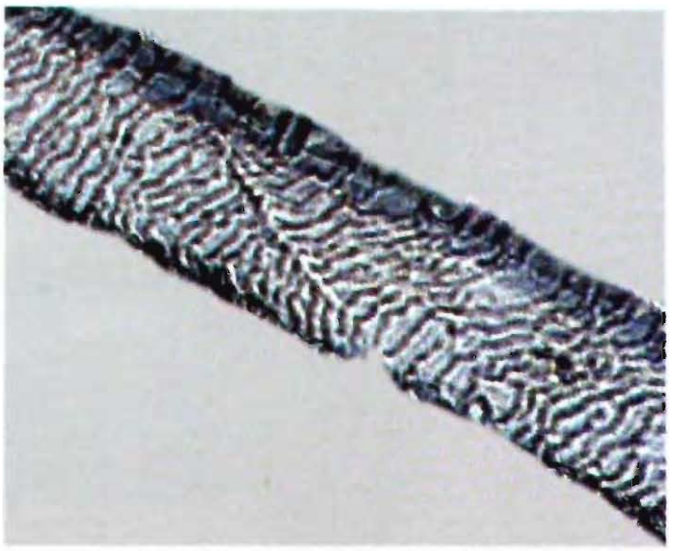


475. Cuticular regular wave, smooth, near at distal 200x

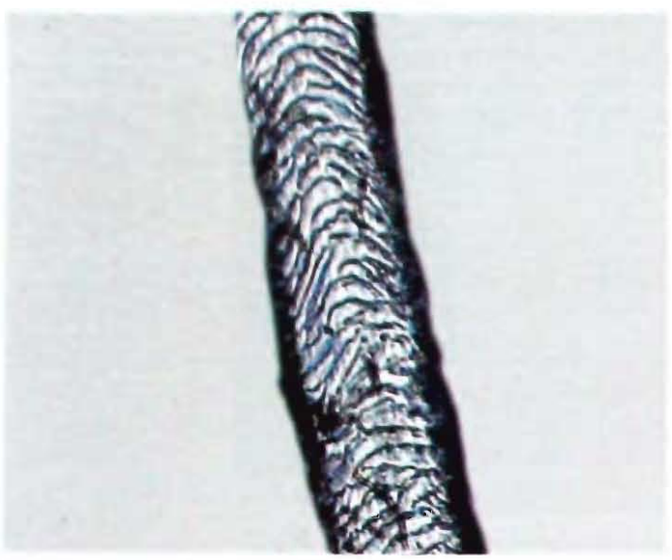
Plate 23. Photomicrographs of hair features of Five Stripped squirrel (light microscopy)



476. Medulla type as seen in hair from all body regions from all body regions



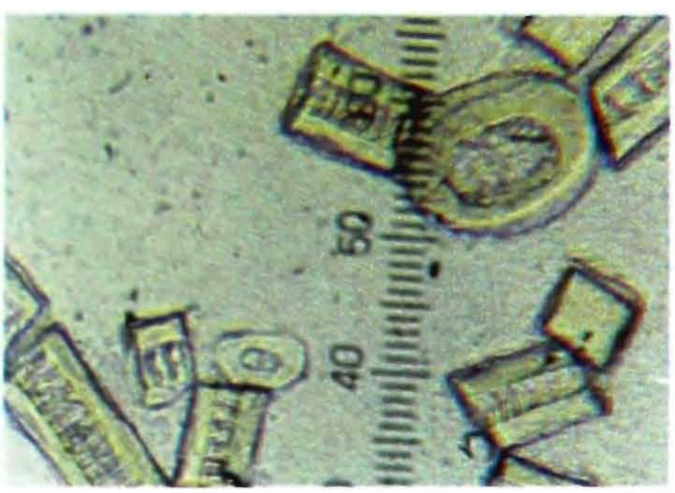
477. Cuticular pattern (at mid) dorsal hair

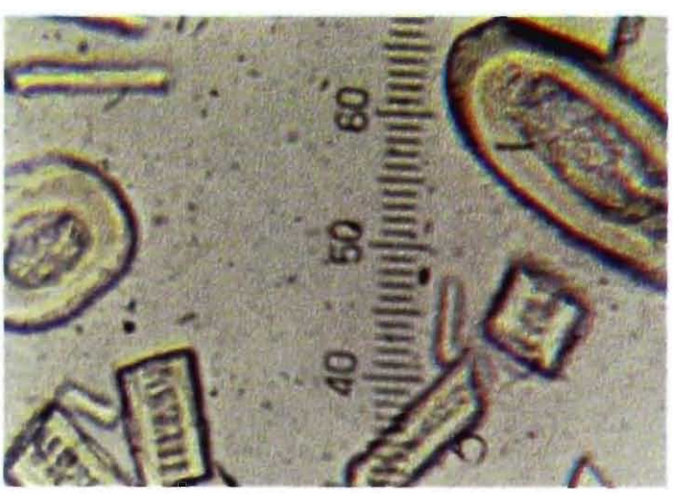


478. Cuticular pattern (at mid) of hair hair from ventral region



479. Cuticular pattern (at mid) of from head region





480. Cross sections of hair (oblong shape) and L.S. of medulla as observed from different body regions

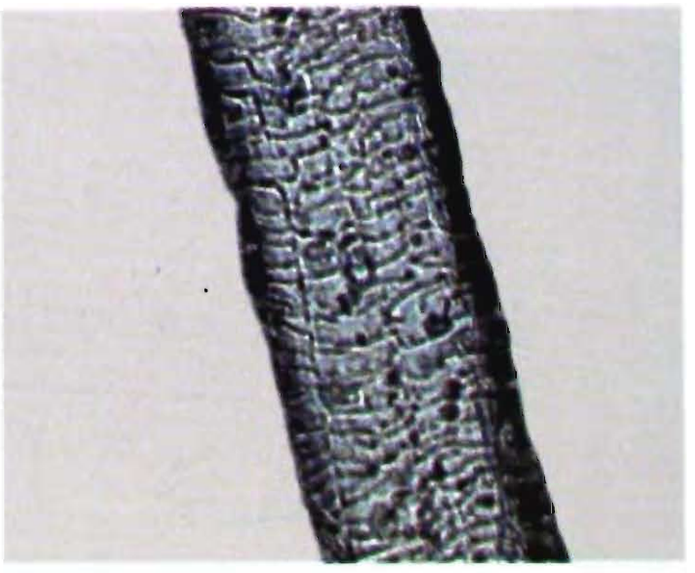
Plate 24. Photomicrographs of hair features of Red Giant Flying Squirrel (Light microscope)



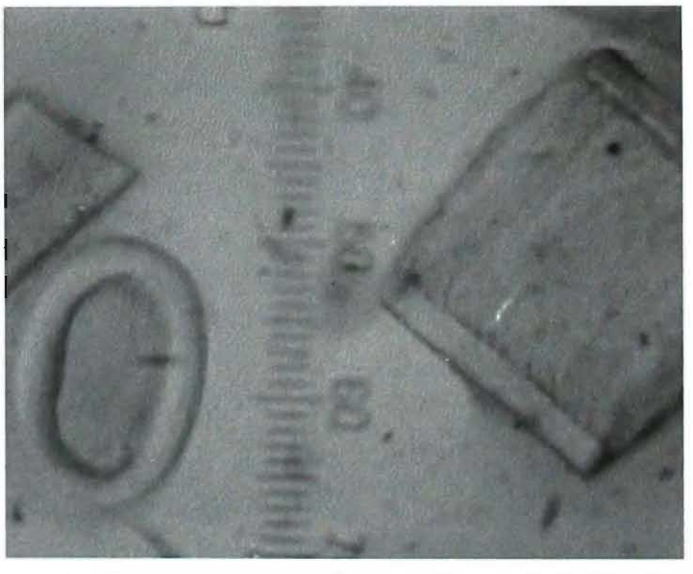
481. Medulla type



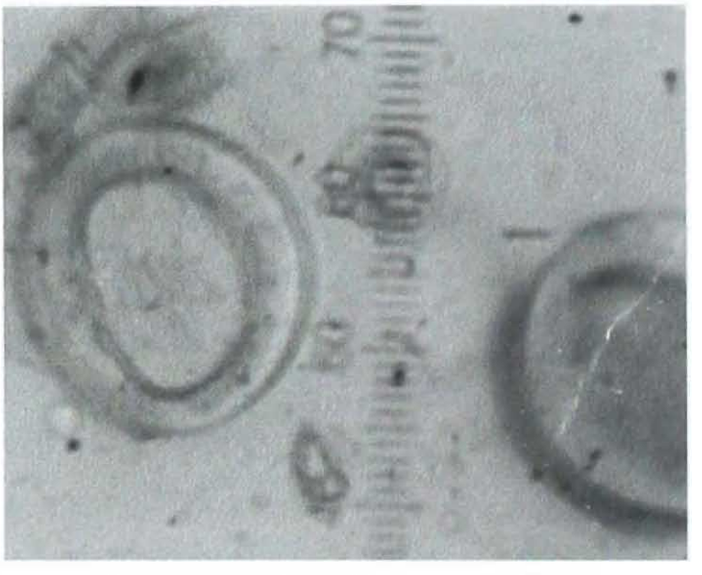
482. Cuticular pattern at distal



483. Cuticular pattern type at mid region as observed from ventral region

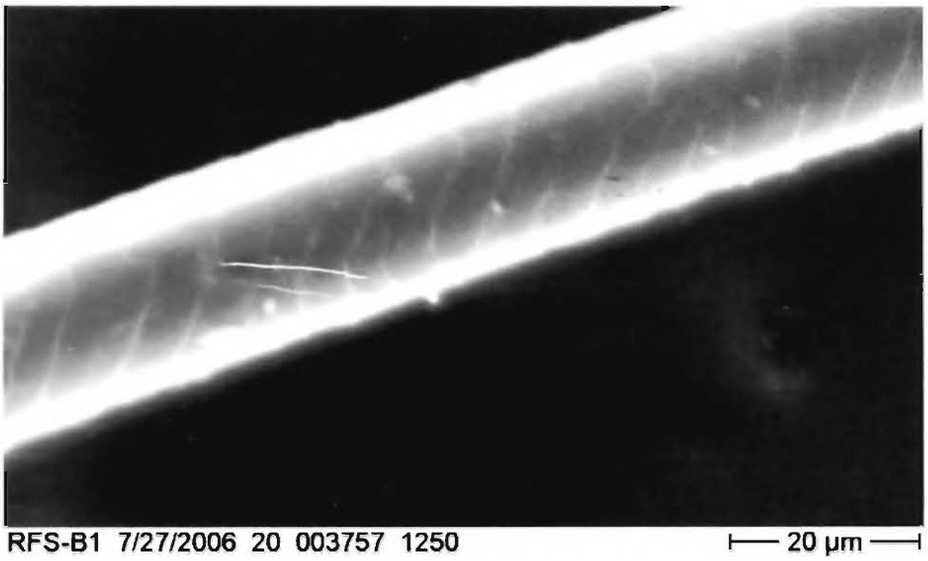


484. Cross section (reniform) and L.S. of medulla

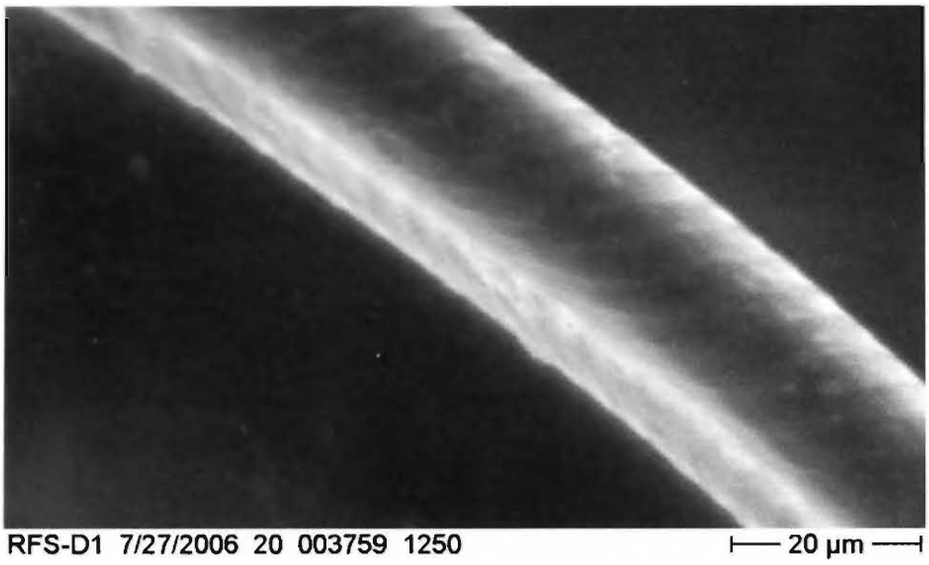


485. Cross section (oblong and reniform)

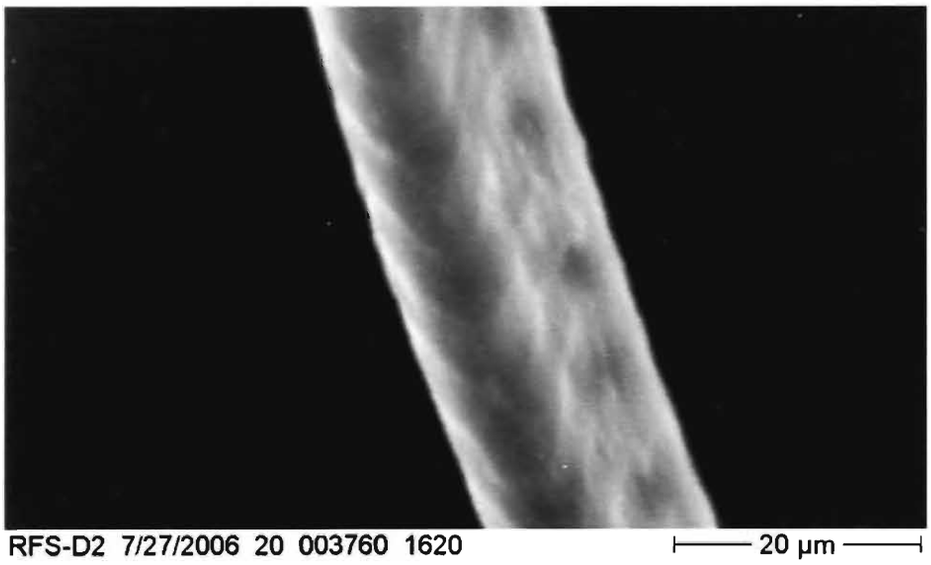
Plate 25. Scanning Electron Micrographs of hair of Red Giant Flying squirrel (Ventral and Dorsal)



486. Ventral (towards distal)

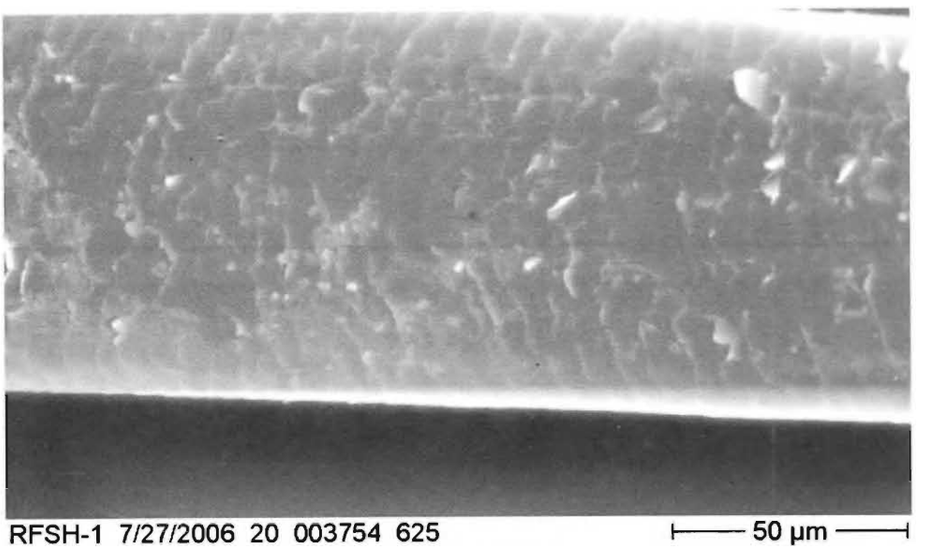


487. Dorsal (towards proximal)

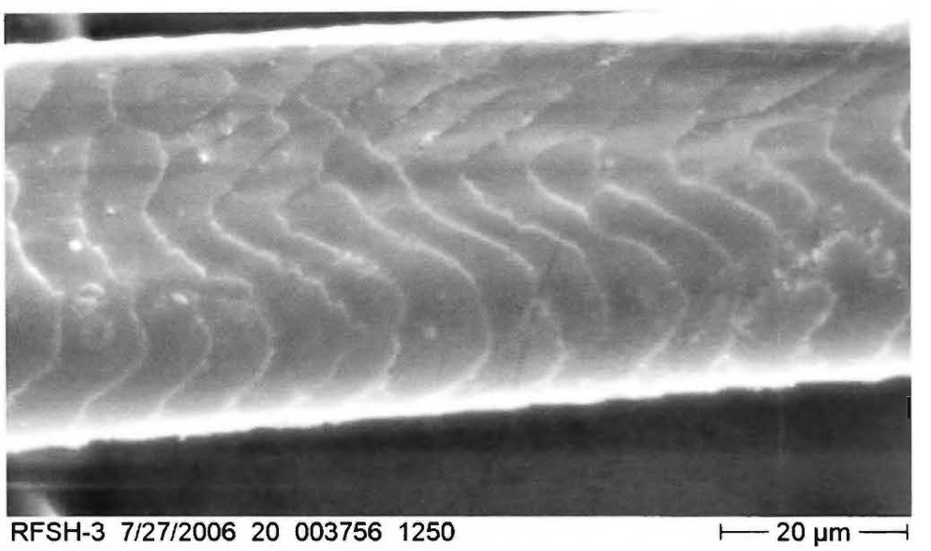


488. Dorsal (mid)

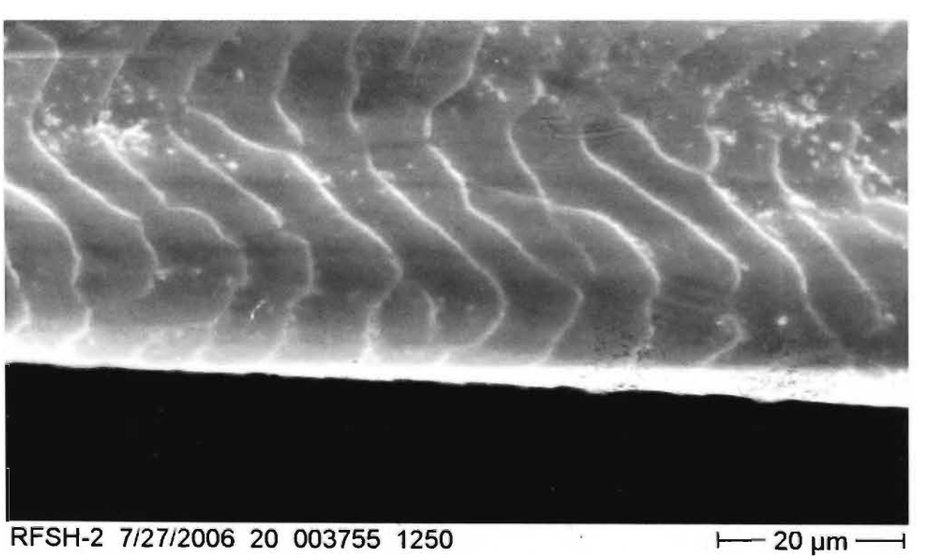
Plate 26. Scanning Electron Micrographs of hair from head region



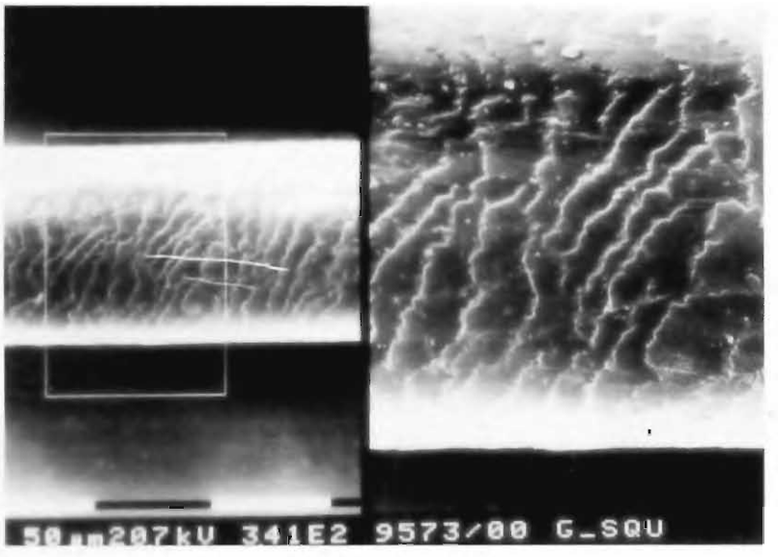
489. At proximal



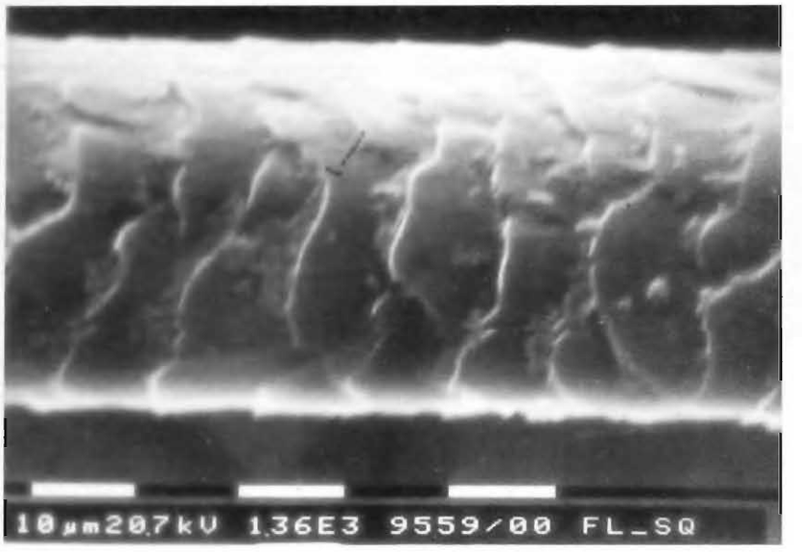
490. At distal



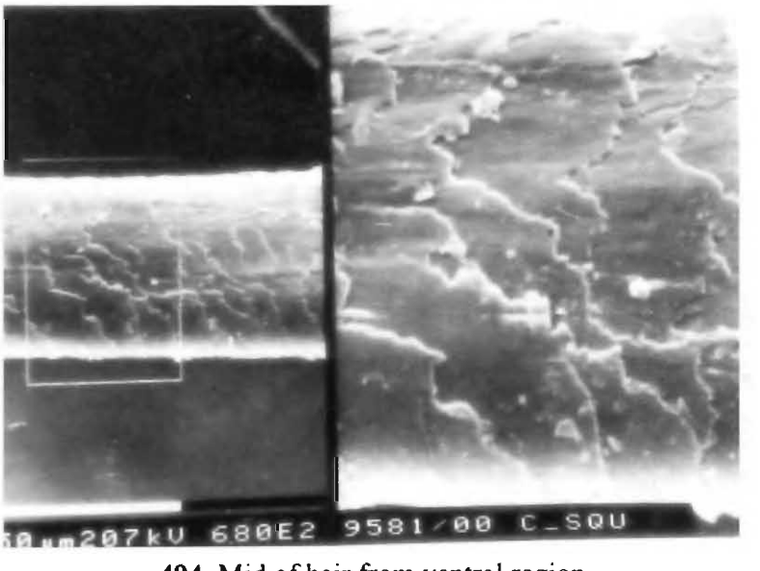
491. At mid



492. Mid of tail hair



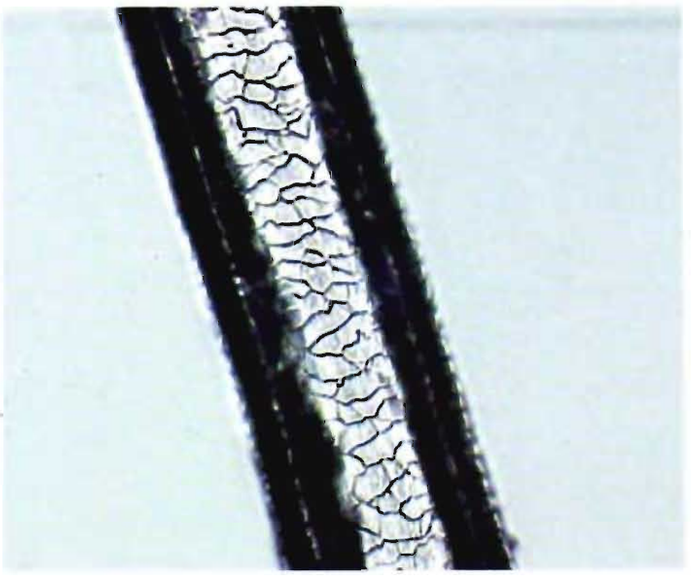
493. Mid of hair from dorsal region



494. Mid of hair from ventral region

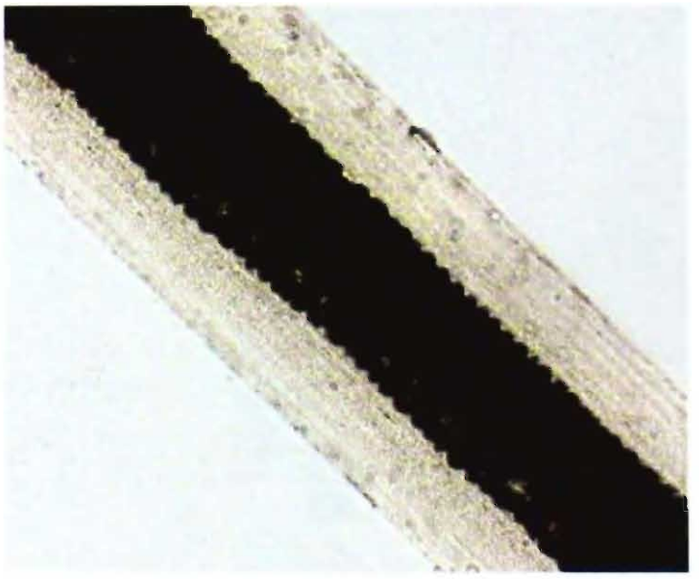
Plate 28. Family Viverridae

Comparative features of cuticular of Small Indian Civet and Yellow throated marten

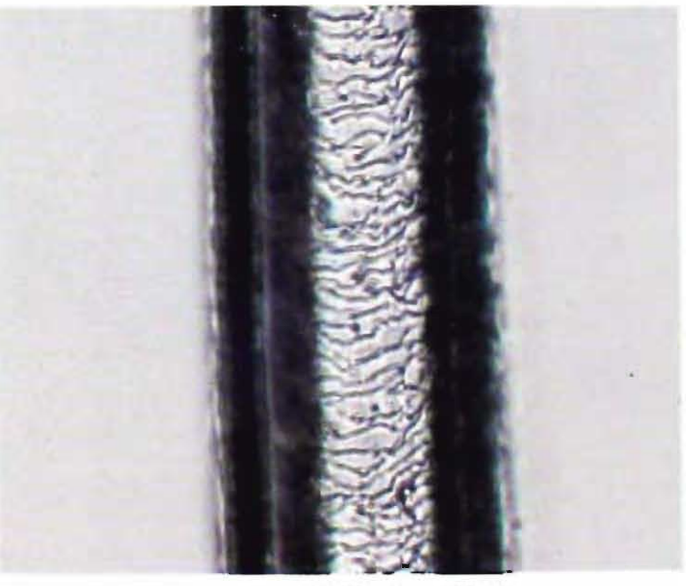




495, 496. Photomicrographs of Cuticular pattern of Small Indian Civet (at proximal, 495 to mid, 496 changing in pattern drastically) 200x

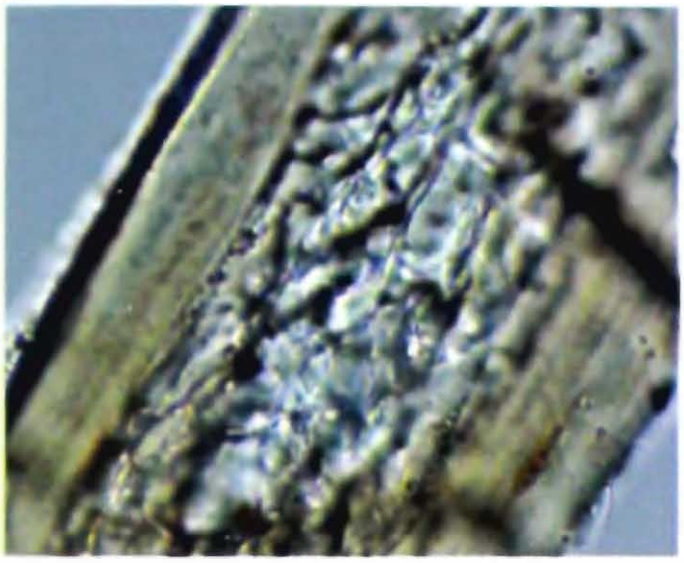


497. Medulla (dorsal) of Yellow throated marten, narrow medulla lattice 200x



498. Cuticular pattern (mid) dorsal Yellow throated marten, SP regular wave, SM rippled, DS near 200x

Dorsal



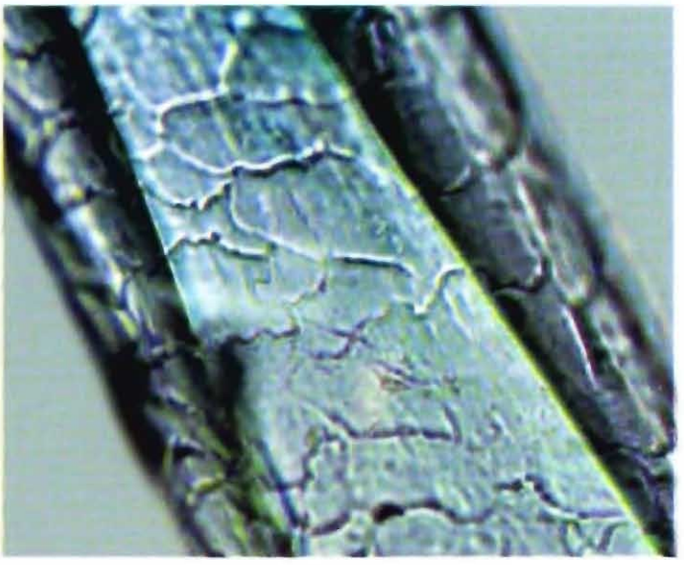
499. Medulla:simple 400x



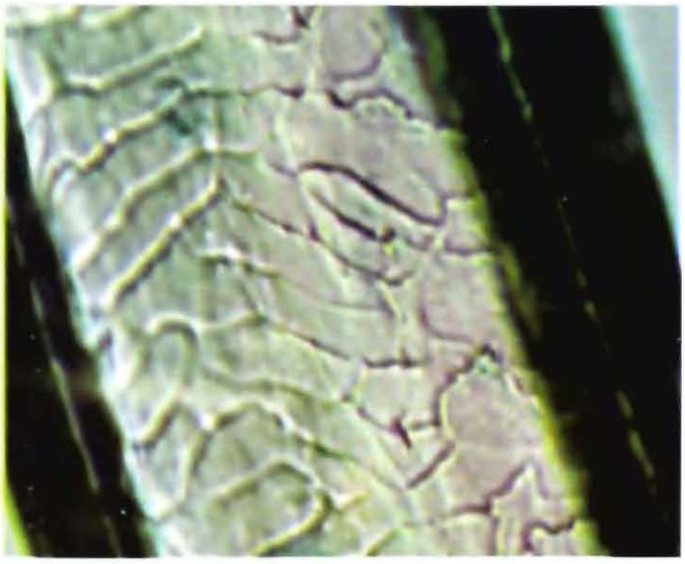
500. Cross section circular 400x



501. Cuticular at proximal irregular wave, rippled, near 400x

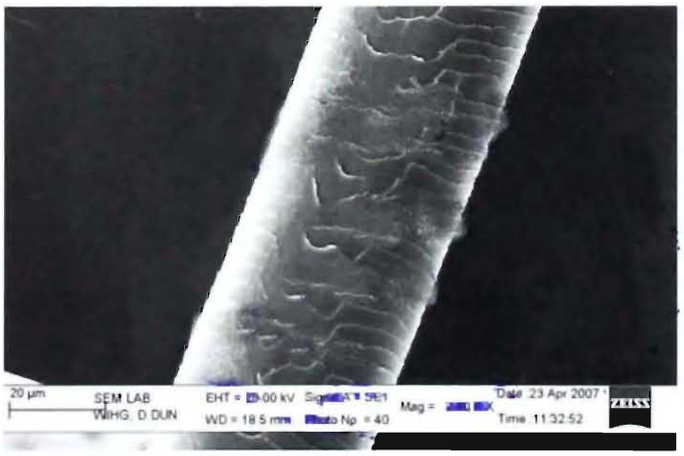


502. Cuticular at distal 400x



503. At mid (slightly rippled) 400x

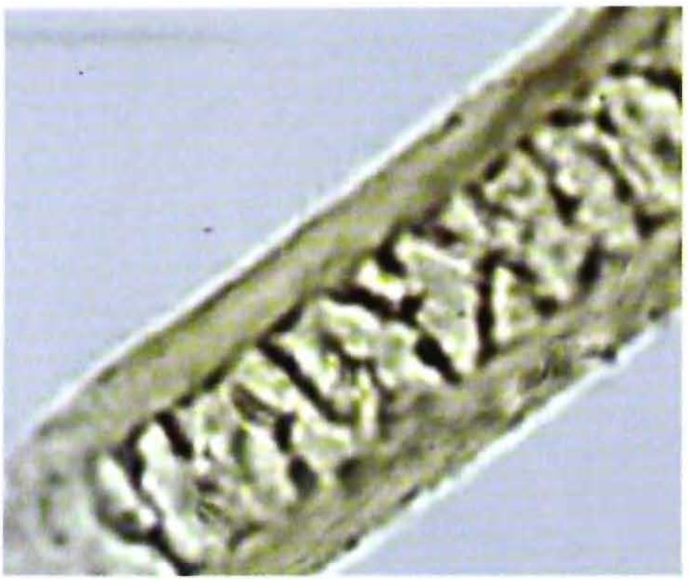
Scanning Electron Micrographs
Dorsal



504. Mid

Plate 29b. ***Atctictis binturong*** (Raffles), Binturong or Bear Cat

Ventral



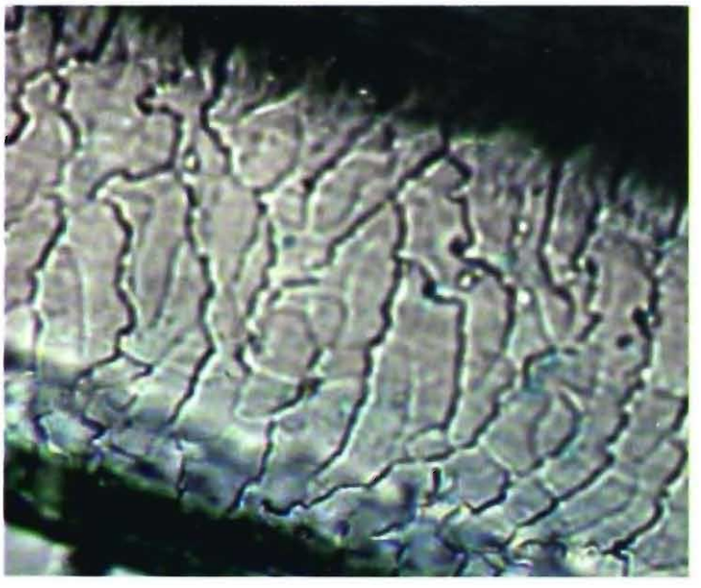
505. Photomicrographs of Cuticular pattern



506. Cross sections 200x



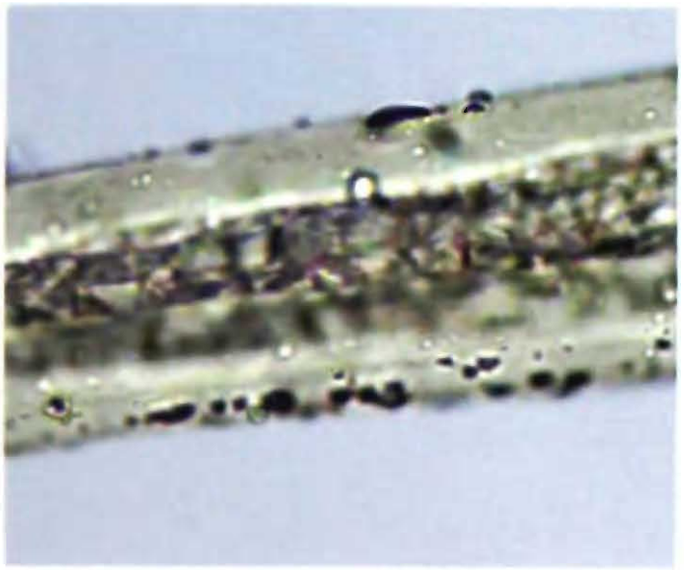
507. Cross section concavoconvex 400x



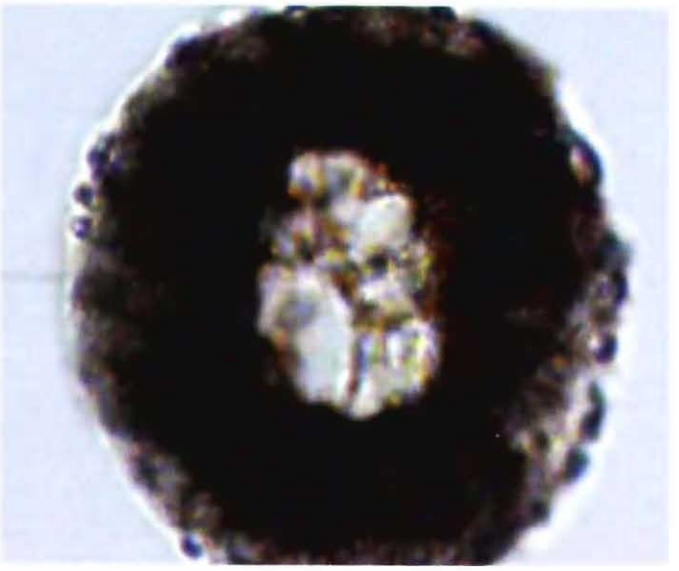
508. Cuticular at mid 400x

Plate 29c. ***Atctictis binturong*** (Raffles), Binturong or Bear Cat

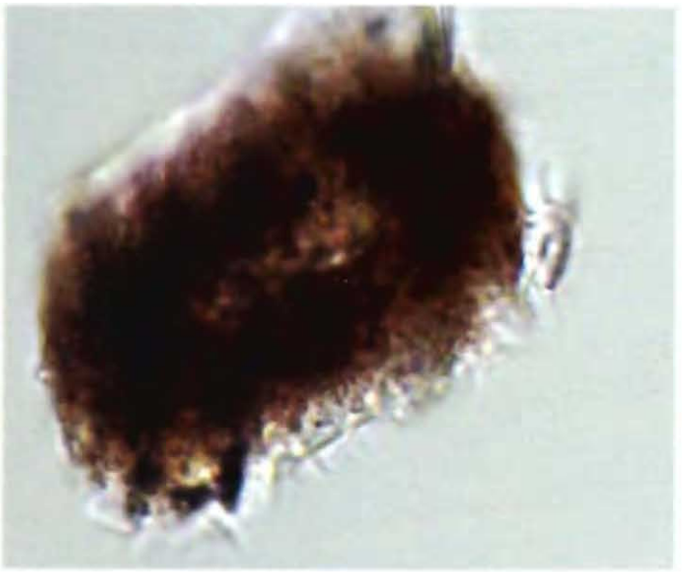
Head



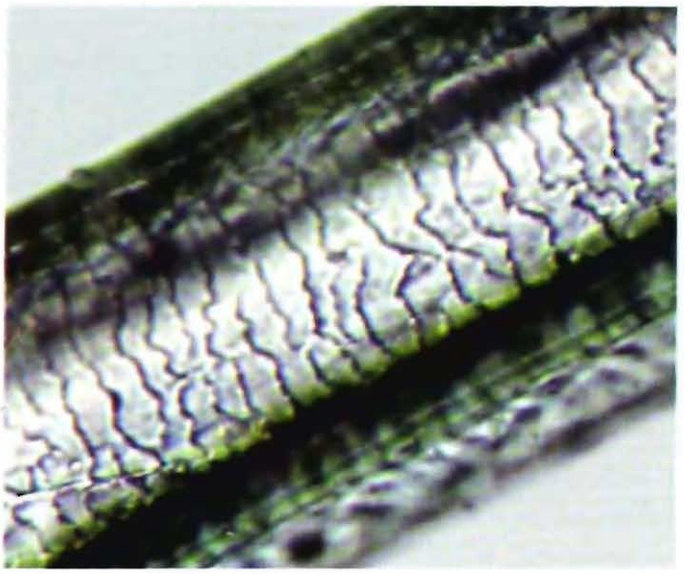
509. Medulla simple 200x



510. Cross section circular, medium medulla 400x



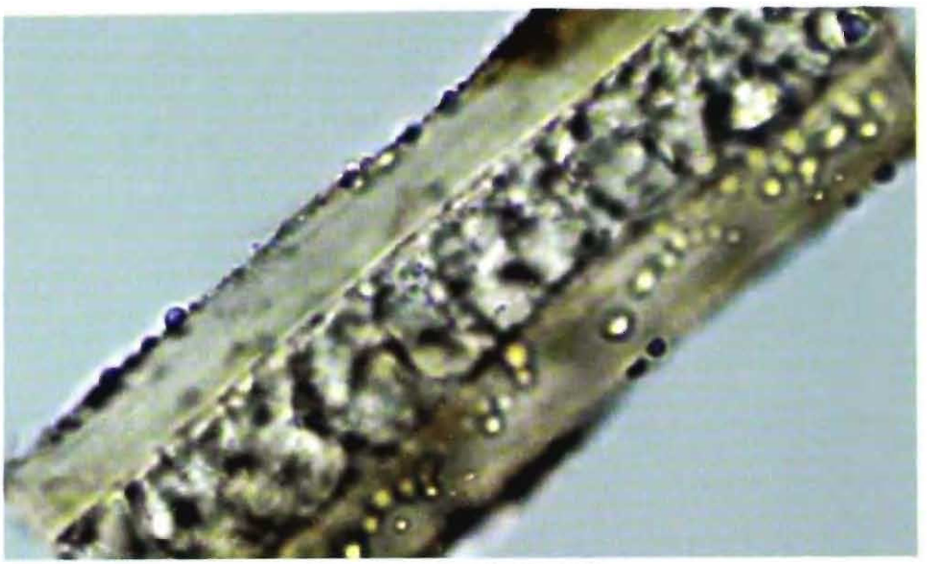
511. Cross section oblong medium medulla 400x



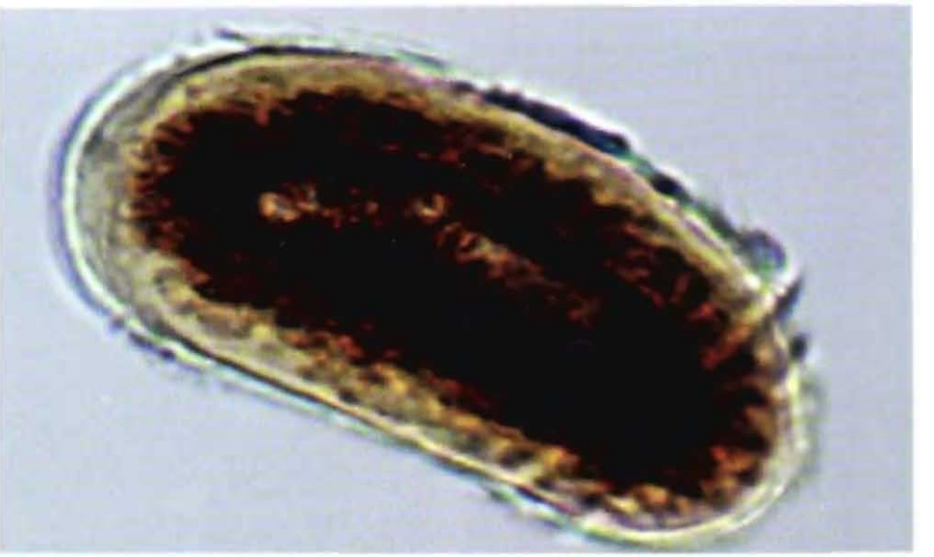
512. Cuticular regular wave, rippled, near at mid 200x

Plate 29d. ***Arcictis binturong*** (Raffles), Binturong or Bear Cat

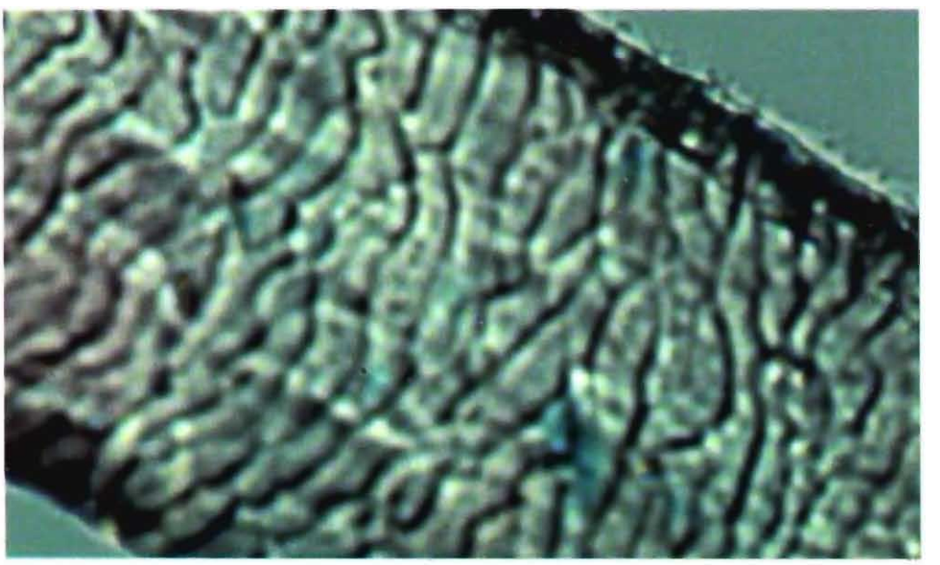
Tail



513. Medulla simple 200x

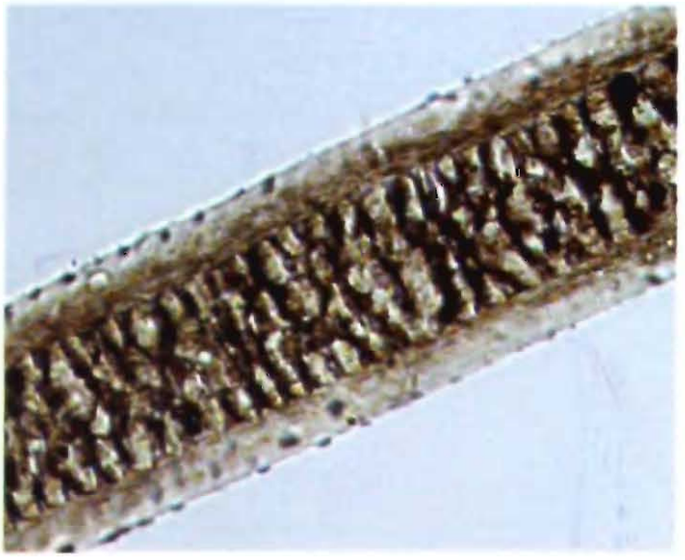


514. Cross section Concavo convex 400x



515. Cuticular at mid irregular wave, rippled, near 400x

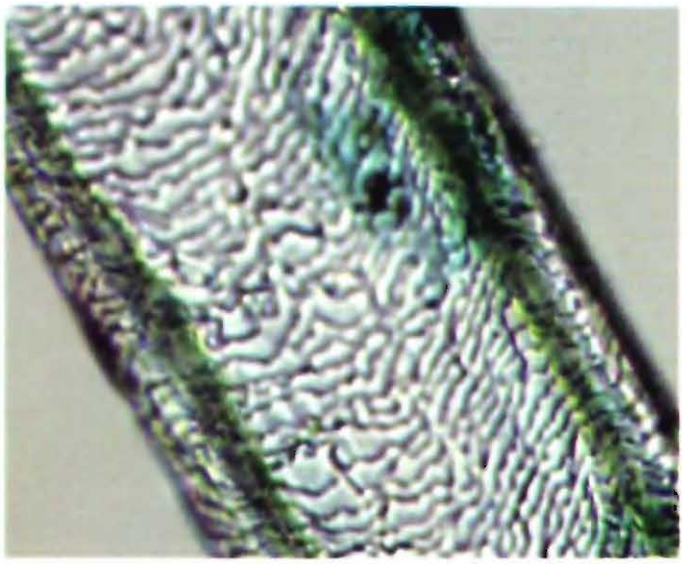
Dorsal



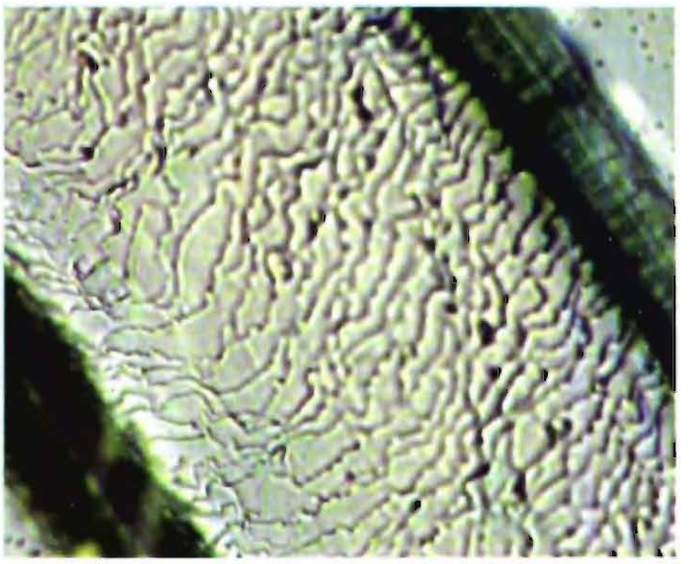
516. Medulla wide aeriform lattice 200x



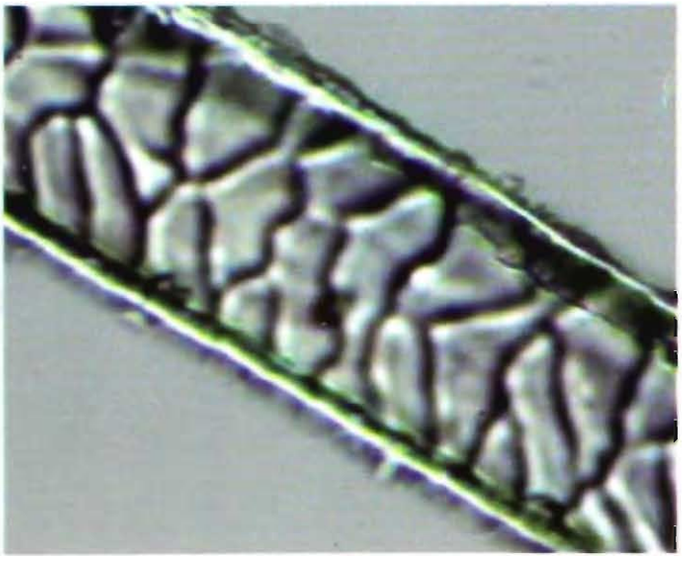
517. Cross section oblong, large medulla 400x



518. At distal, irregular wave, rippled, close 200 x

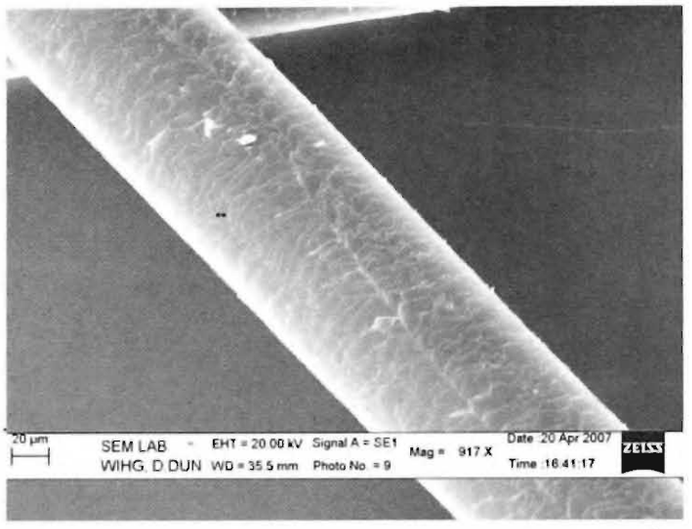


519. At mid irregular wave, rippled, near 400x

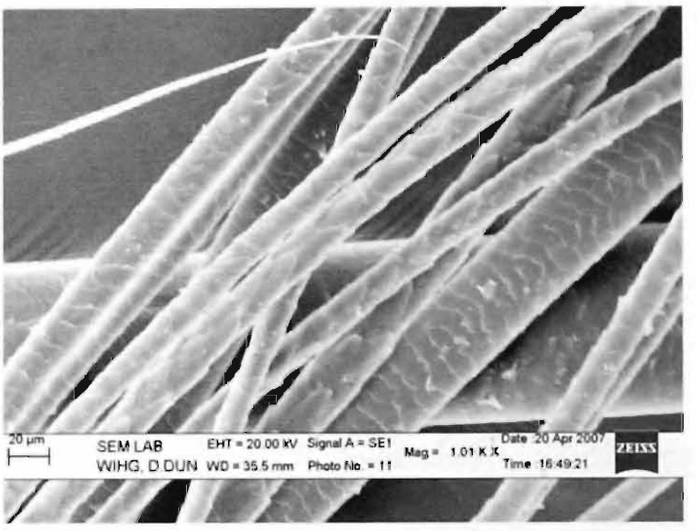


520. Secondary guard hair Regular mosaic, smooth, near 200x

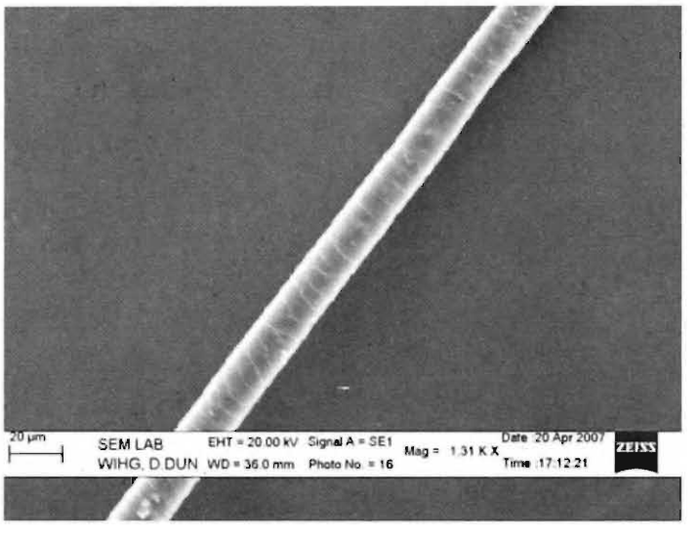
Scanning Electron Micrographs Dorsal



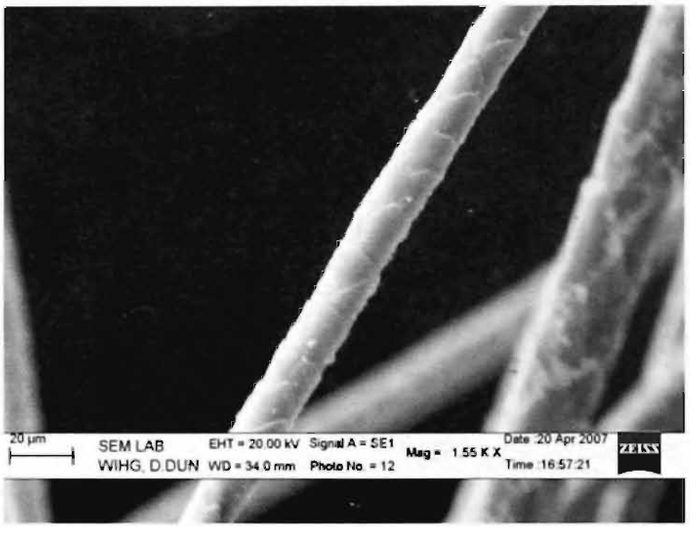
521. At mid, distal and proximal



522. Group of different types of hair (Guard and fur with different areas)



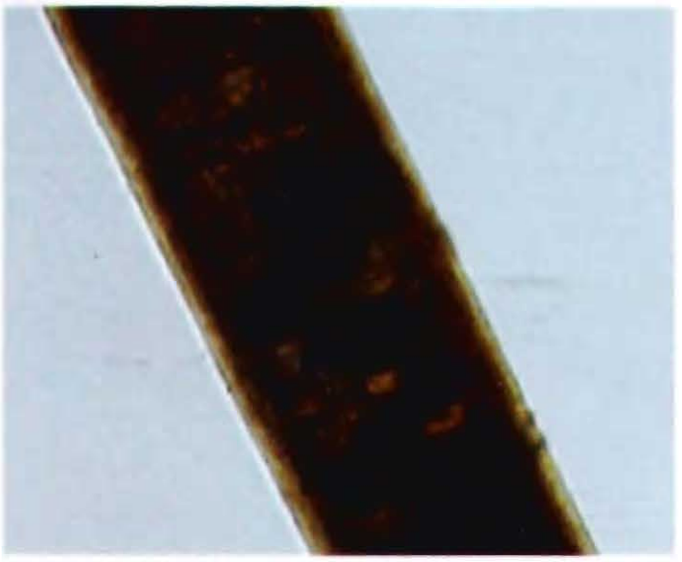
523. Proximal part of hair



524. Tip of hair

Plate 30b. ***Paguma larvata*** (Hamilton-Smith) Masked palm civet

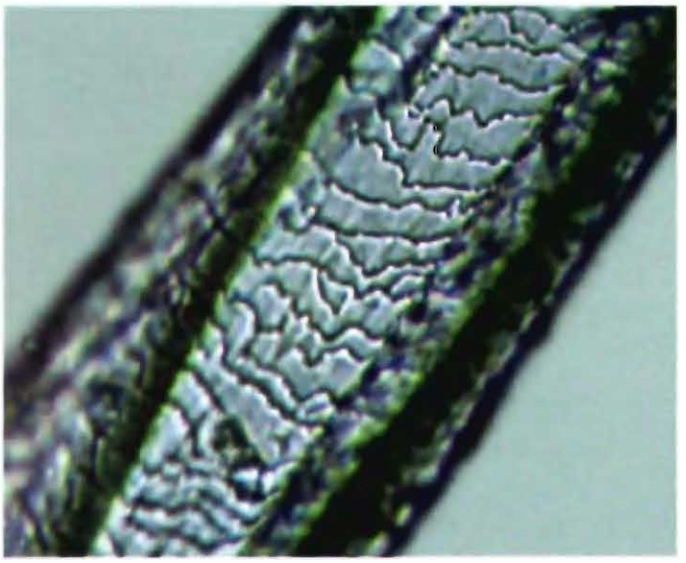
Ventral



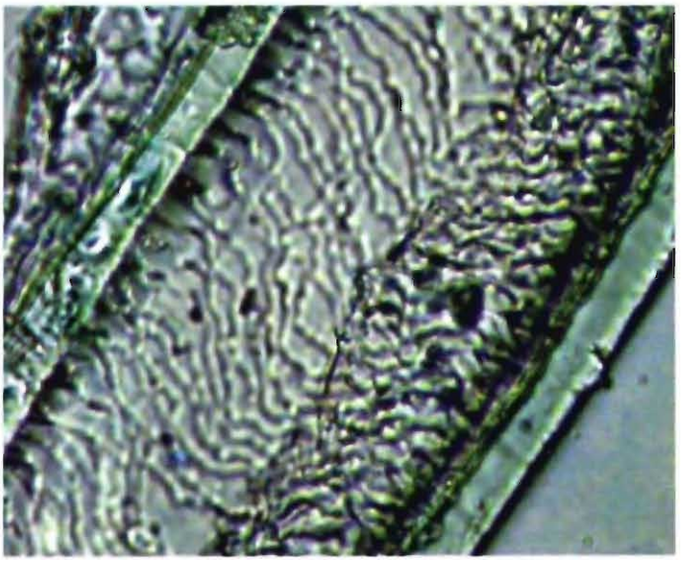
525. Medulla type uniserial ladder 200x



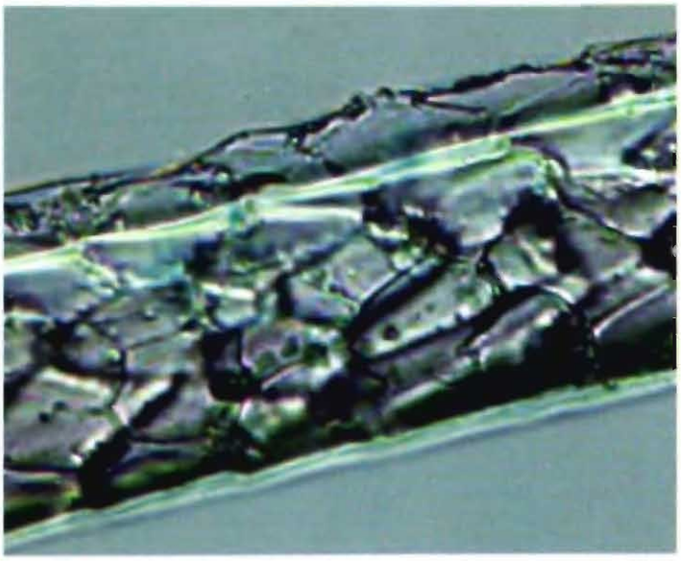
526. Cross section oblong, with large medulla 400x



527. Cuticular at distal Irregular wave, rippled, near 400x



528. At mid irregular wave, rippled, near 400x



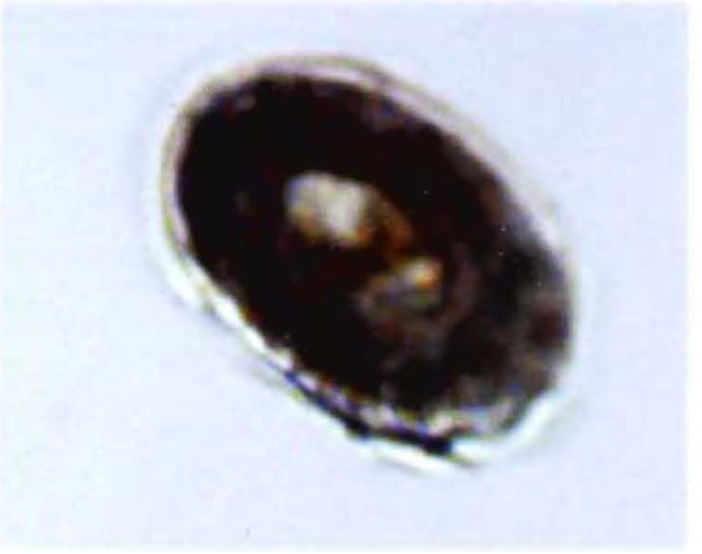
529. Fur hair cuticular400x

Plate 30c. ***Paguma larvata*** (Hamilton-Smith) Masked palm civet

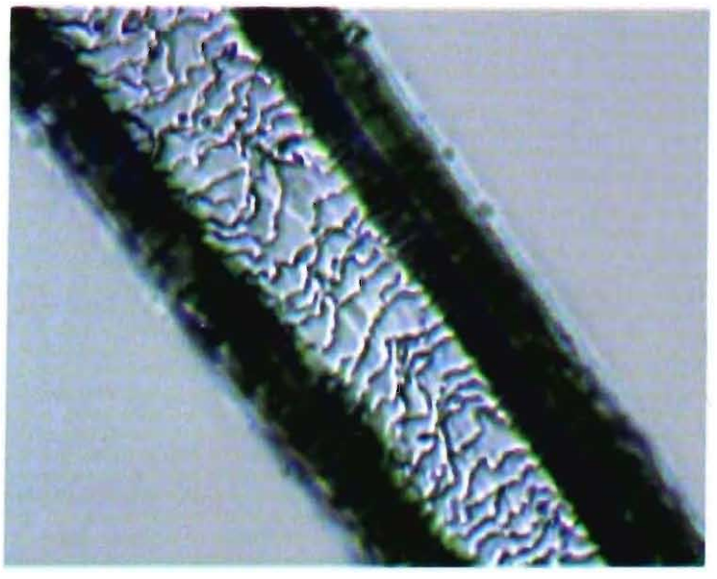
Head



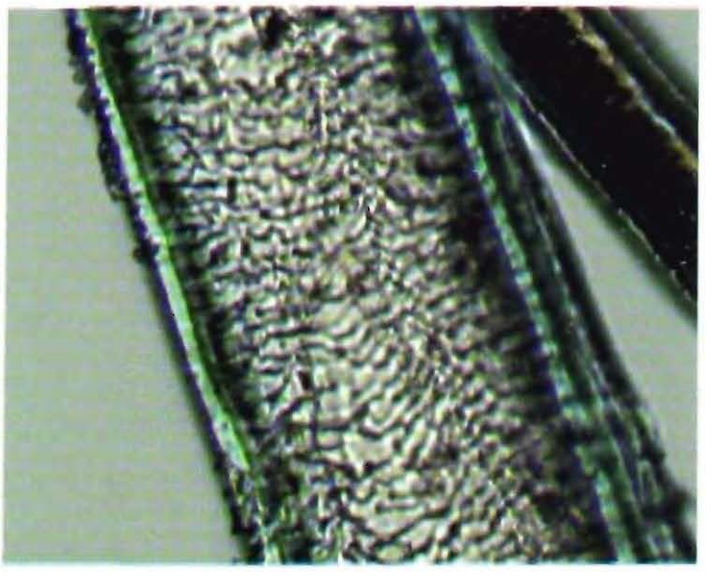
530. Medulla simple 200x



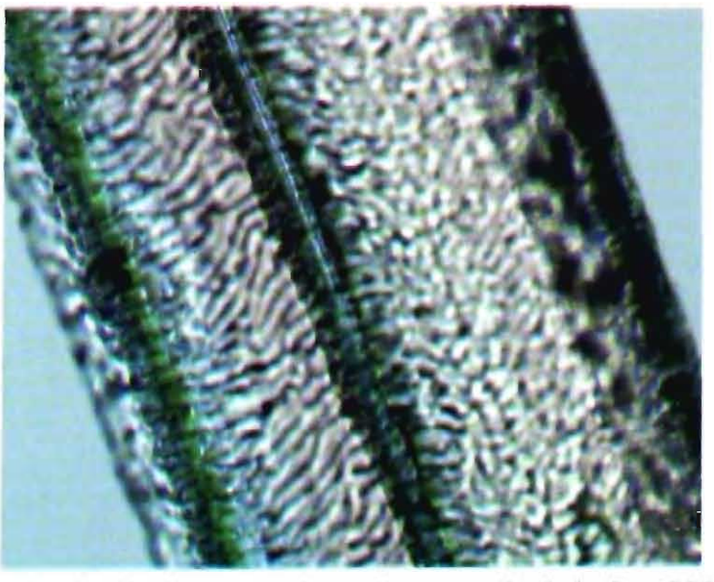
531. Cross section oblong, divided medulla 400x



532. Distal 200x



533. Proximal 200x



534. Mid cuticular pattern irregular wave, rippled, close 200x

Plate 30d. ***Paguma larvata*** (Hamilton-Smith) Masked palm civet

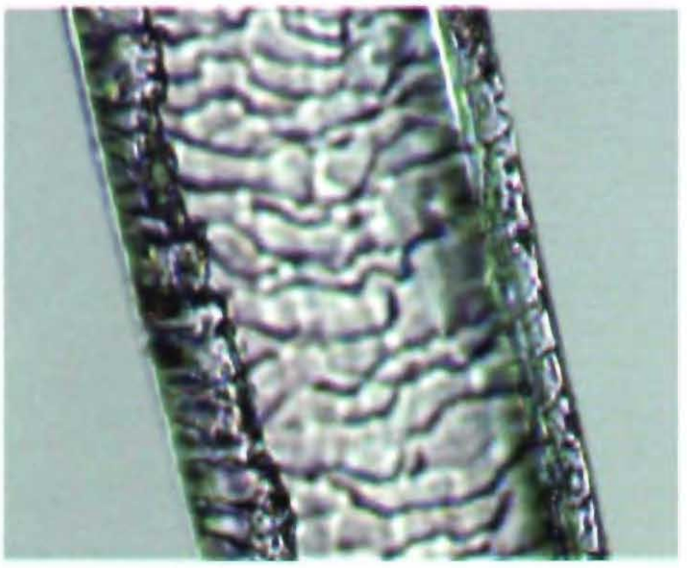
Tail



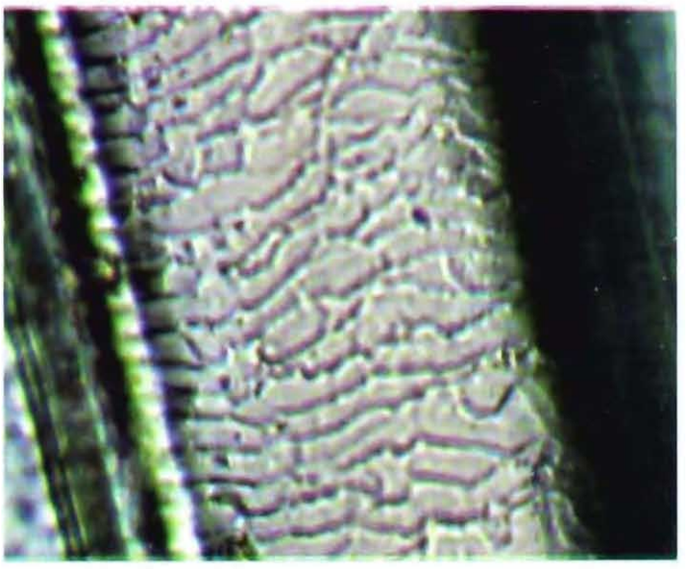
535. Medulla wide acriform lattice 400x



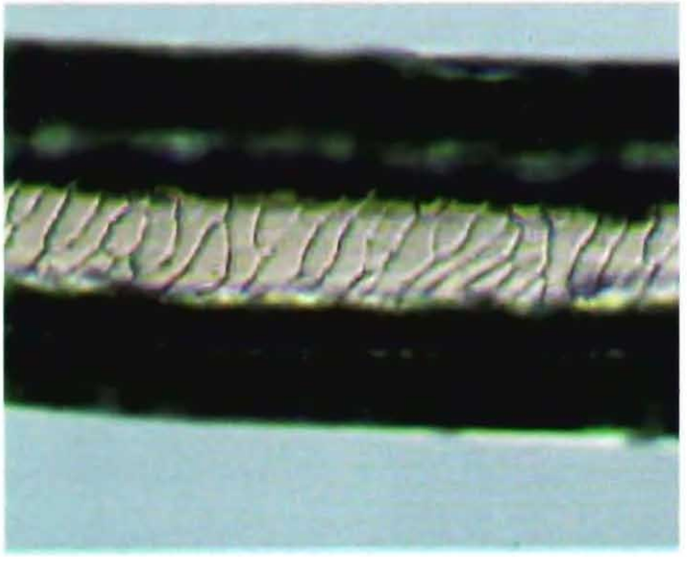
536. Cross section oblong, large medulla 400x



537. Proximal Irregular wave, rippled, near 400x



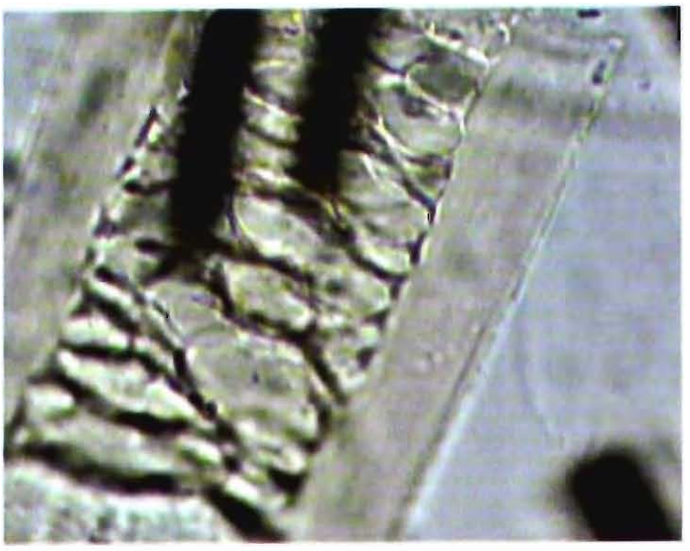
538. Irregular wave, rippled, near at mid 400x



539. Distal regular wave, smooth, near 200x

Plate 31a. ***Paradoxurus jerdoni*** Blanford (Jerdon's palm civet)

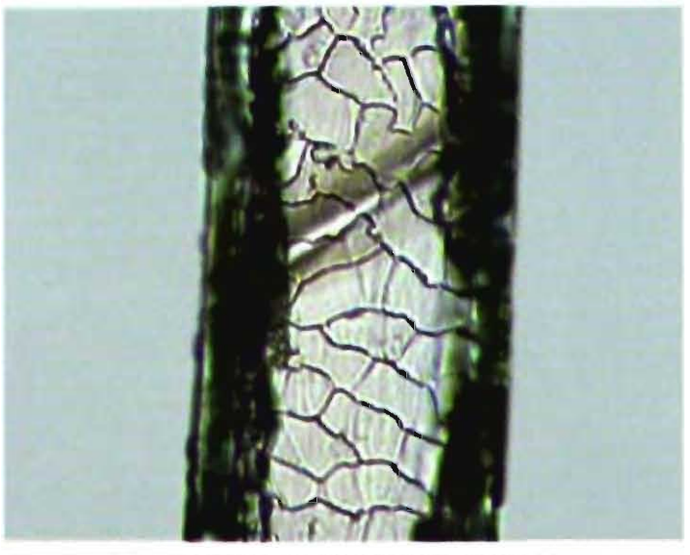
Dorsal



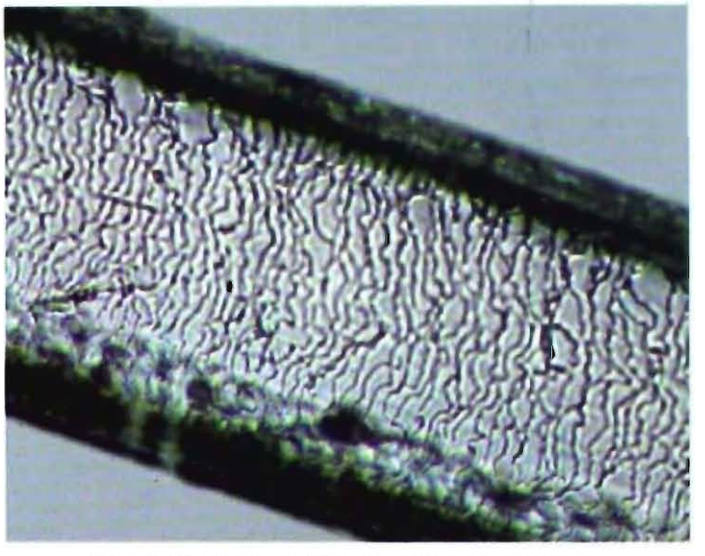
540. Medulla wide aeriform lattice 800x



541. Cross section oblong 400x

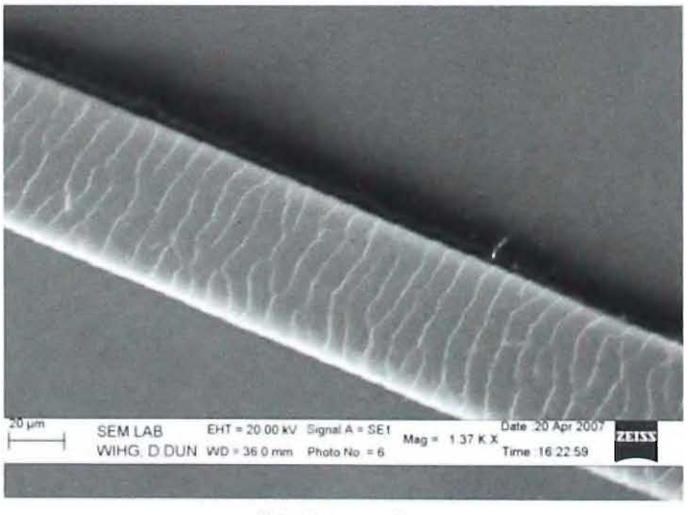


542. cuticular at distal 400x Irregular wave, smooth, near

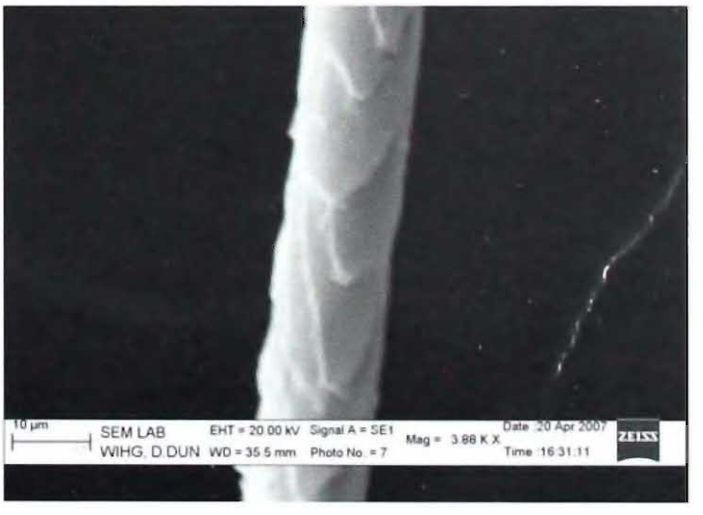


543. Cuticular at mid Irregular wave, rippled, close 400x

Scanning Electron Micrographs



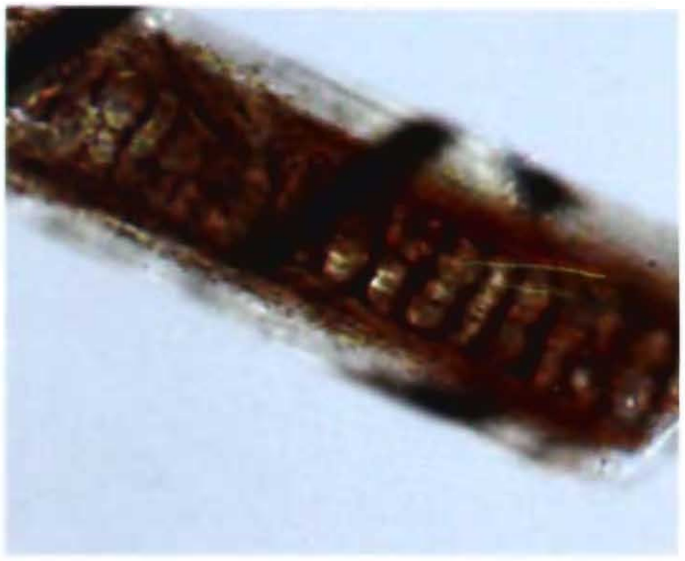
544. At proximal



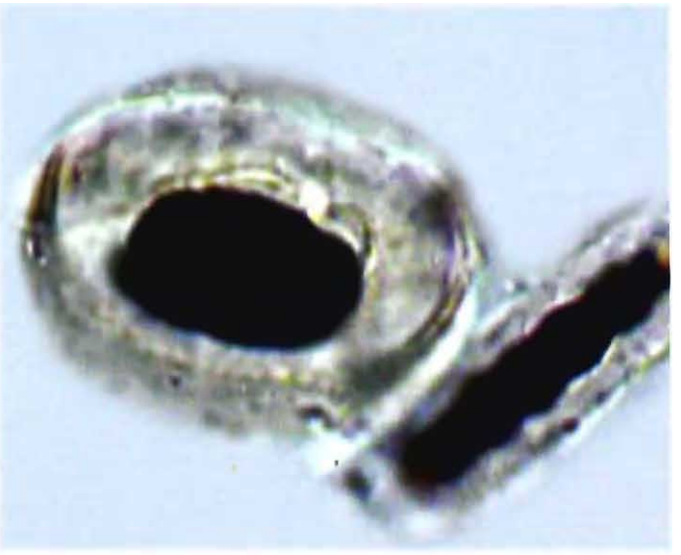
545. Fur hair (dentate)

Plate 31b. ***Paradoxurus jerdoni*** Blanford (Jerdon's palm civet)

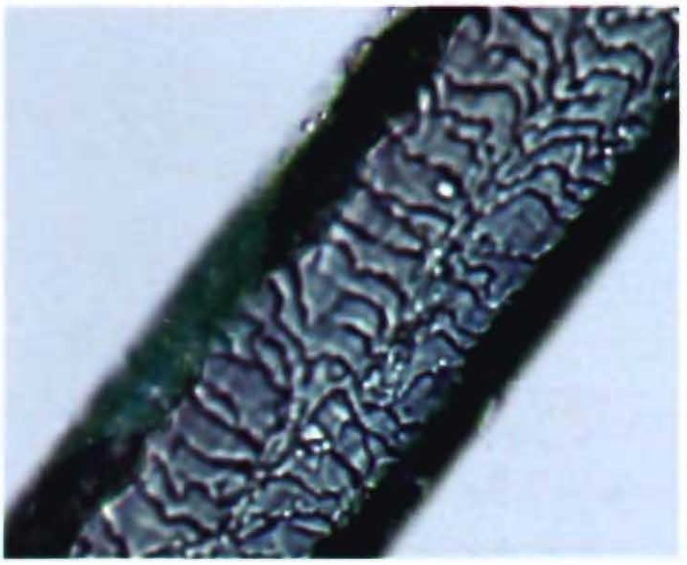
Ventral



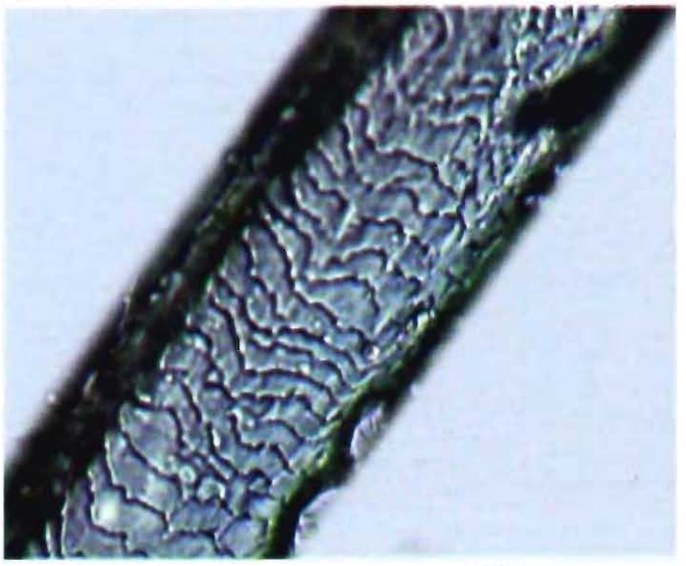
546. Medulla wide aeriform lattice 200x



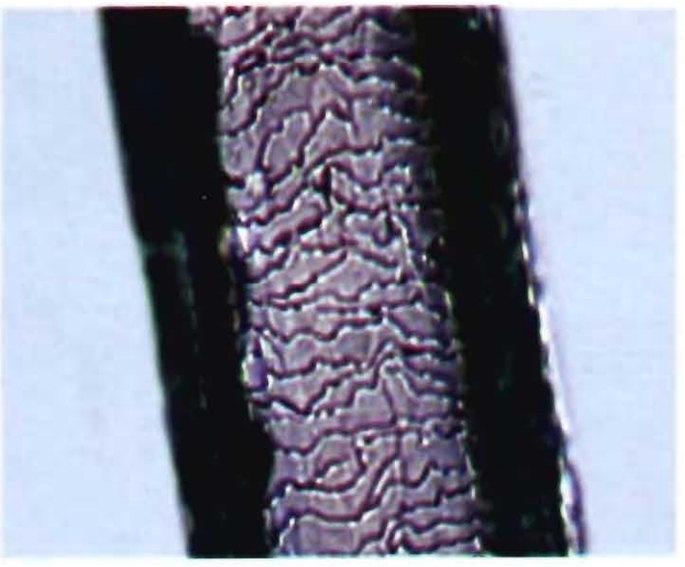
547. Cross section oblong,large medulla 400x



548. Cuticular at distal 200x



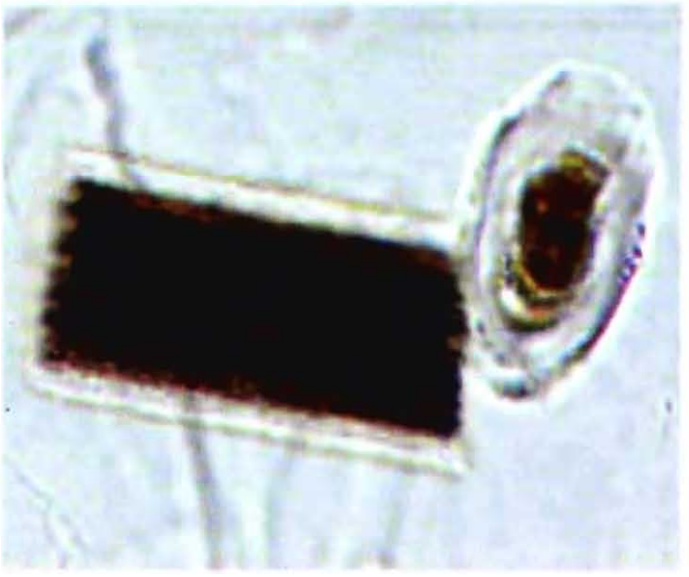
549. Cuticular at proximal 200x



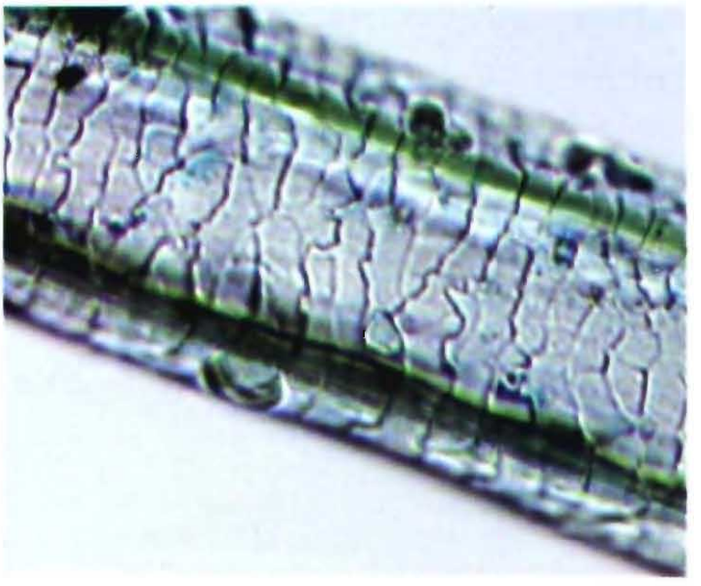
550. Cuticular at mid 200x

Plate 31c. ***Paradoxurus jerdoni*** Blanford (Jerdon's palm civet)

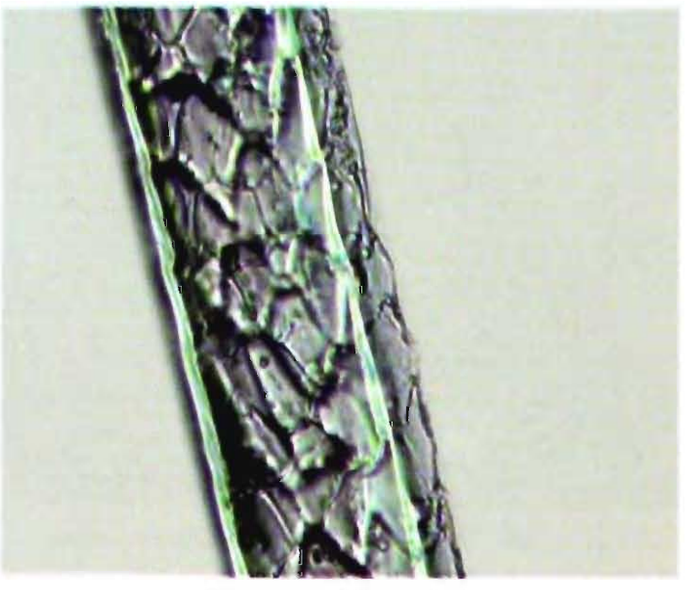
Head



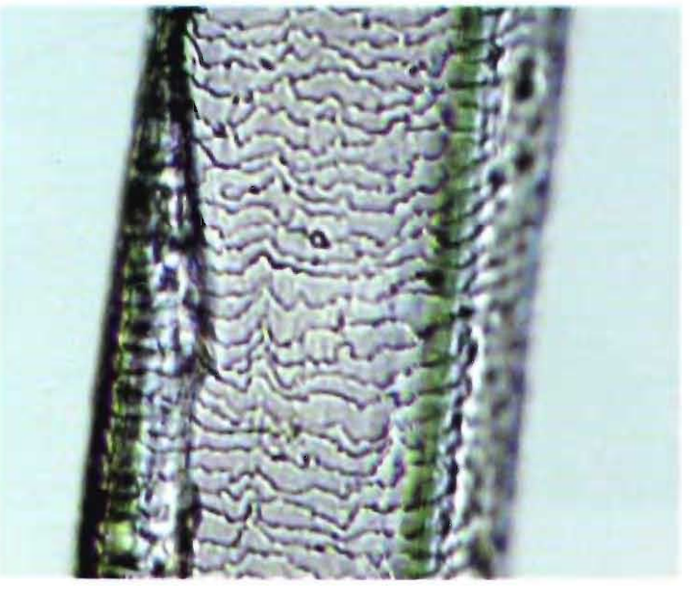
551. Medulla wide aeriform lattice and cross section 200x



552. At distal 200x



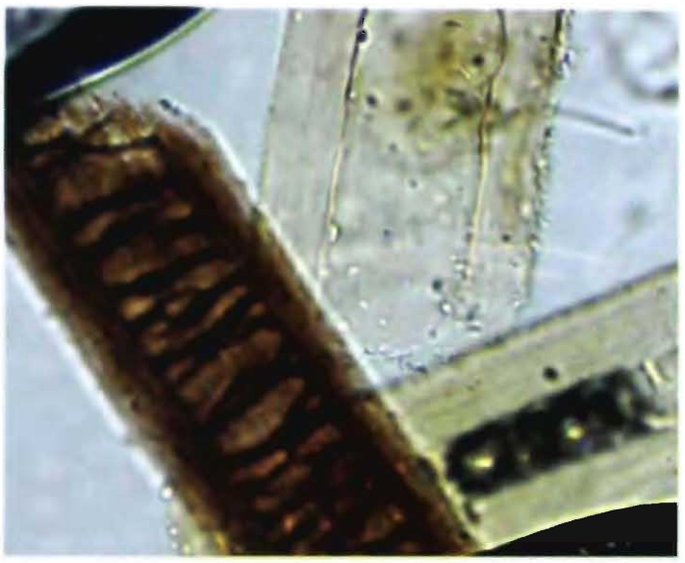
553. Towards base 200x



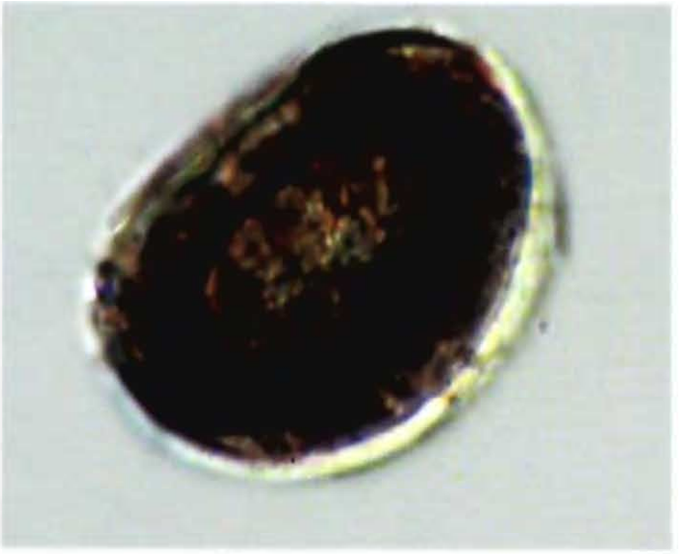
554. At mid 200x

Plate 31d. ***Paradoxurus jerdoni*** Blanford (Jerdon's palm civet)

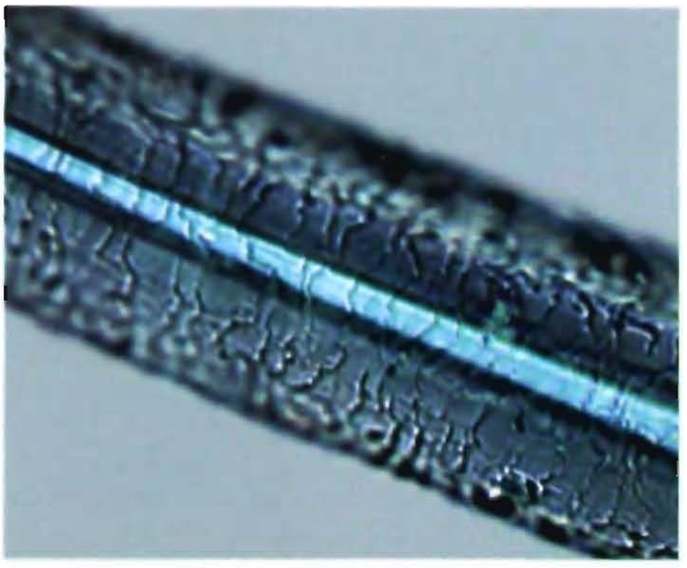
Tail



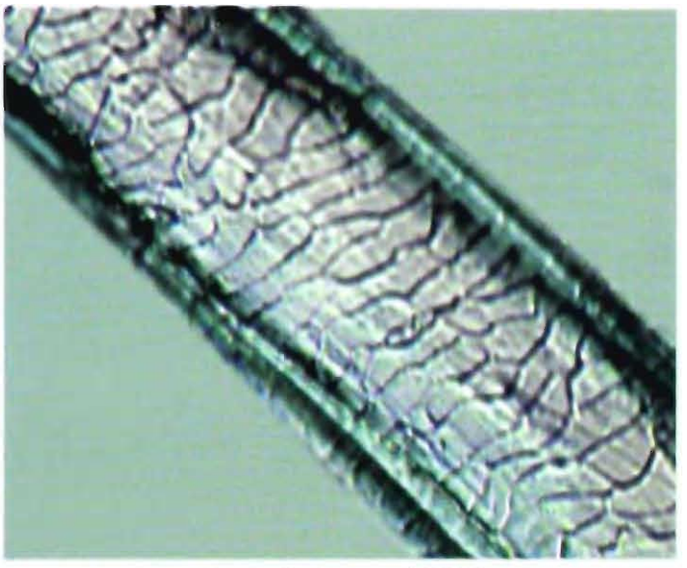
555. Medulla wide aeriform lattice 200x



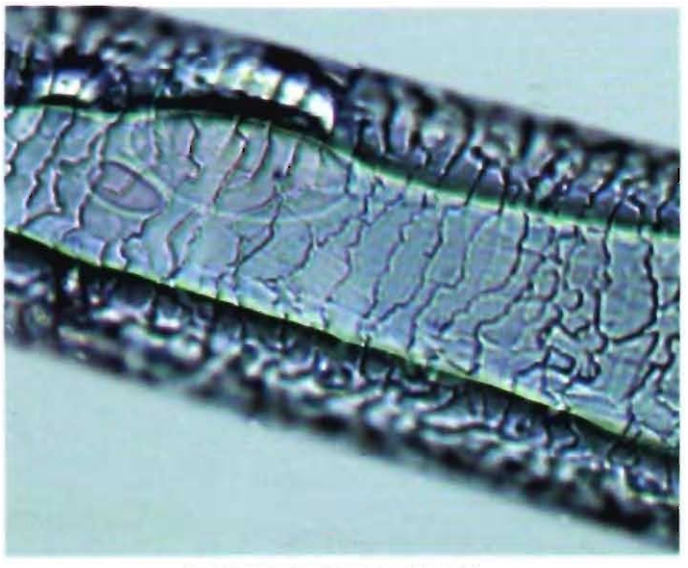
556. Cross section 200x



557. Cuticular at dista 200x



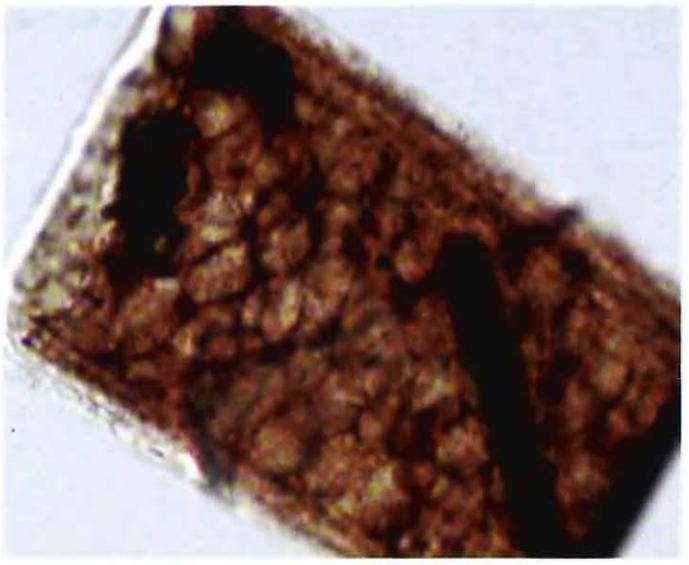
558. Cuticular at mid 200x



559. Cuticular at proximal 200x

Plate 32a. ***Paradoxurus hermaphrodites*** (Pallas), Common palm civet

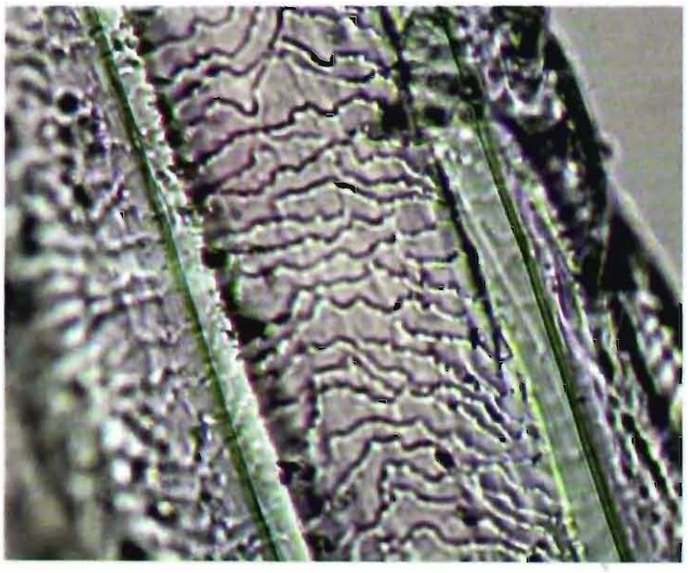
Dorsal



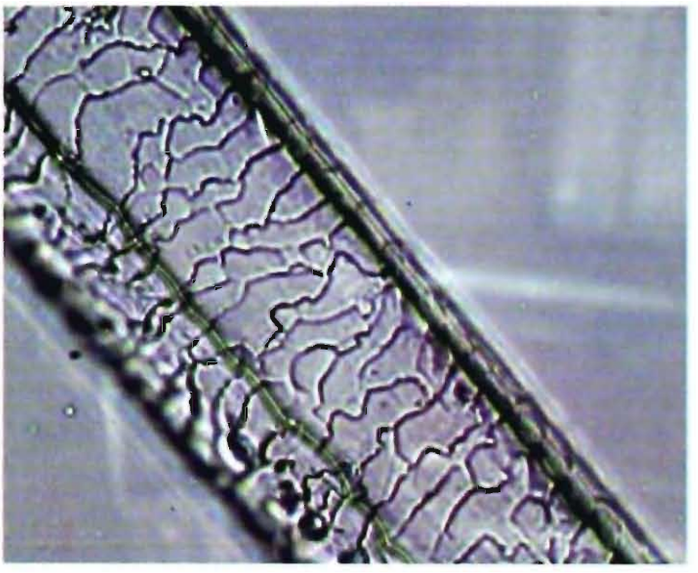
560. Medulla wide aeriform lattice 400x



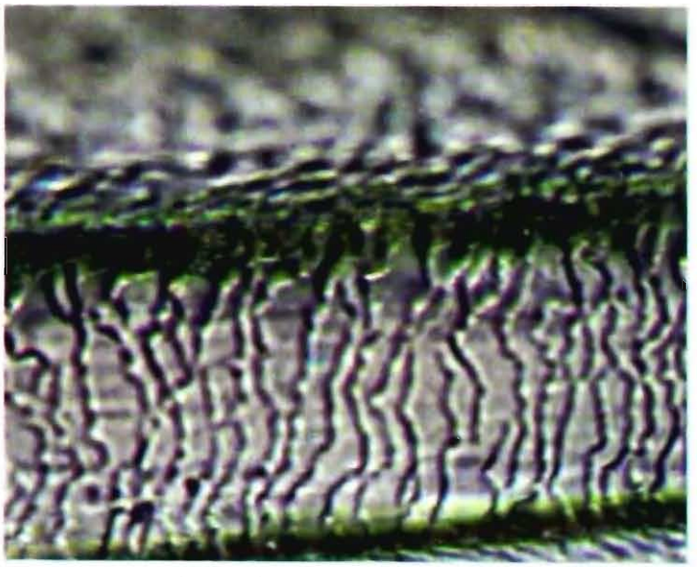
561. Cross section oblong,large medulla400x



562. Cuticular at mid 200x

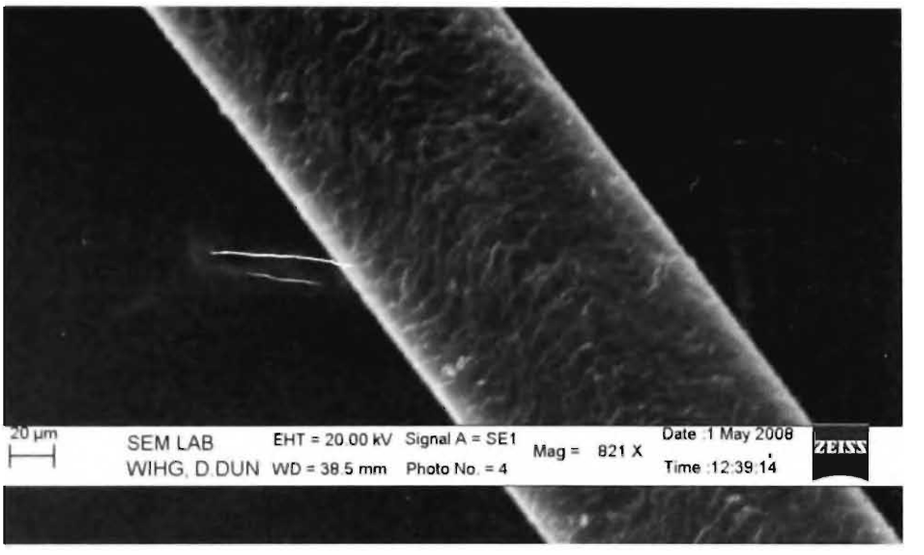


563. Cuticular at distal 200x

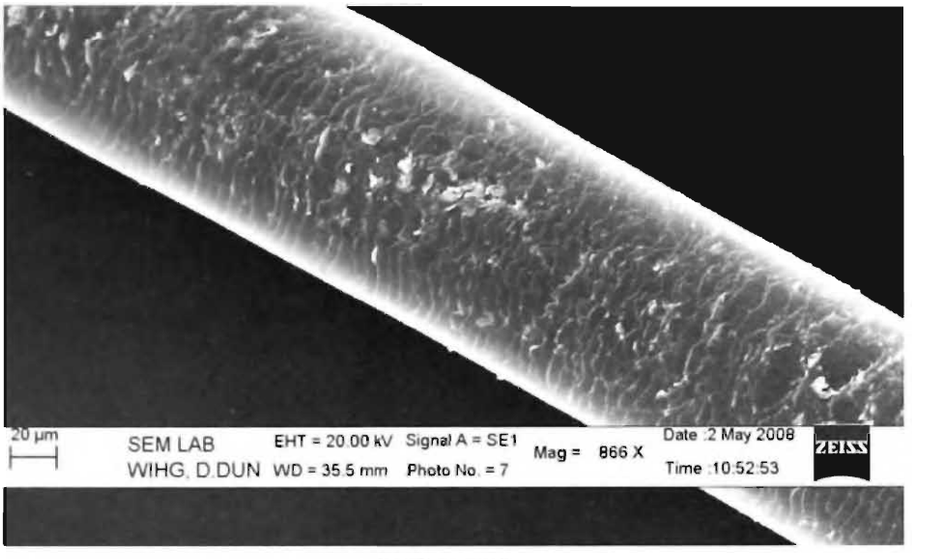


564. Cuticular at proximal 200x

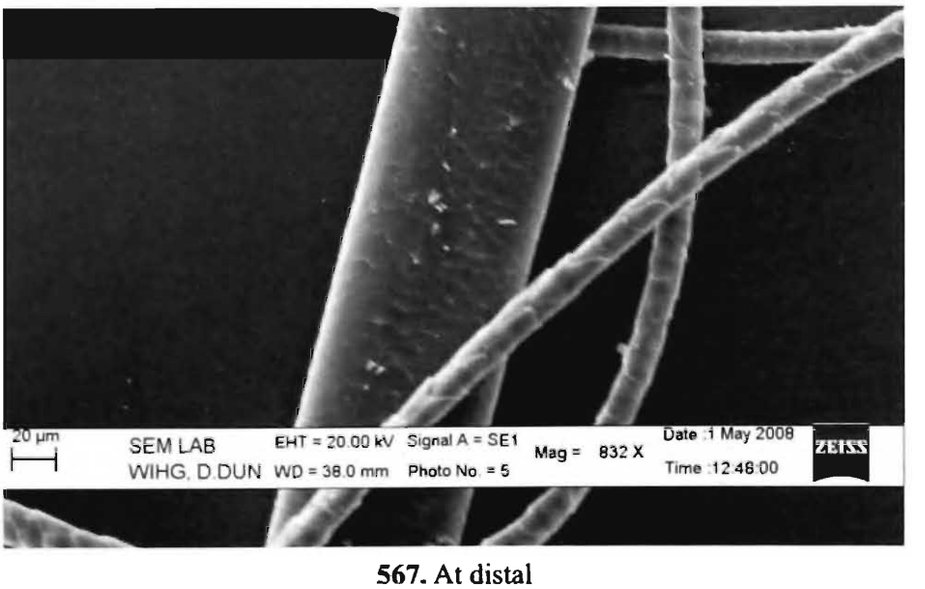
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565. At mid



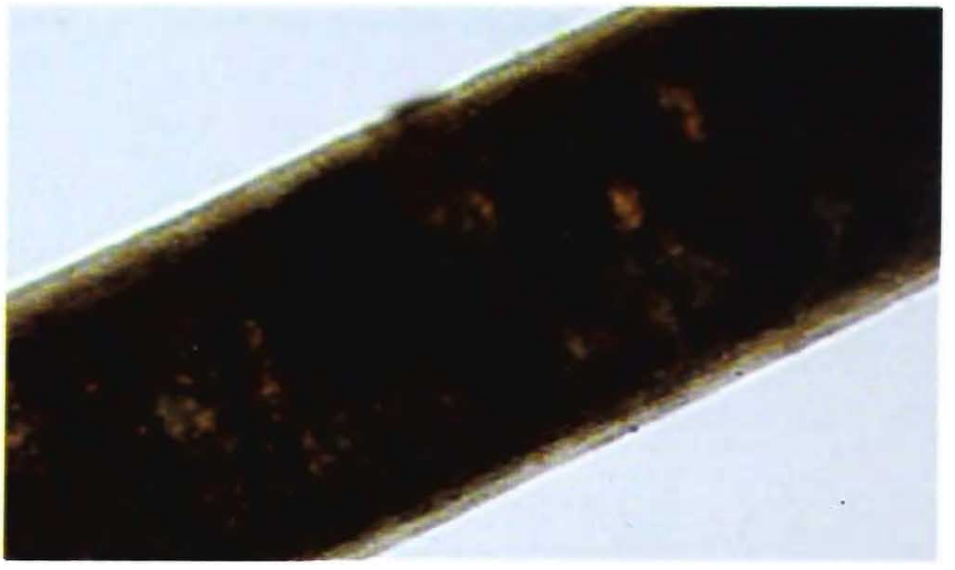
566. At proximal



567. At distal

Plate 32b. ***Paradoxurus hermaphrodites*** (Pallas) Common palm civet

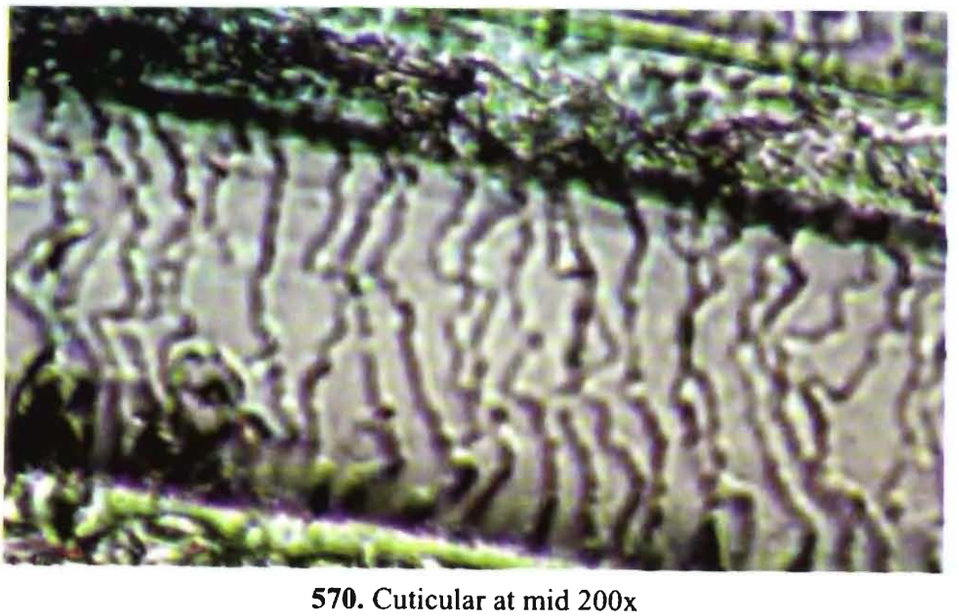
Ventral



568. Medulla 200x

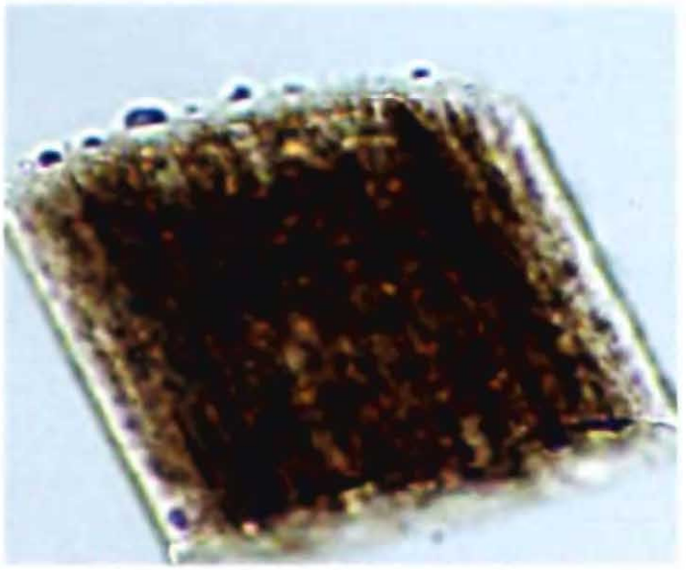


569. Cross section circular400x

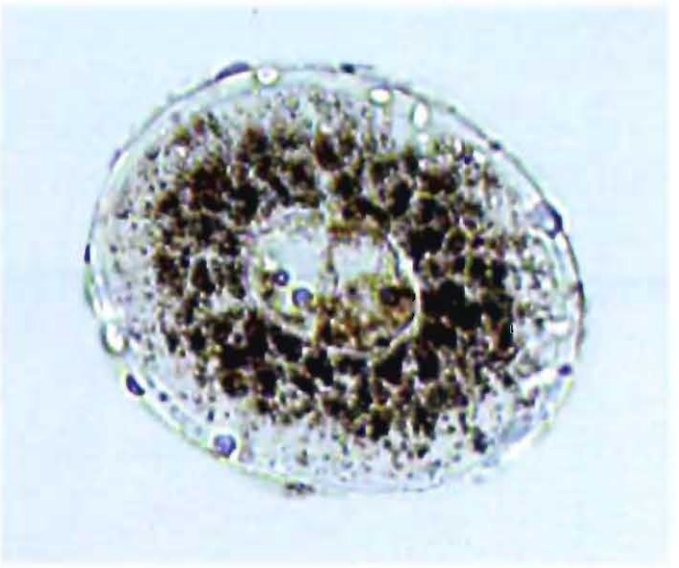


570. Cuticular at mid 200x

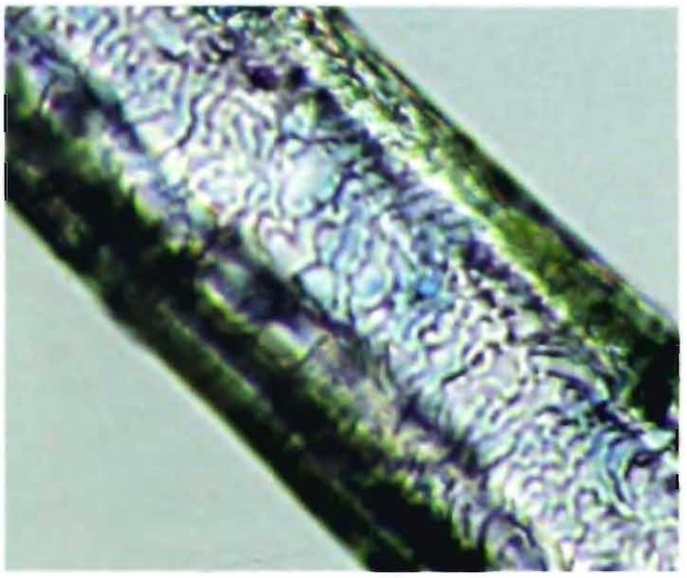
Head



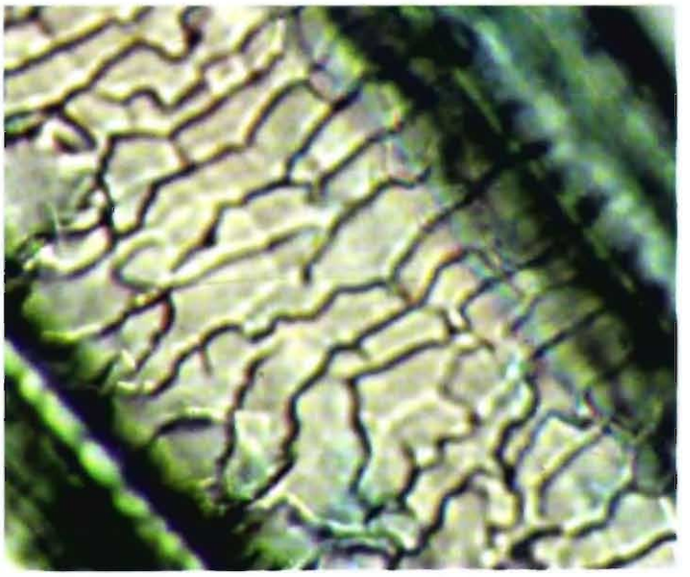
571. Medulla Multiserial ladder 400x



572. Cross section circular 400x



573. Cuticular at distal 200x



574. Cuticular at mid 400x

Plate 32d. ***Paradoxurus hermaphrodites*** (Pallas) Common palm civet

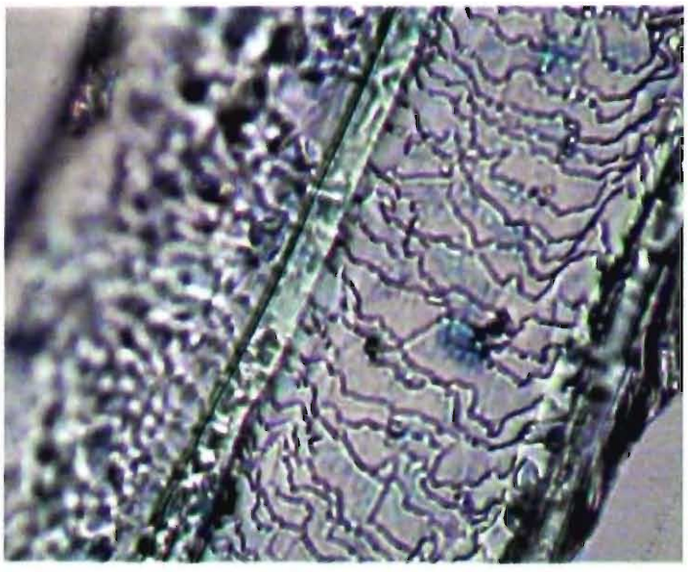
Tail



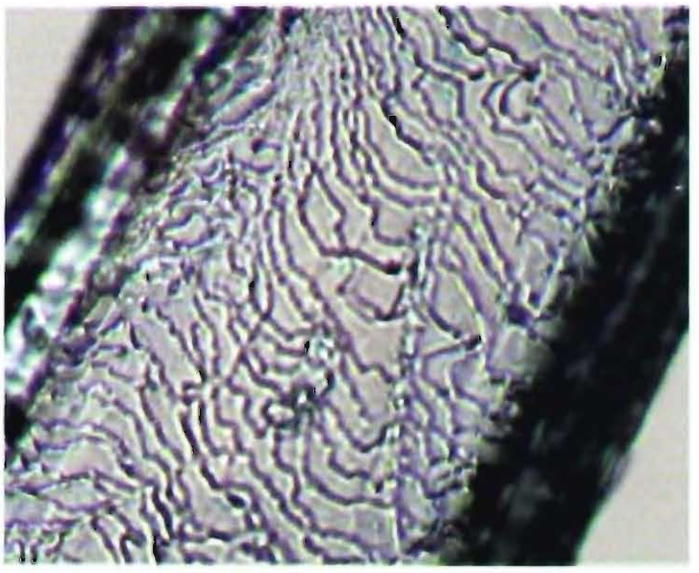
575. Medulla wideaeriform lattice 200x



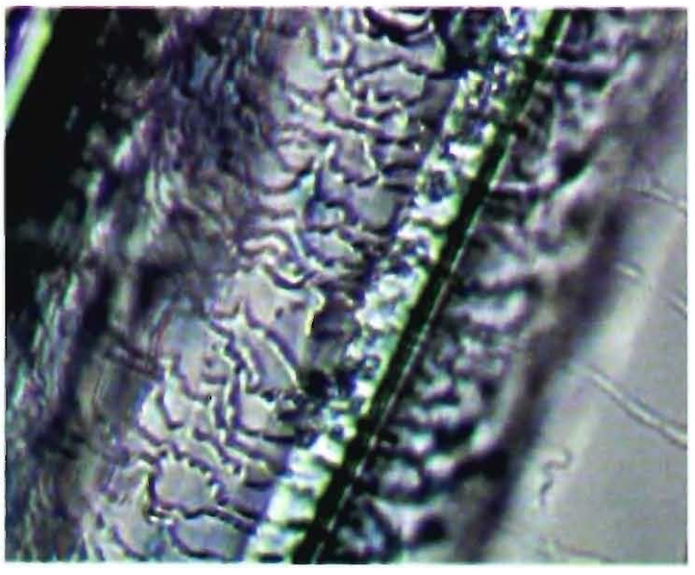
576. Cross section 200x



577. Cuticular at distal 400x

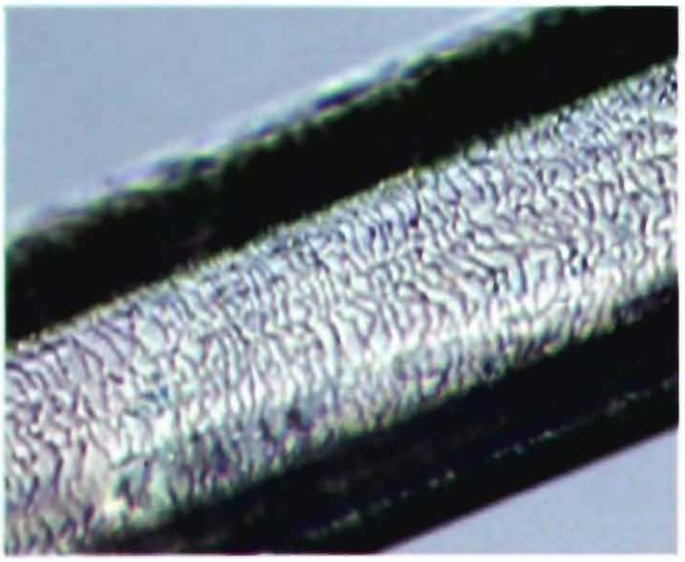


578. Cuticular ta mid



579. Cuticular at proximal 400x

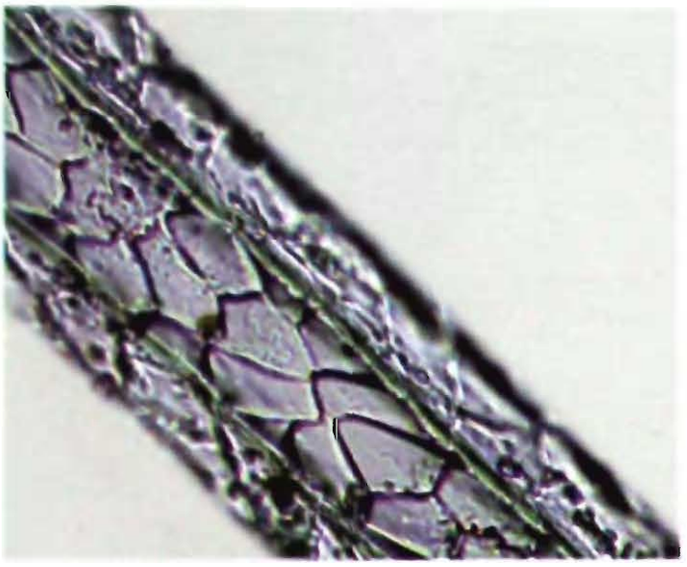
Dorsal



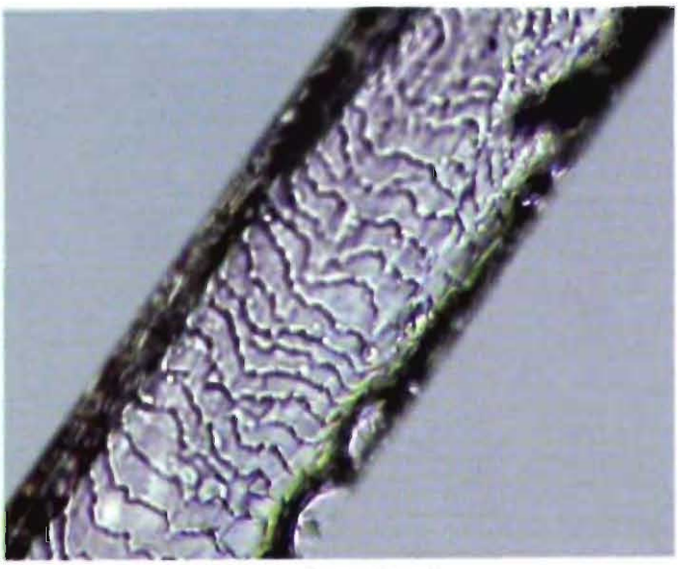
580. Cuticular pattern at distal 400x



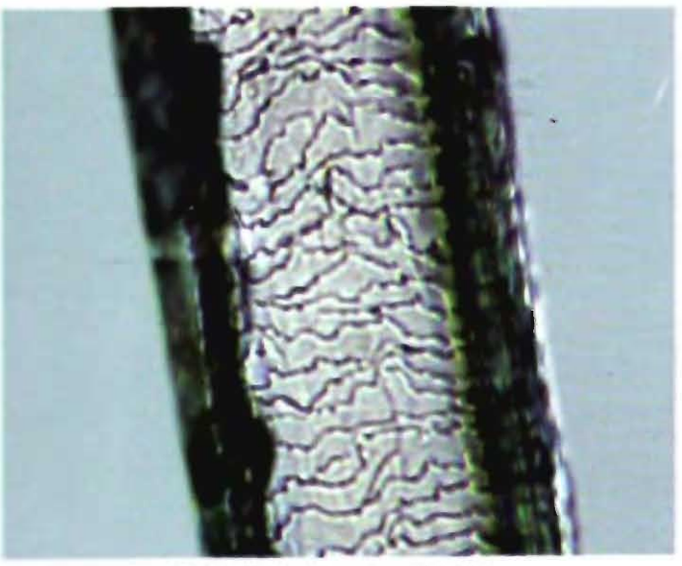
581. Cuticular at proximal dentate, smooth, near 400x



582. Cuticular towards proximal 400x



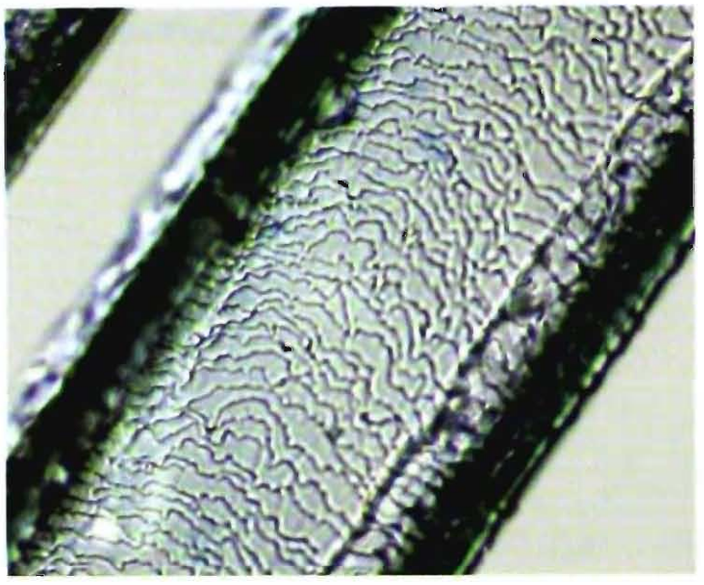
583. Towards mid



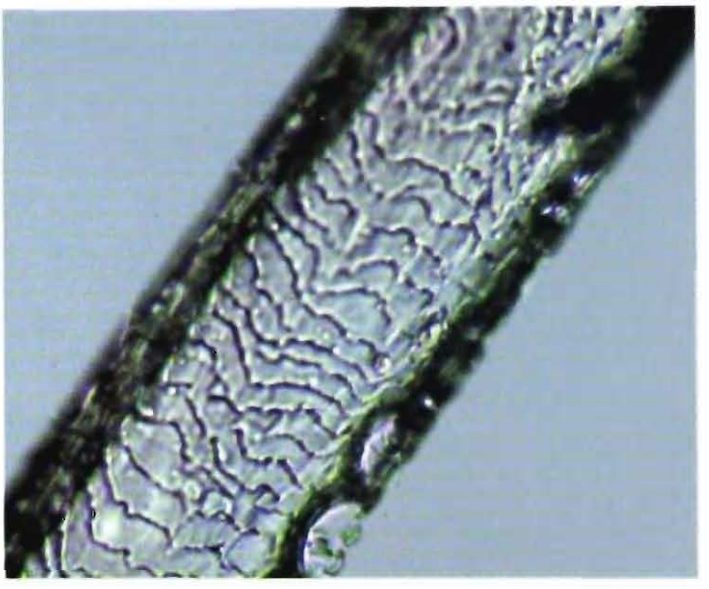
584. Cuticular at mid 400x

Plate 33b. ***Viverra indica*** (Desmarest), Small Indian civet

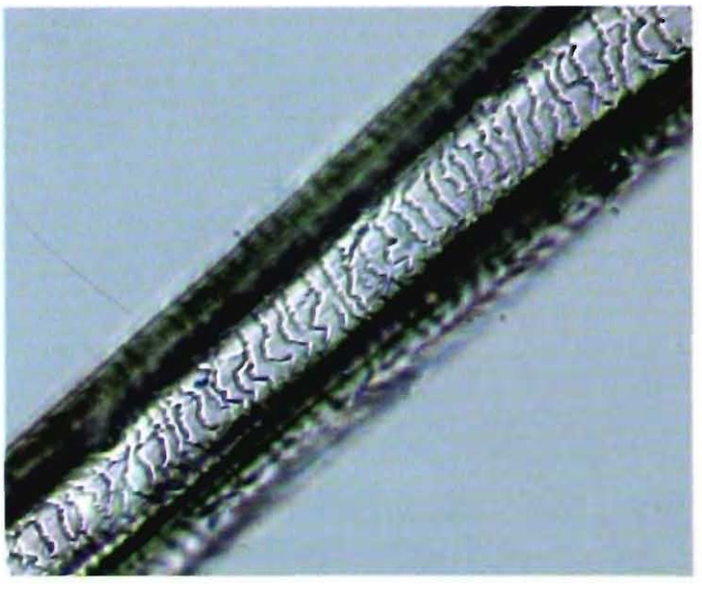
Ventral



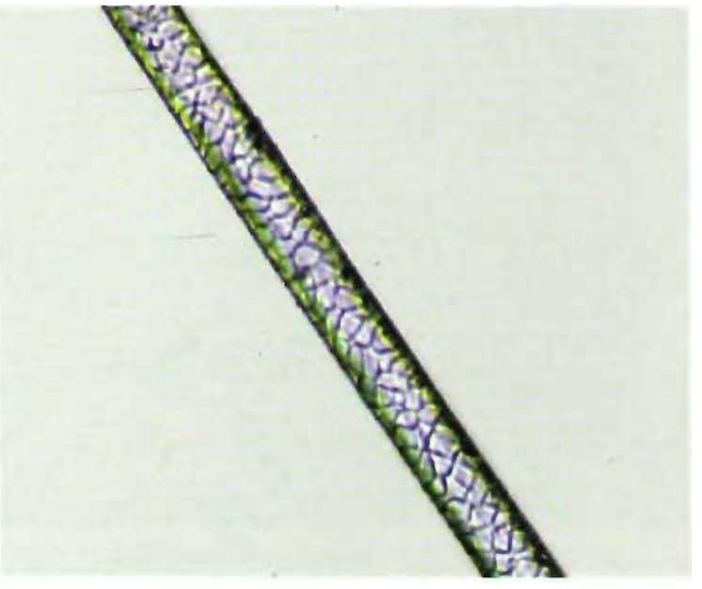
585. Cuticular at mid 400x



586. Cuticular at distal 400x

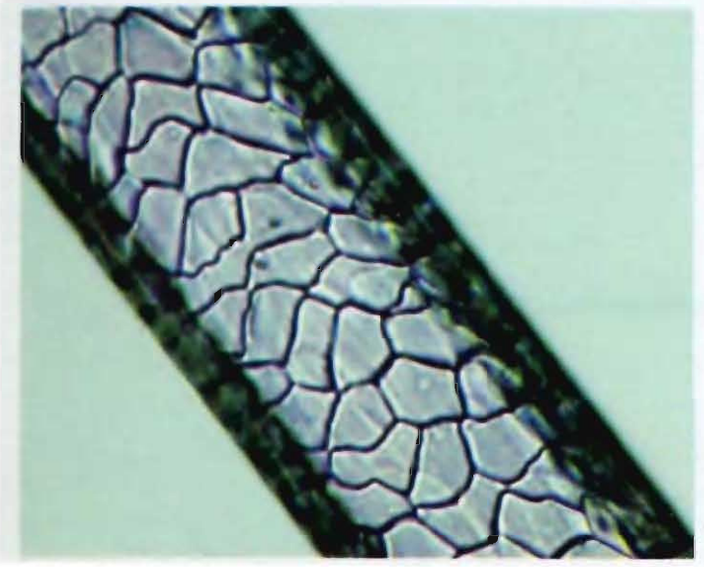


587. Cuticular at proximal 400x

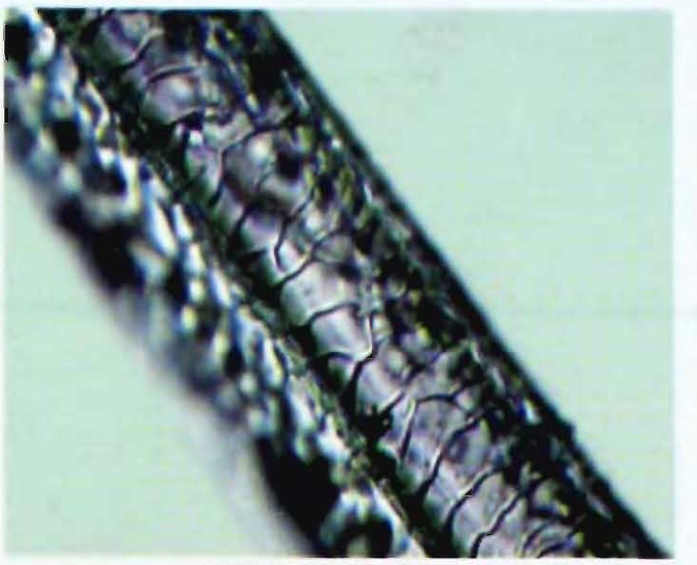


588. Cuticular pattern of secondary guard hair 200x

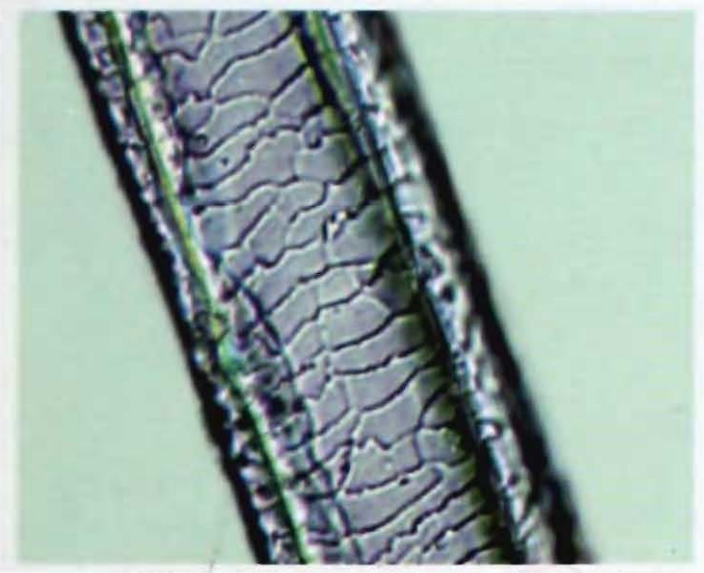
Head



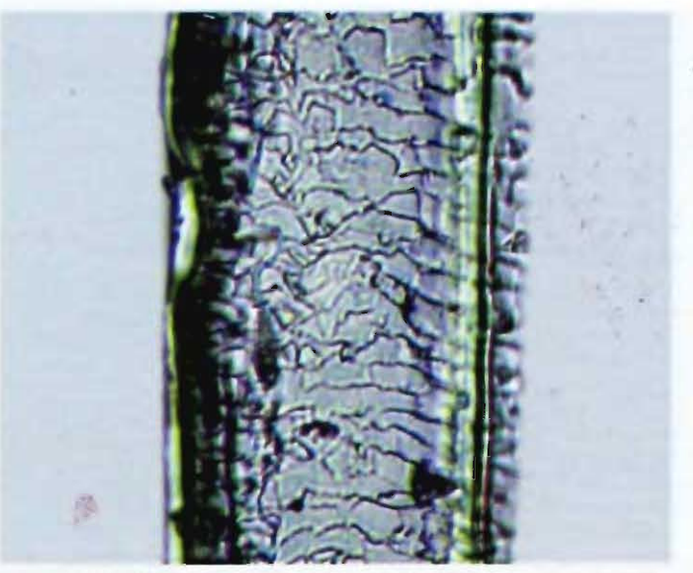
589. At proximal, coronal type, smooth, near 400x



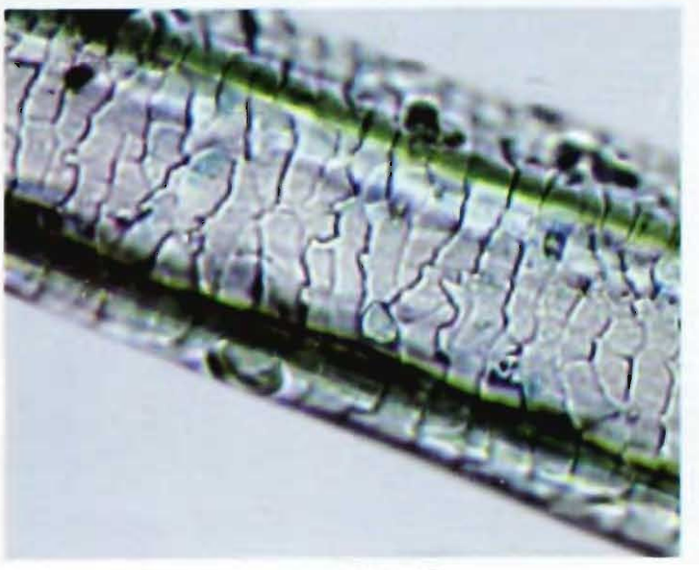
590. At proximal 800x



591. At distal irregular wave, rippled, near 200x



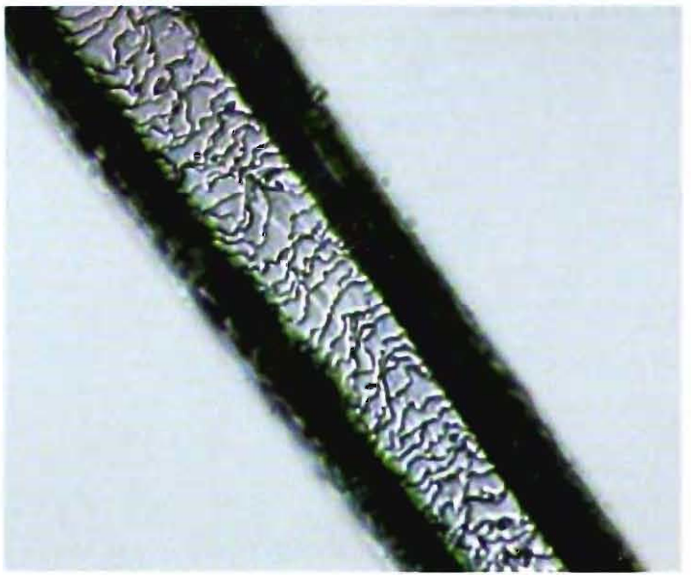
592. At mid Irregular ave, rippled, near 400x



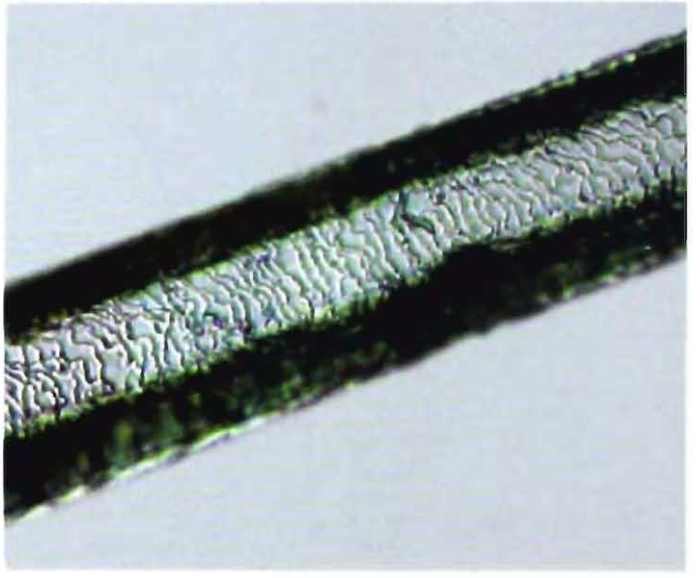
593. At distal 400x

Plate 33d. ***Viverra indica*** (Desmarest), Small Indian civet

Tail

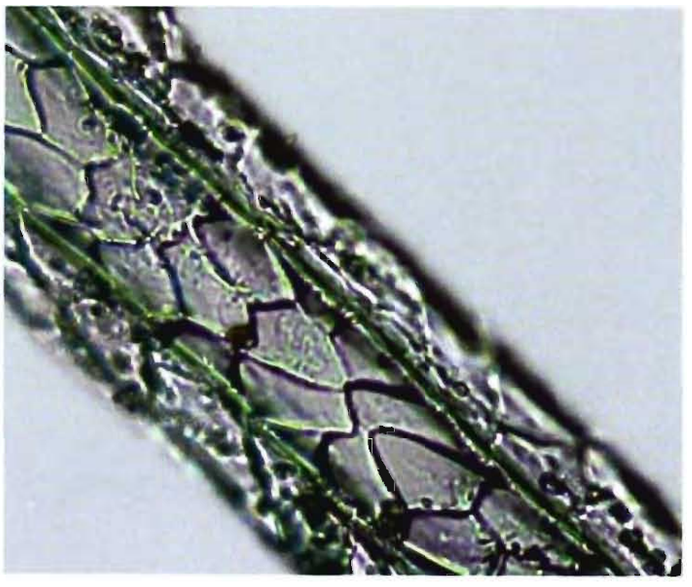


594. Cuticular at mid irregular wave, rippled, near 400x



595. Cuticular at distal

Secondary Guard hair of Dorsal region



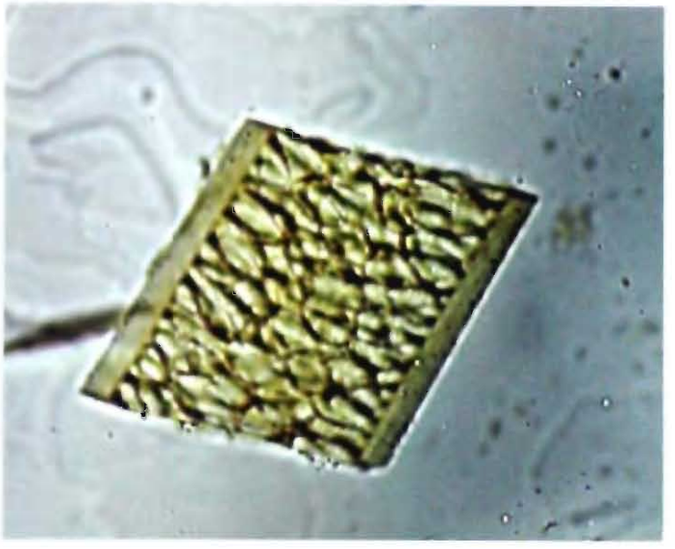
596. Cuticlar at proximal



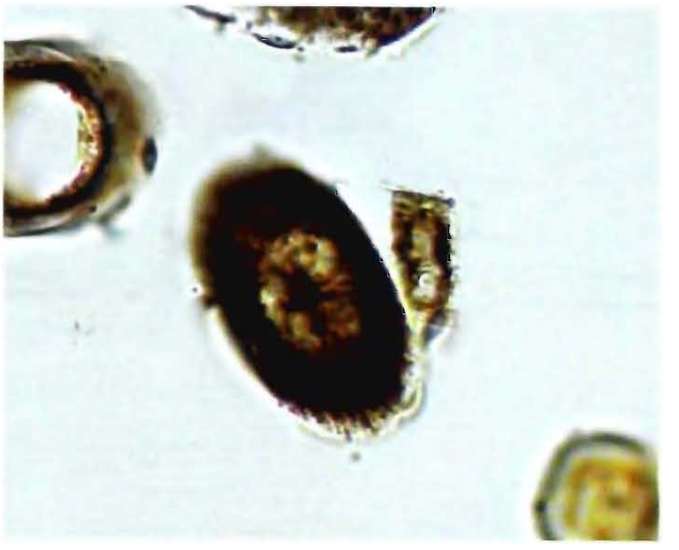
597. Cuticular towards mid

Plate 34a. ***Viverra zibetha*** Linnaeus (Large Indian civet)

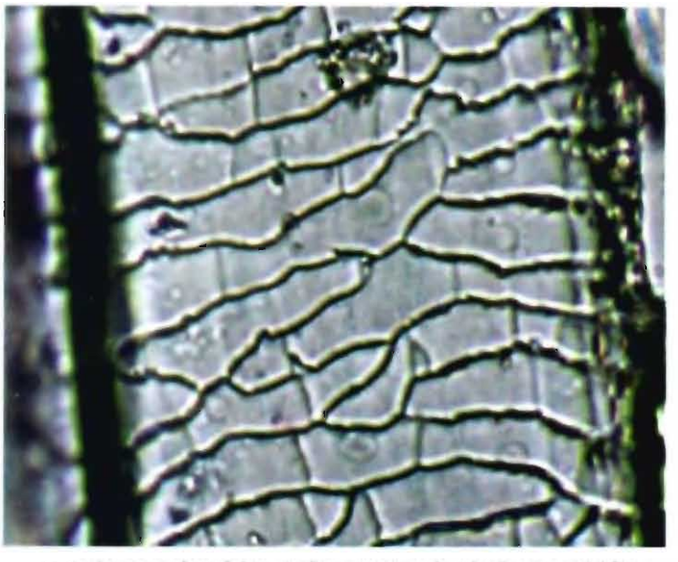
Dorsal



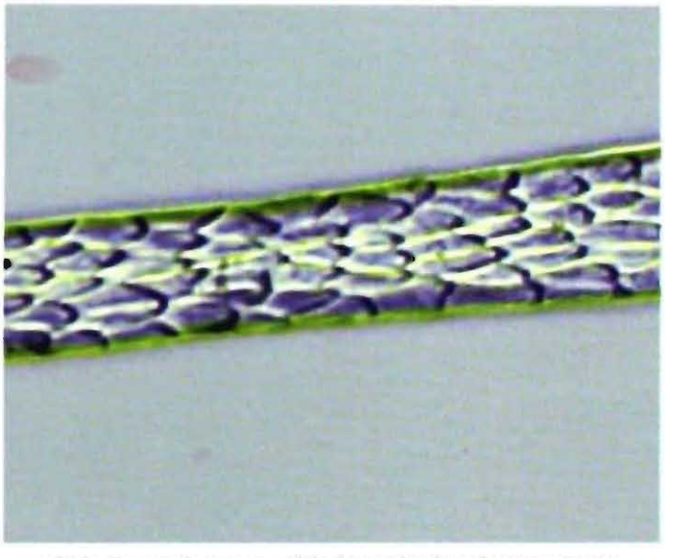
598. Medulla wide aeriform lattice 400x



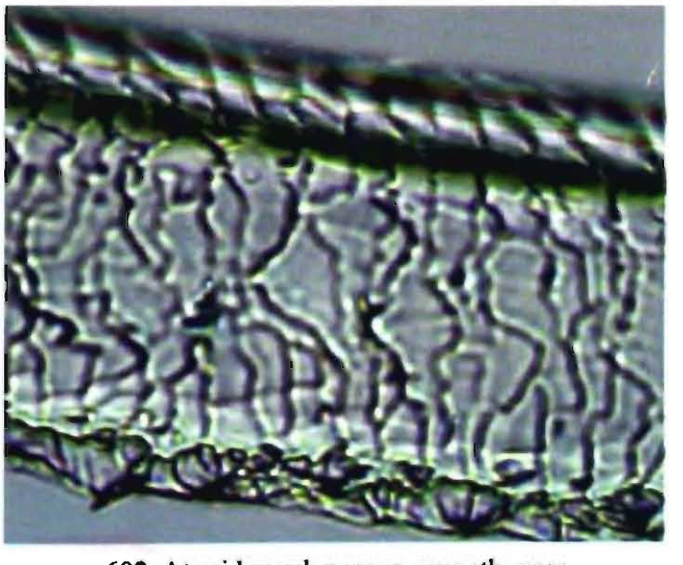
599. Cross sections oblong,with large medulla100x



600. At proximal irregular wave, rippled, near 400x



601. Secondary guard hair cuticular dentate 200x



602. At mid regular wave, smooth, near

Plate 34b. ***Viverra zibetha*** Linnaeus (Large Indian civet)

Ventral

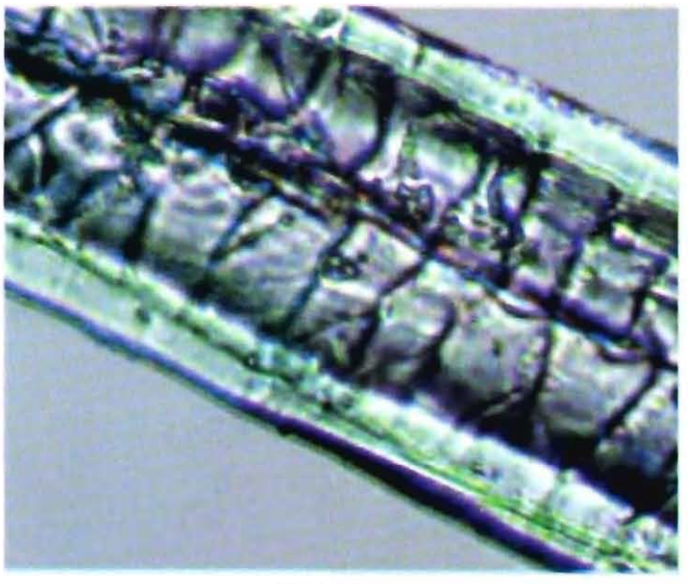


603. medulla wide aeriform lattice 400x

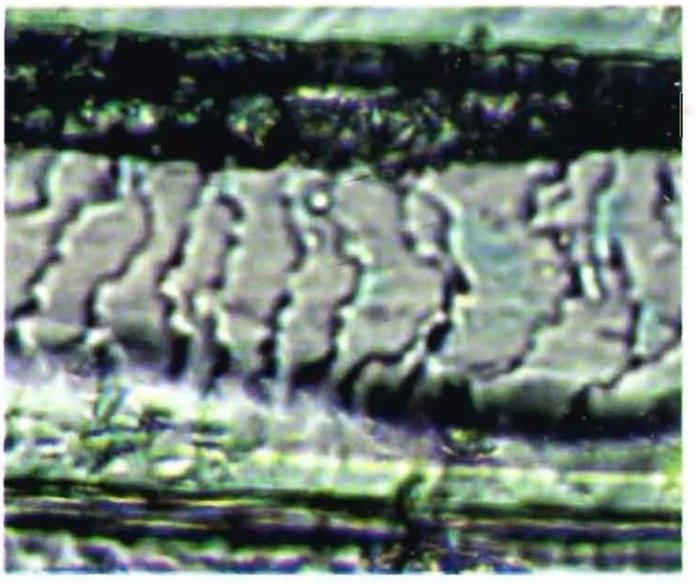


604. Cross section circular

Secondary Guard hair of Dorsal region



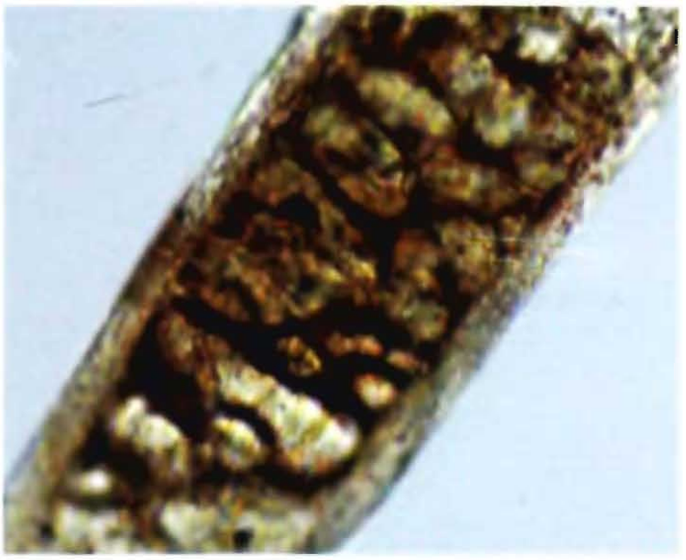
605. Cuticular at mid



606. Cuticular at distal

Plate 34c. ***Viverra zibetha*** Linnaeus (Large Indian civet)

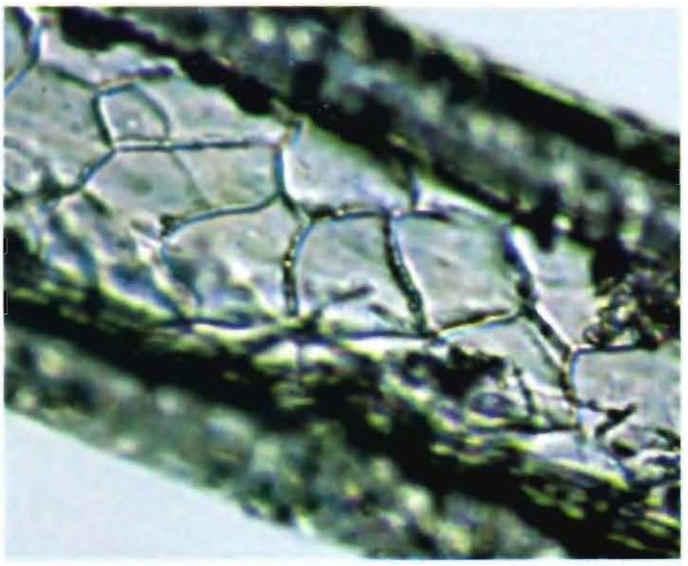
Head



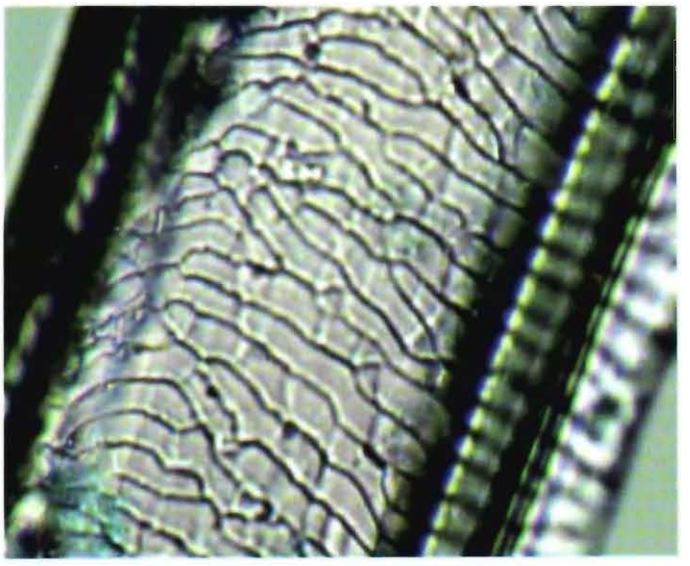
607. Medulla wideaeriform lattice 200x



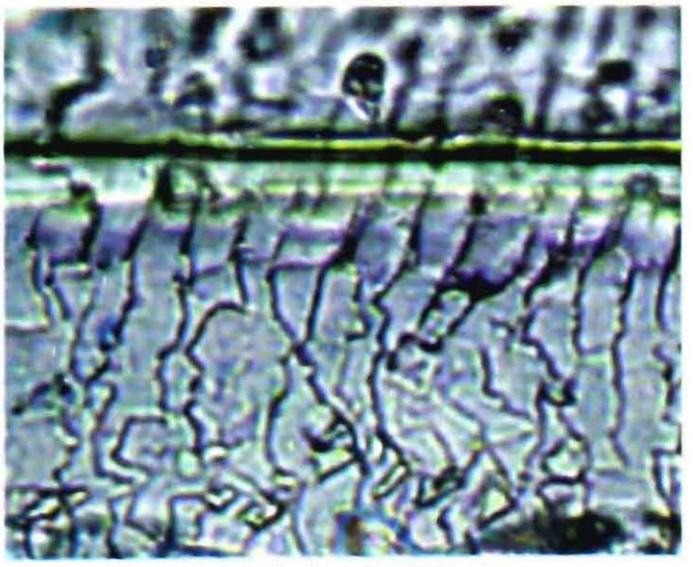
608. Cross section circular 200x



609. Cuticular transitional 400x



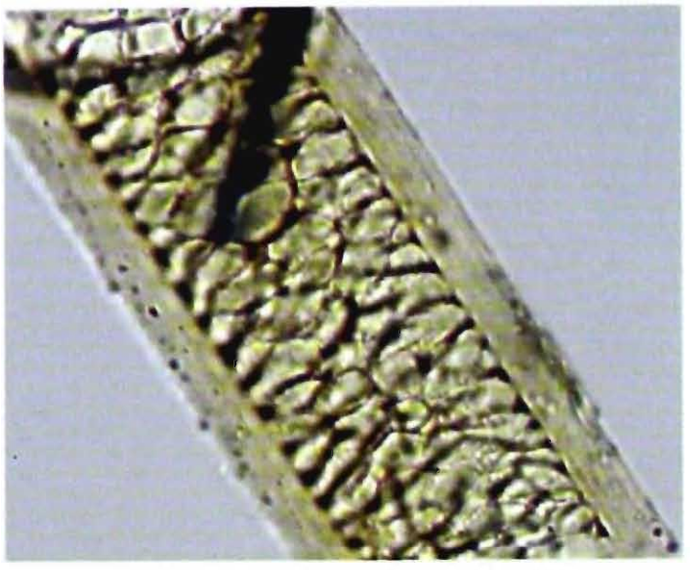
610. Cuticular at mid 400x



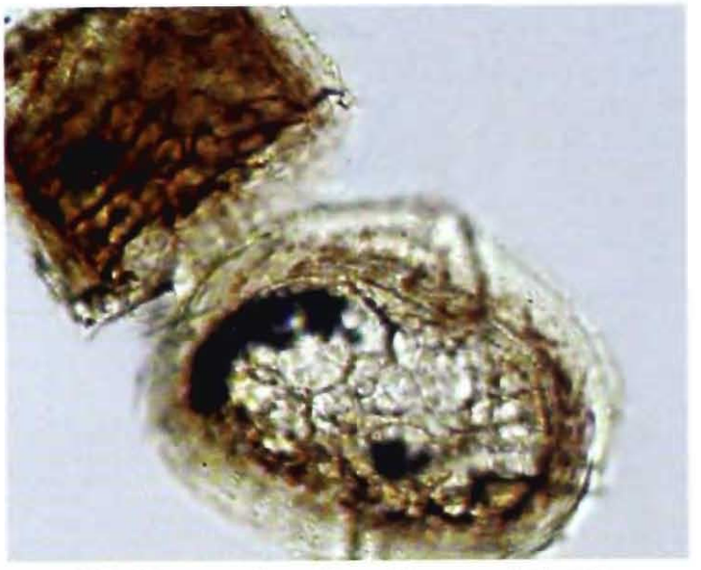
611. Cuticular at distal 400x

Plate 34d. ***Viverra zibetha*** Linnaeus (Large Indian civet)

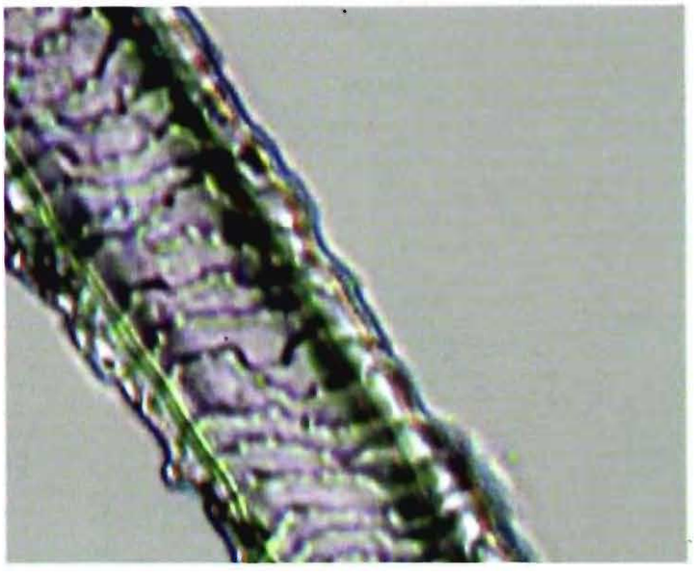
Tail



612. Medulla wide aeriform lattice 200x



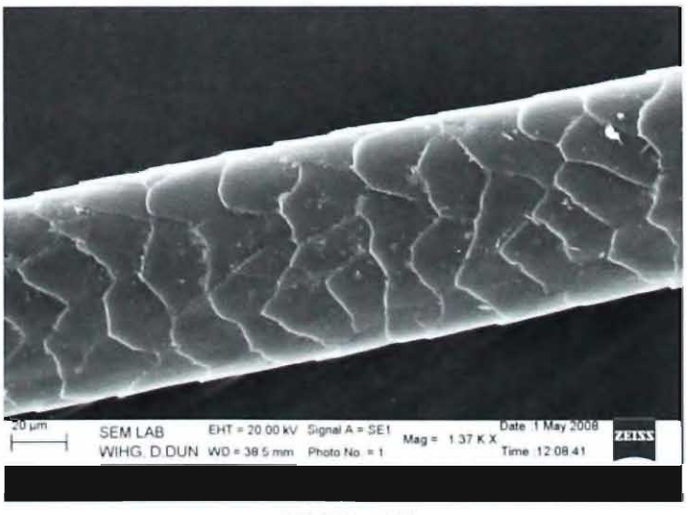
613. Cross section oblong, large medulla 200x



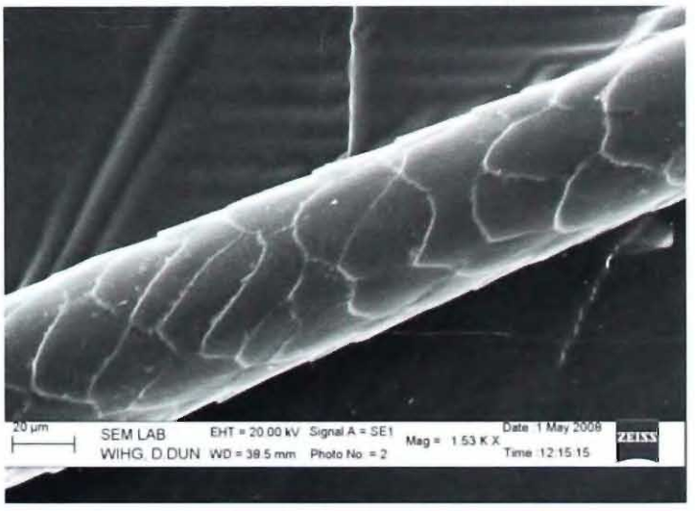
614. Cuticular at distal 200x

Scanning Electron Micrographs

Viverra zibetha **(Large Indian civet)**

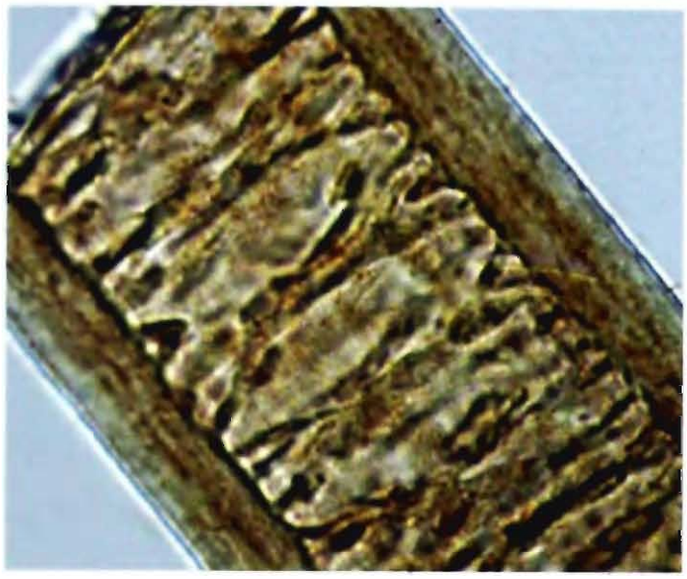


615. At mid

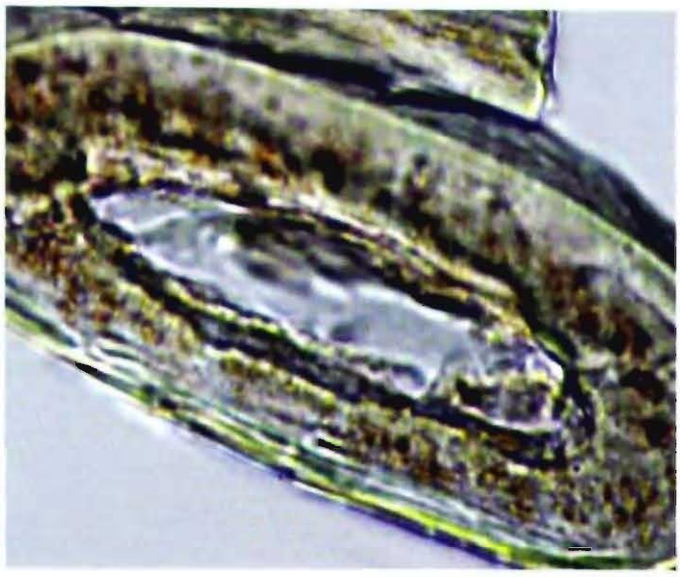


616. At distal Mustelidae

Dorsal



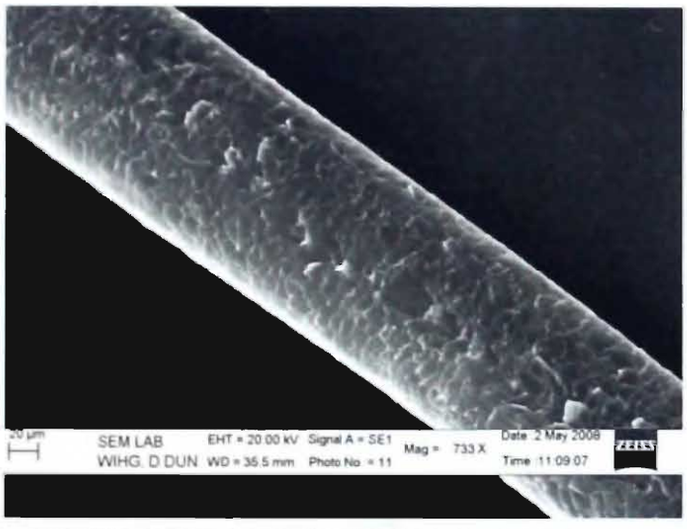
617. Medulla Narrow medulla lattice 800x



618. Cross section oblong,large medulla 800x

Scanning Electron Micrographs

***Lutra lutra* Common otter**



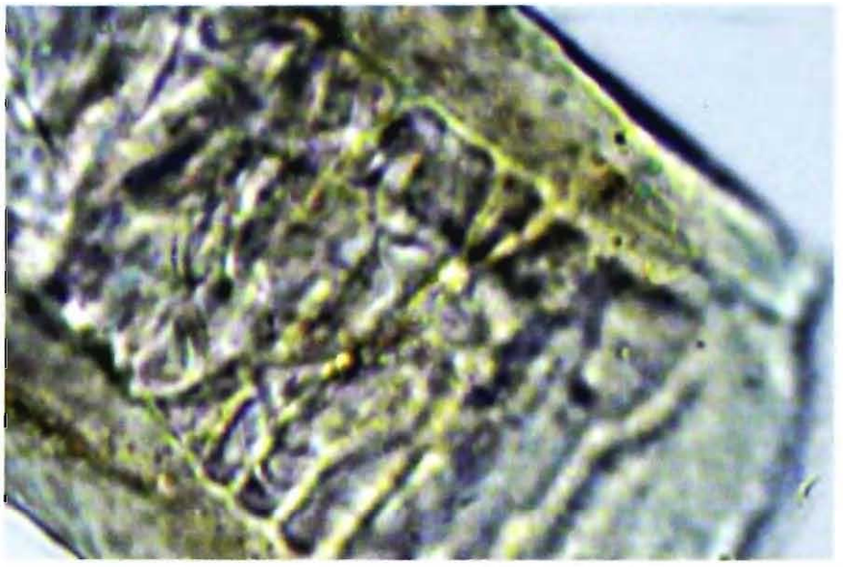
619. Cuticular at mid Irregular wave, rippled, close



620. Cuticular at distal Irregular wave, rippled, close

Plate 35b. ***Lutra lutra*** (Linn.) Common otter

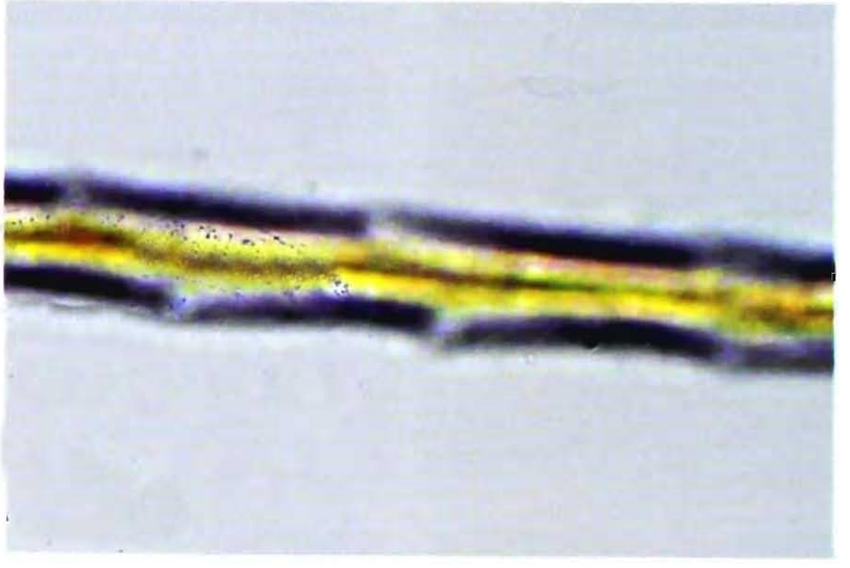
Ventral



621. Medulla Narrow medulla lattice 800x



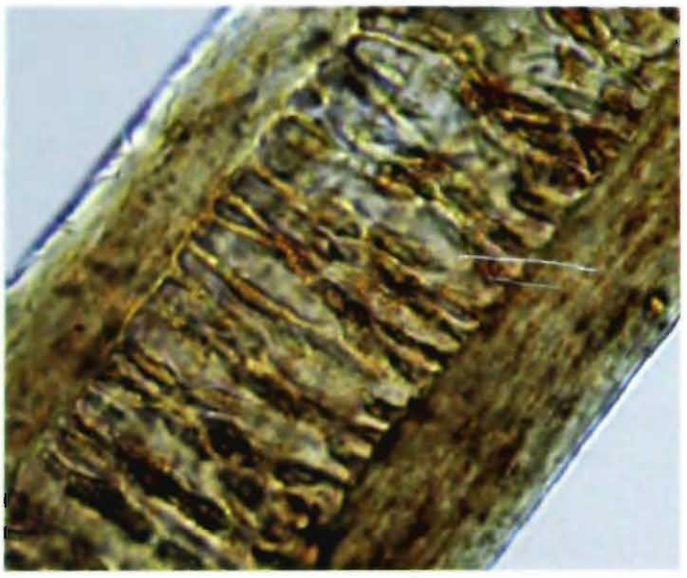
622. Cross section oblong 800x



623. Medulla type of fur hair 400x

Plate 35c. ***Lutra lutra*** (Linn.) Common otter

Head



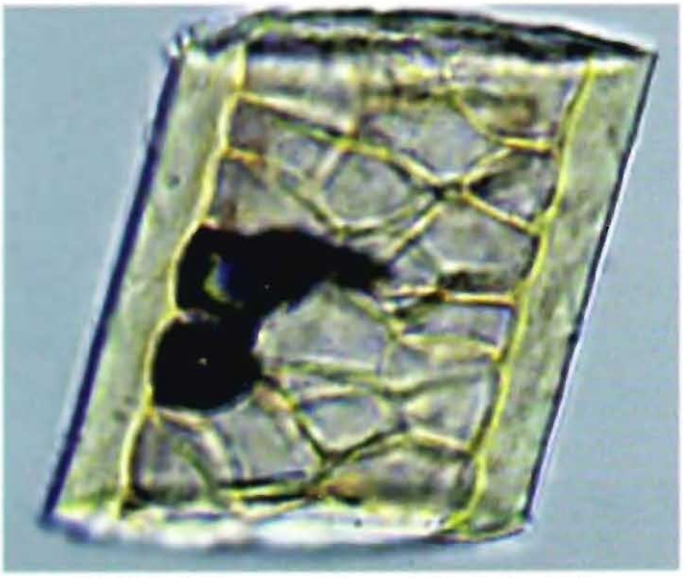
624. Medulla : Narrow medulla lattice 800x



625. Cross section oblong 800x

Plate 35c. ***Lutra lutra*** (Linn.) Common otter

Tail



626. Medulla type wide medulla lattice 800x



627. Cross section oblong 800x

Plate 36a. ***Lutrogale perspicillat*** (I Geoffray Saint-Hilaire), Smooth coated otter

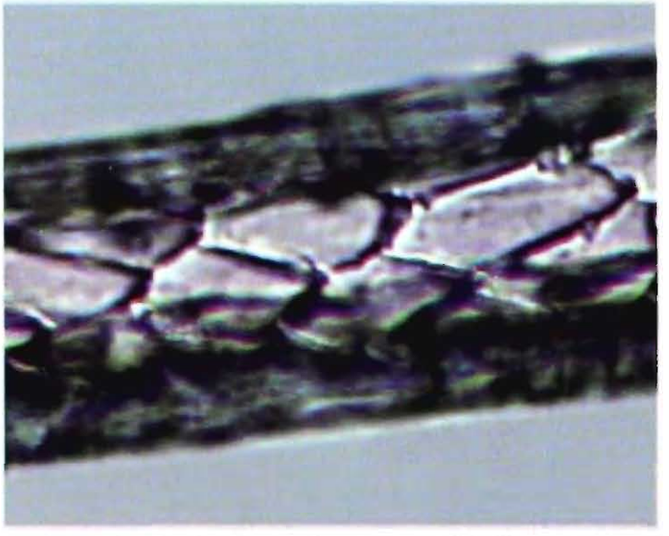
Dorsal (400x)



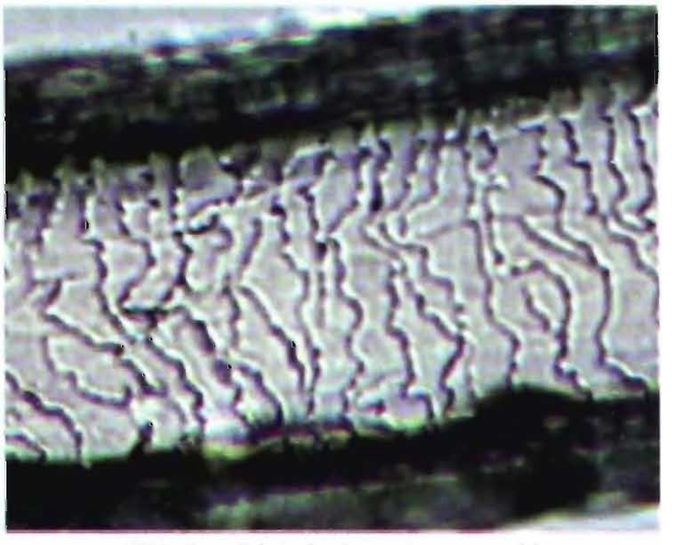
628. Medulla widemedulla lattice



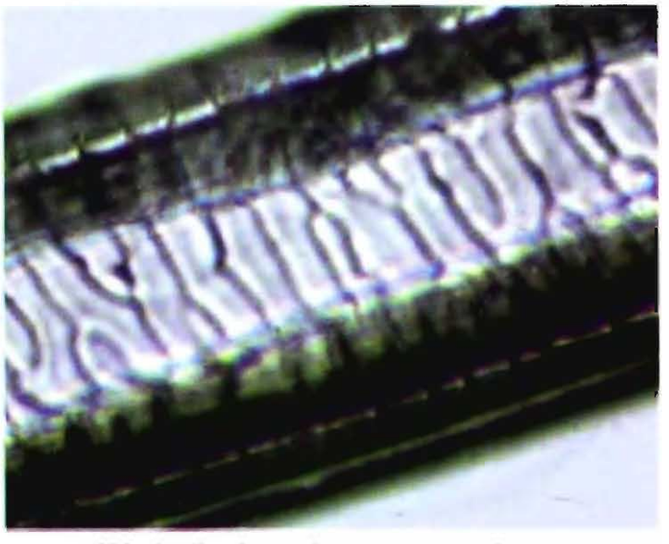
629. Cross sections oblong, reniform



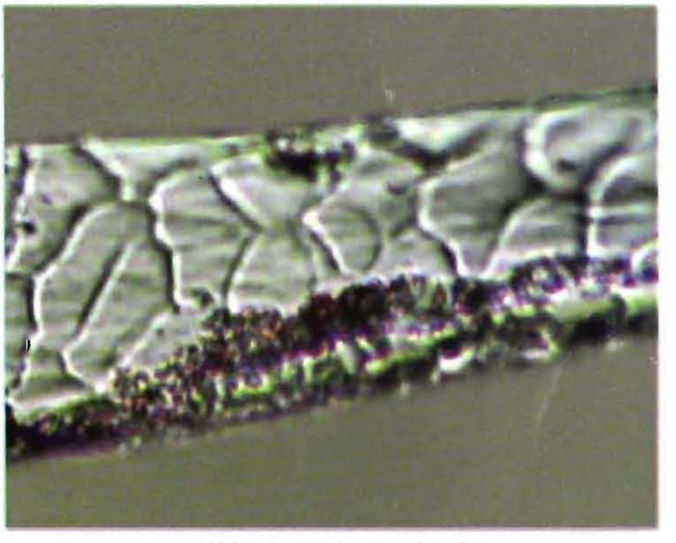
630. Towards proximal, transitional type



631. At mid cuticular pattern at mid

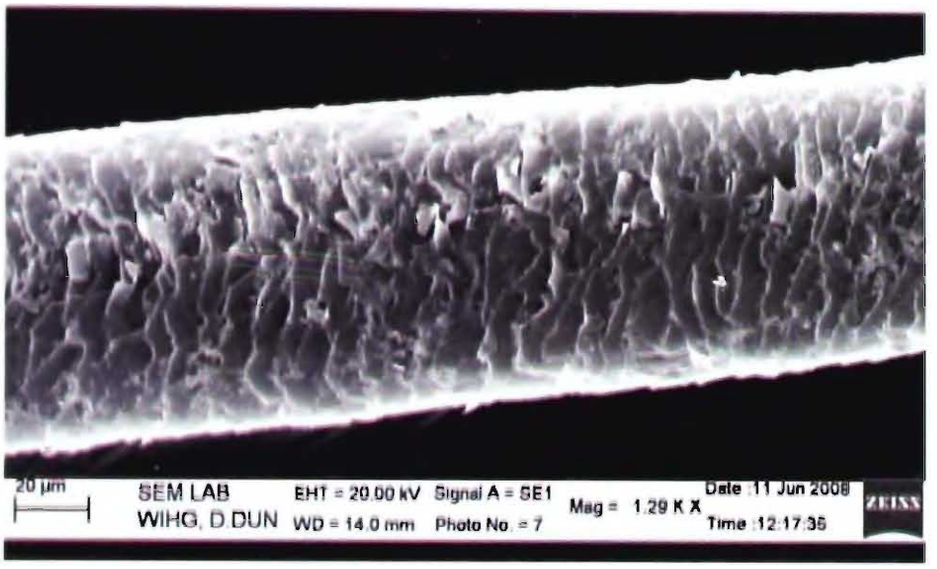


632. At distal, regular wave, smooth, near

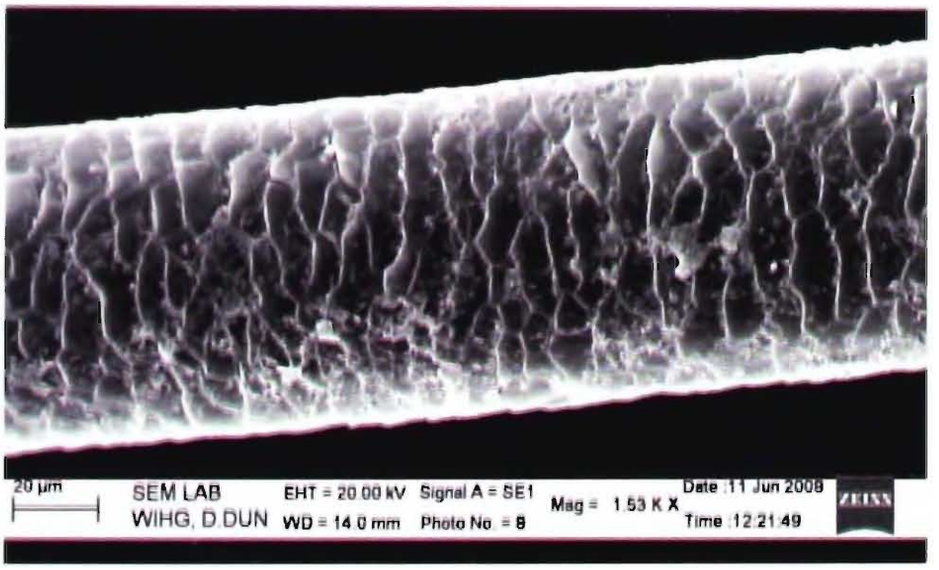


633. Towards proximal

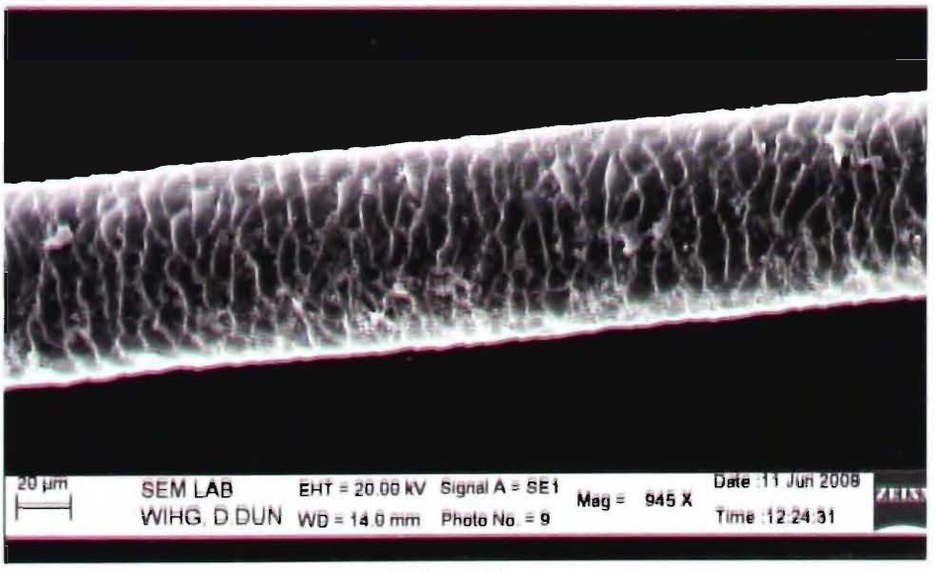
Lutrogale perspicillata (I Geoffray Saint-Hilaire), Smooth coated otter



634. At mid



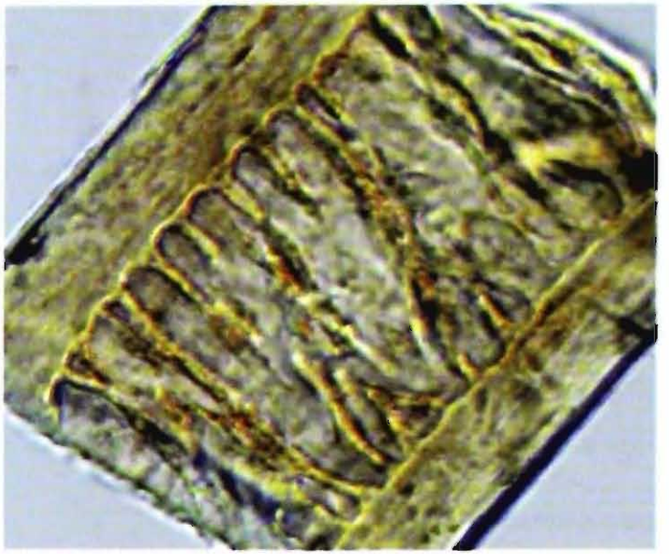
635. At proximal



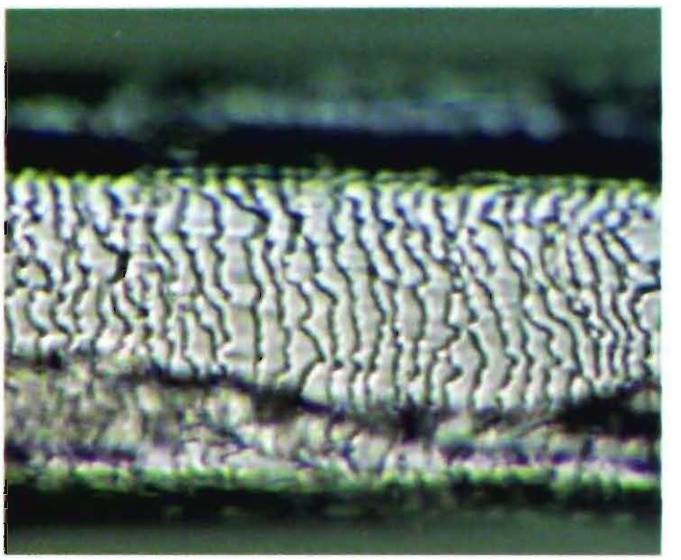
636. At distal

Plate 36b. ***Lutrogale perspicillat*** (I Geoffray Saint-Hilaire), Smooth coated otter

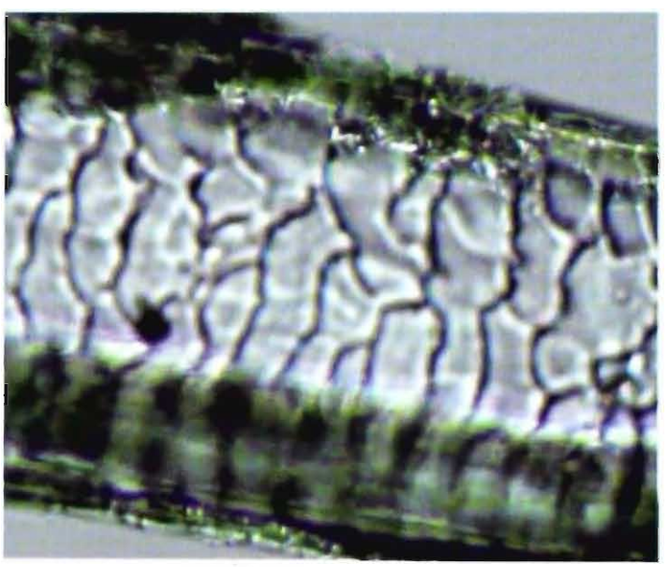
Ventral



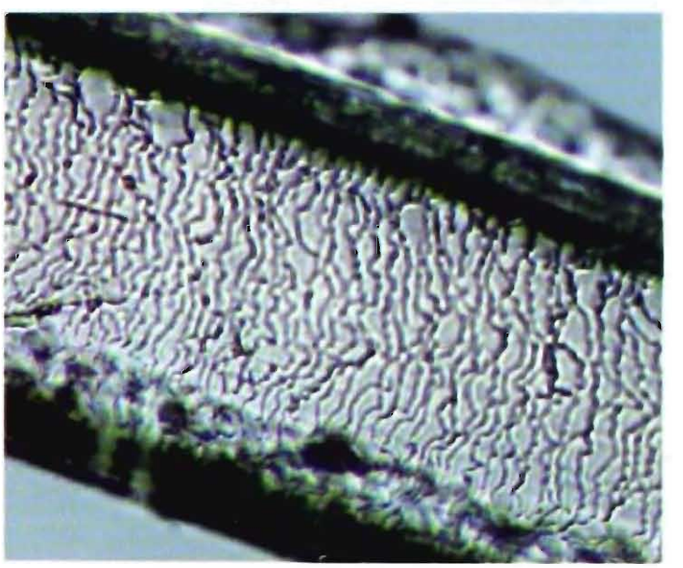
637. Medulla narrow medulla lattice 200xx



638. Cuticular at distal 200x

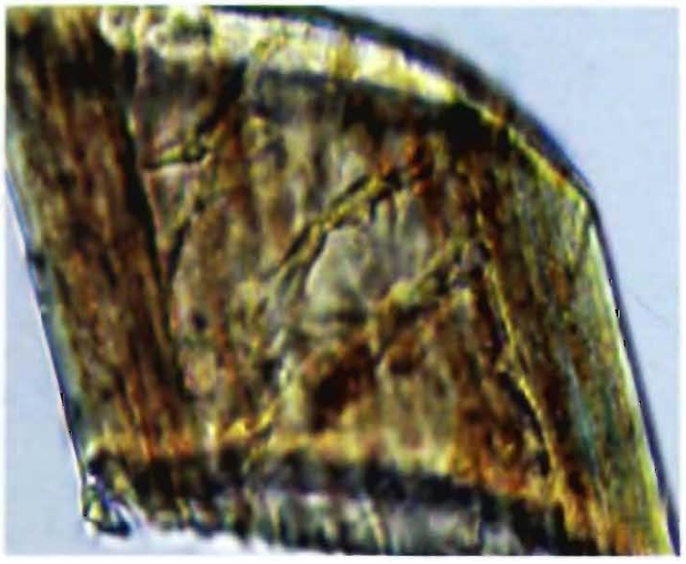


639. Cuticular at mid 200x



640. Cuticular at proximal 400x

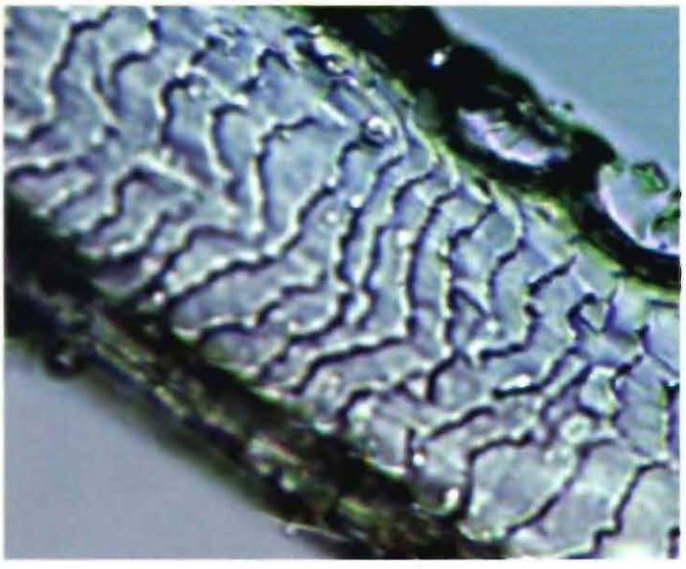
Head



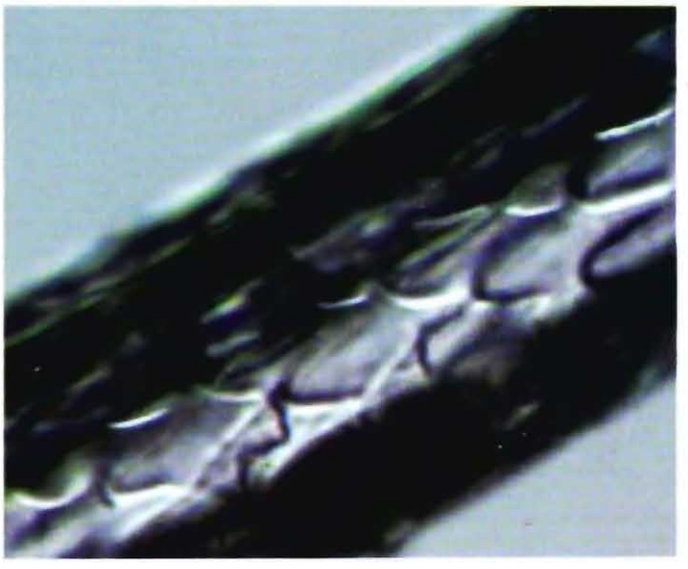
641. Medulla narrow medulla lattice 400x



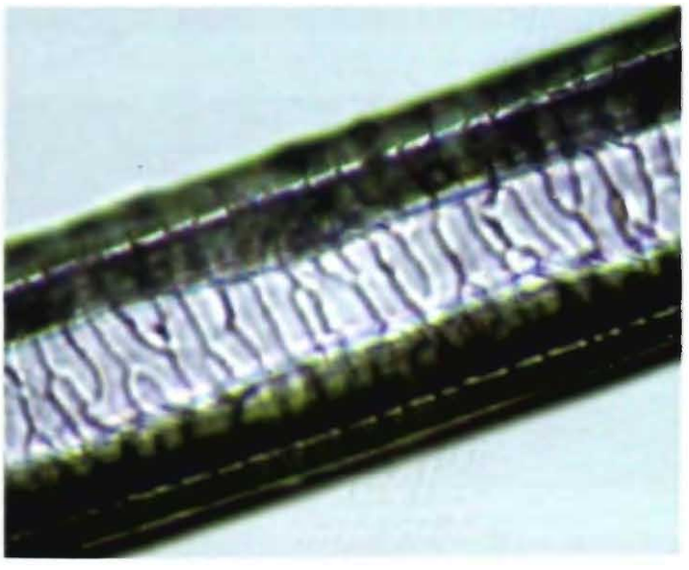
642. Cross section oblong 400x



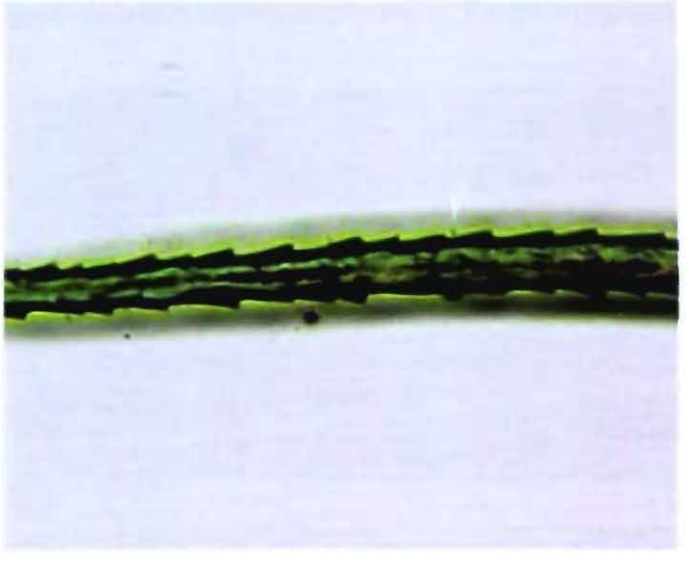
643. Cuticular at mid 400x



644. Cuticular towards proximal 400x



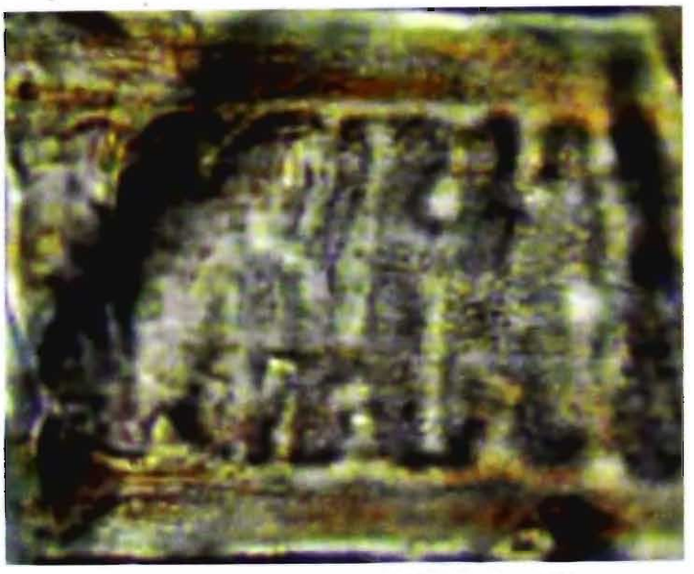
645. Cuticular at distal 400x



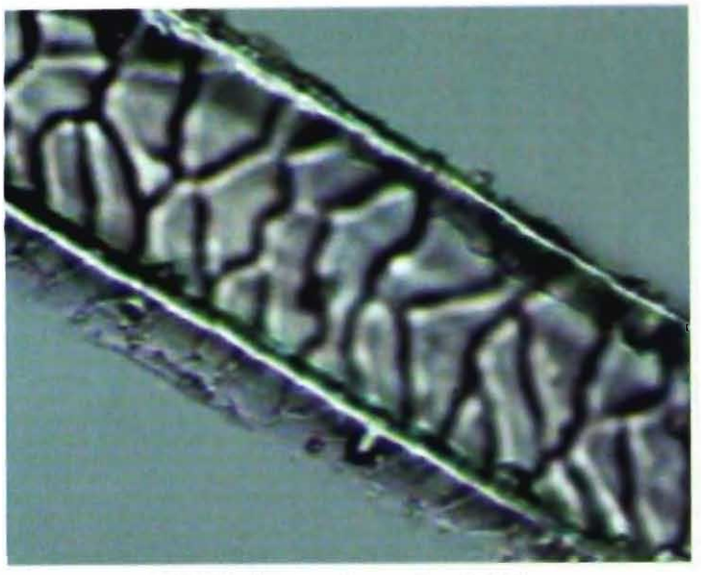
646. Fur hair

Plate 36d. ***Lutrogale perspicillat*** (I Geoffray Saint-Hilaire), Smooth coated otter

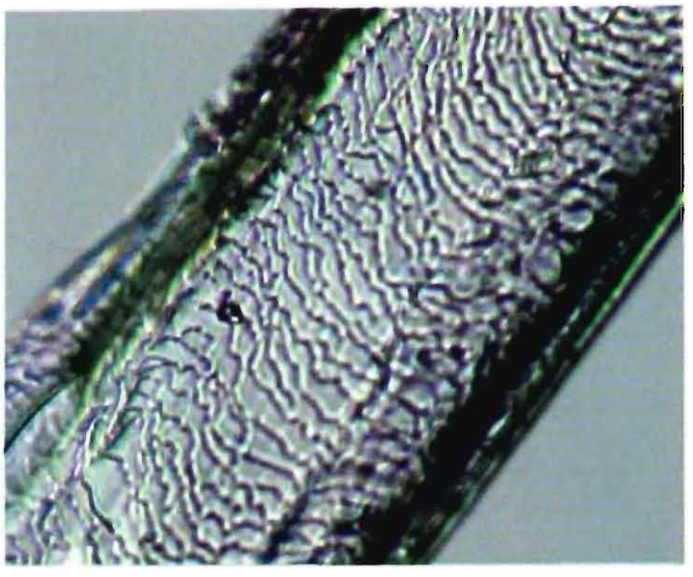
Tail



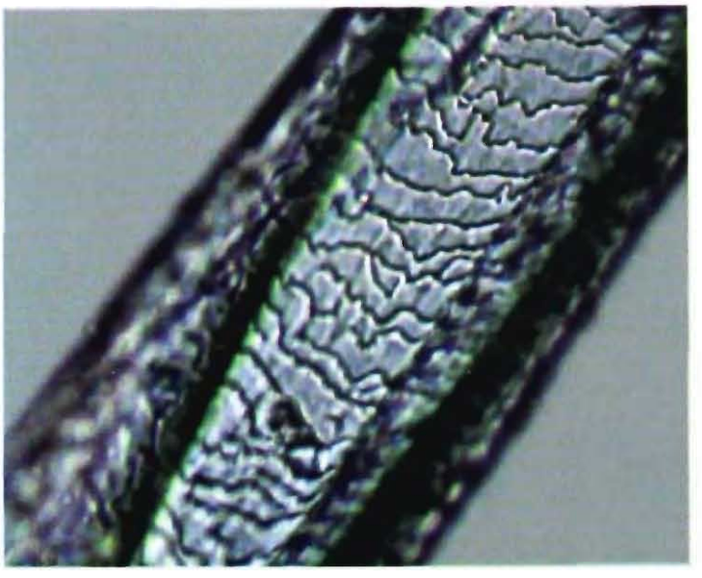
647. Medulla narrow medulla lattice 400x



648. Cuticular at proximal 200x



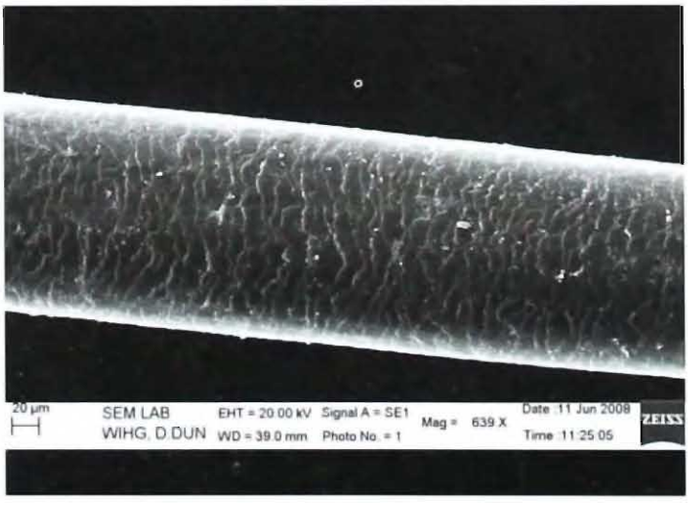
649. Cuticular at mid 400x



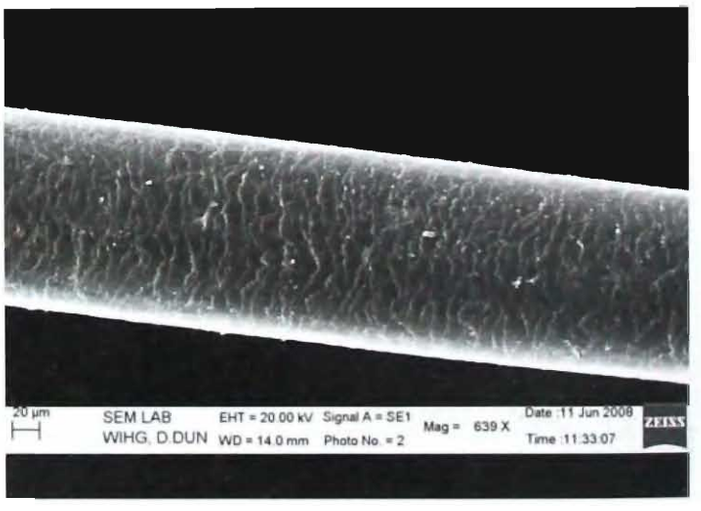
650. At distal 400x

Plate 37. ***Arctonyx collaris Cuvier,*** Hog badger

Dorsal



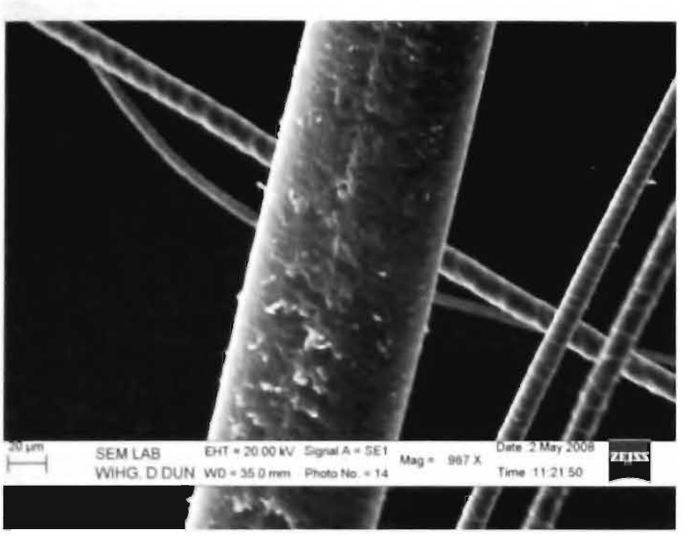
651. Cuticular at mid irregular wave, rippled, near



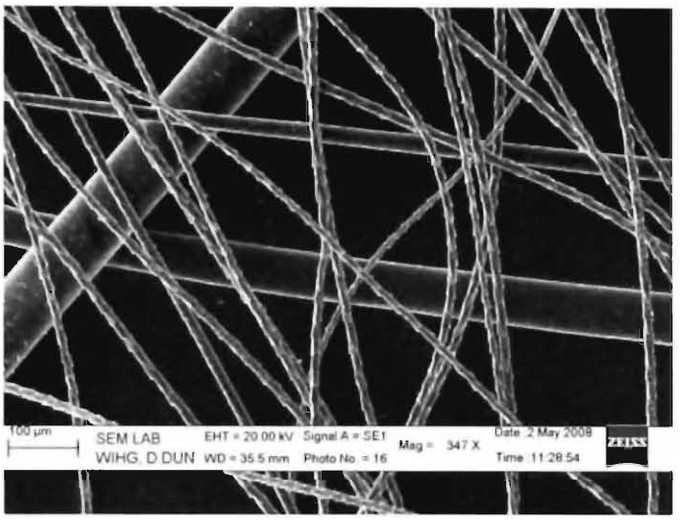
652. Cuticular at proximal Irregular wave, rippled, near

Plate 38a. ***Millivora capensis*** (Schreber), Honey Badger

Dorsal



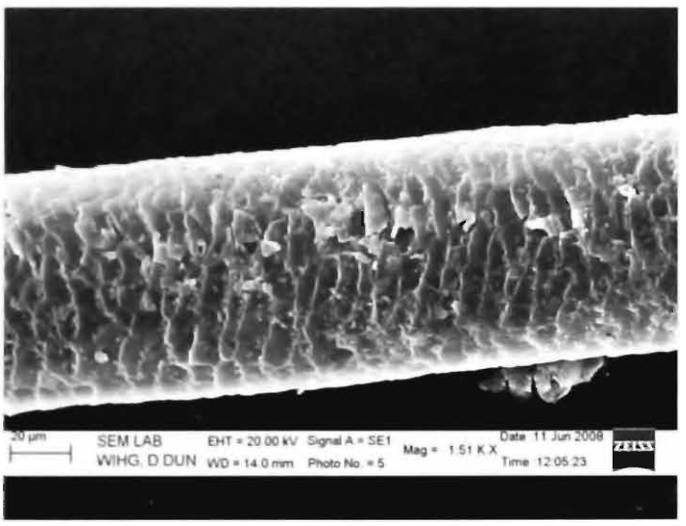
653. At mid, distal and proximal



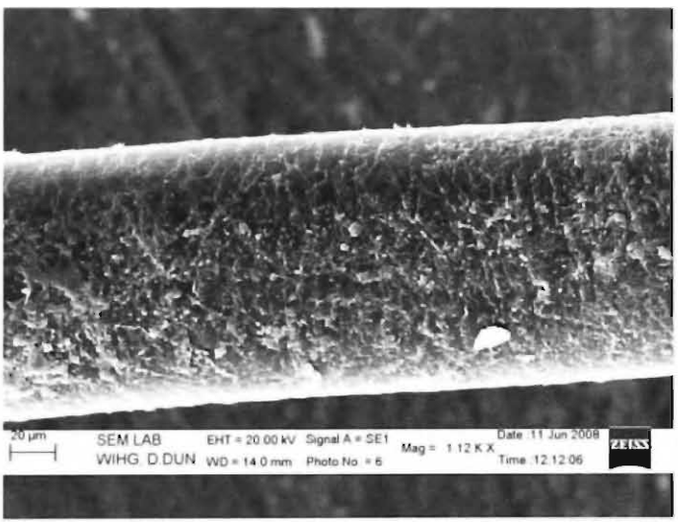
654. Primary guard hair with fur hair

Plate 39a. ***Amblonyx cinereus*** (Illiger), Small clawed otter

Dorsal



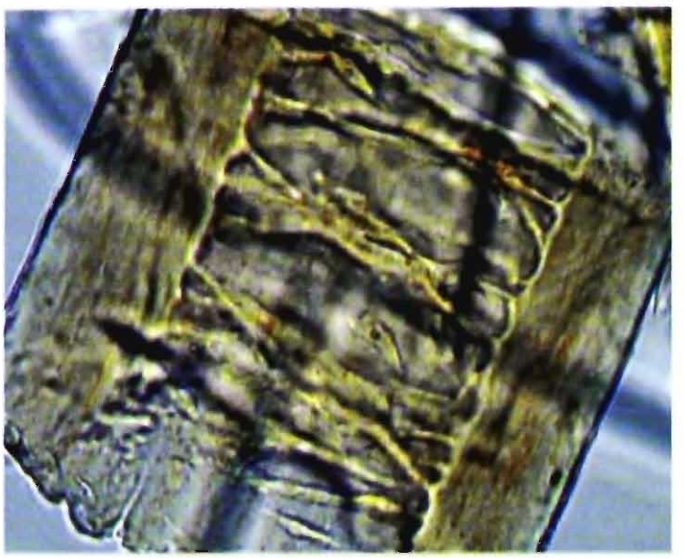
655. Cuticular at mid regular wave, rippled, near



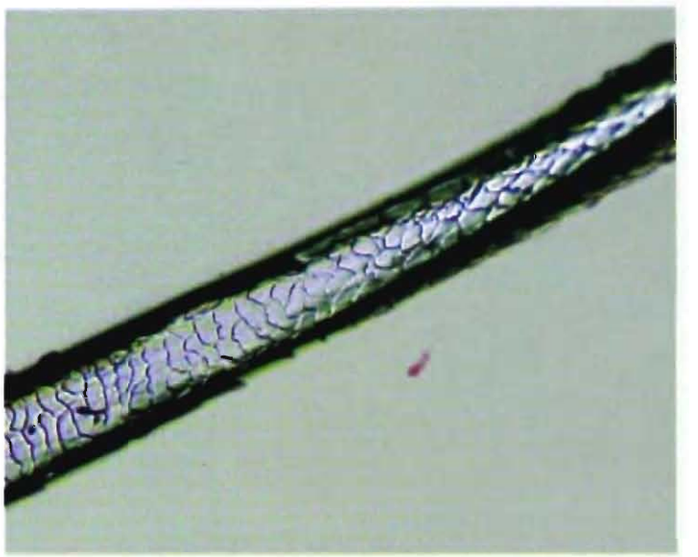
656. Cuticular at proximal

Plate 40a. ***Mastes sibrica*** Pallas, Siberian Weasel

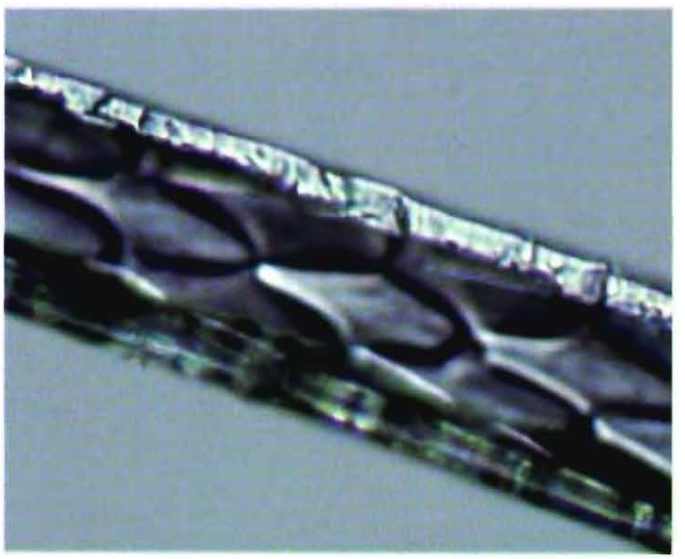
Dorsal



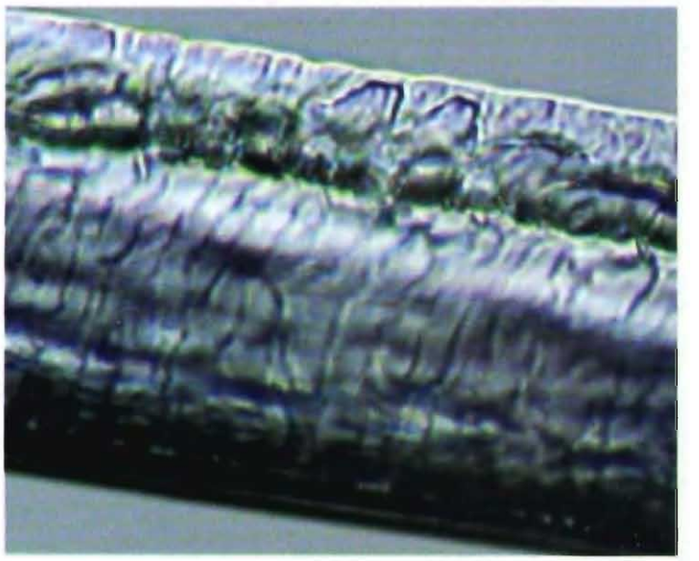
657. Medulla type simple, with oblong shape through cross section 400x



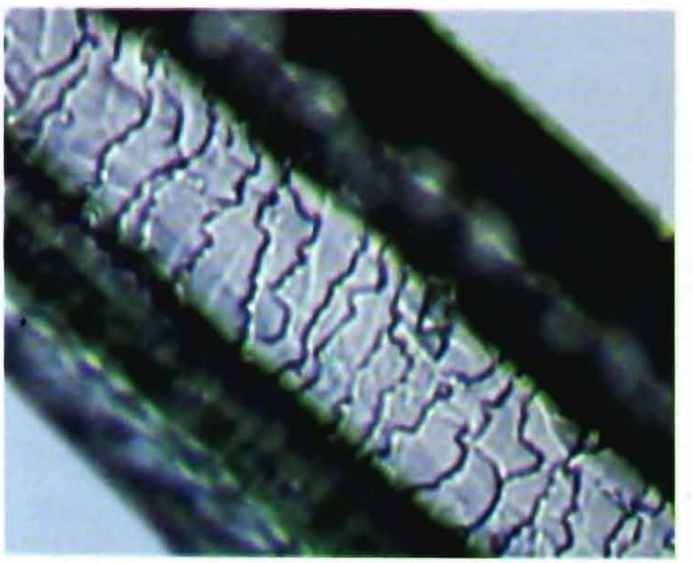
658. Towards proximal 200x



659. At proximal 200x



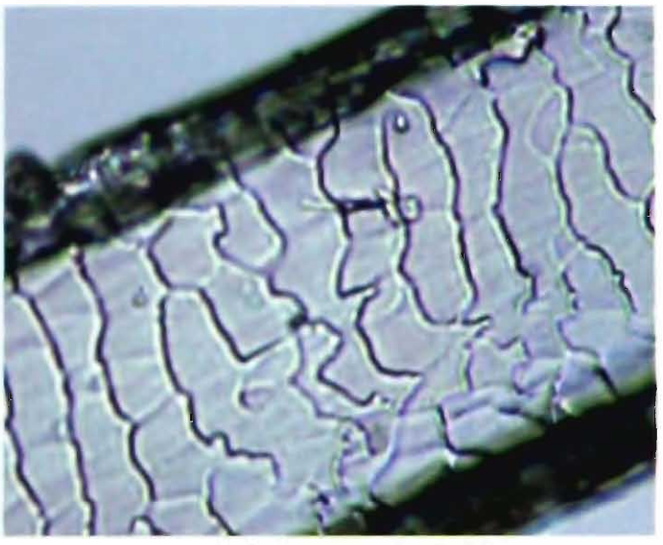
660. At distal 400x regular wave, smooth, near 400x



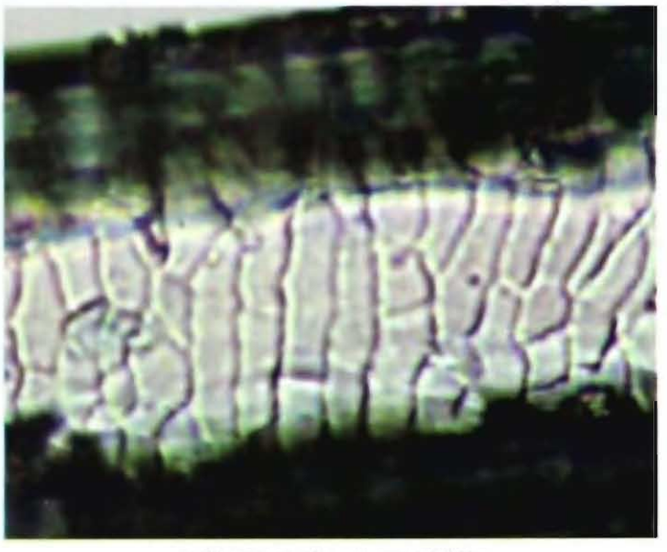
661. Cuticular at mid 400x

Plate 40b. ***Mastes sibrica*** Pallas, Siberian Weasel

Ventral



662. Cuticular at proximal 400x

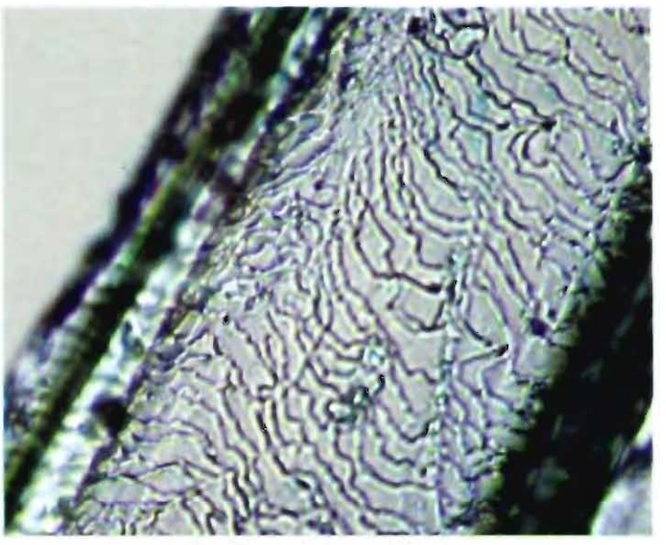


663. Cuticular at mid 200x

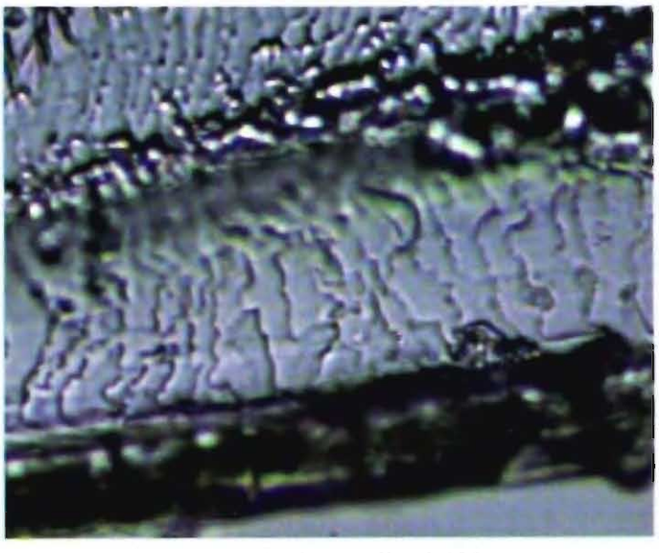


664. Cuticular at distal 200x

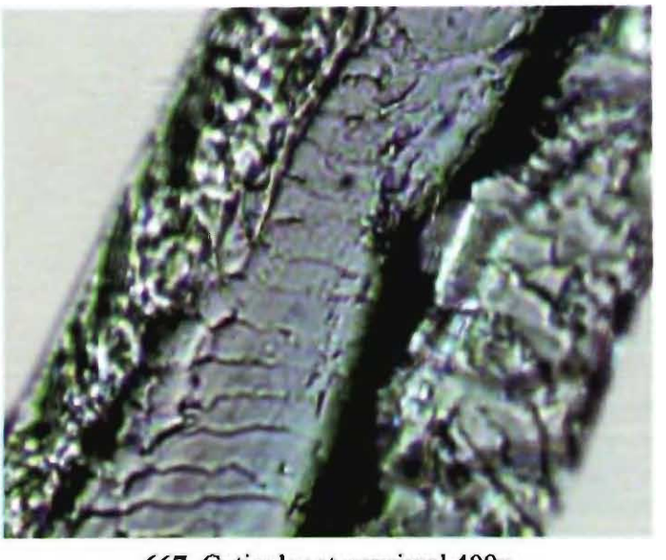
Head



665. Cuticular at mid 400x



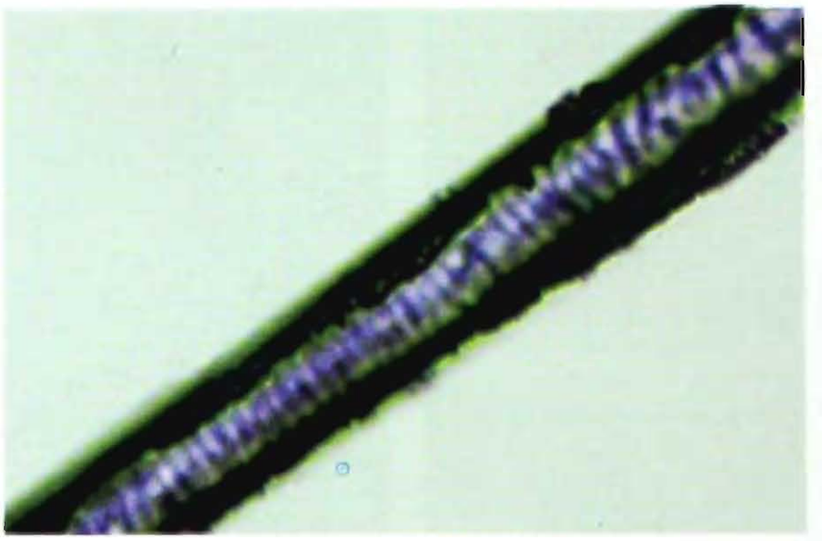
666. Cuticular at distal 400x



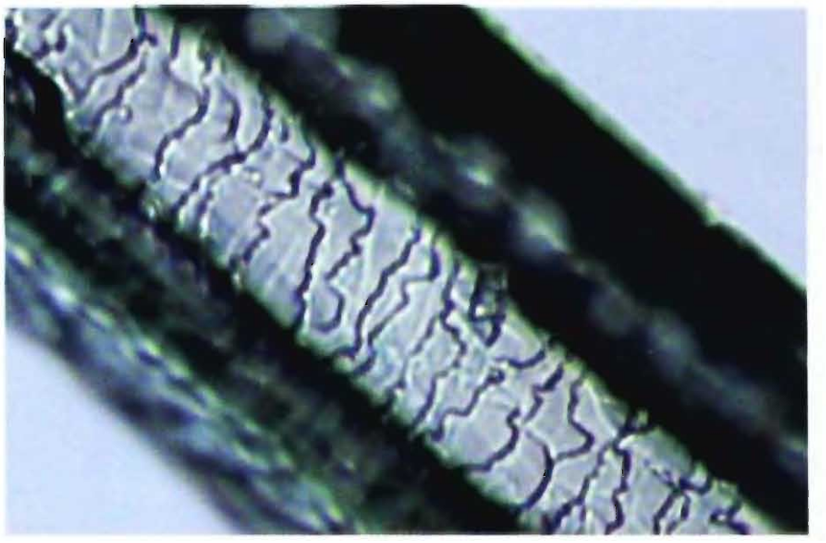
667. Cuticular at proximal 400x

Plate 40d. ***Mastes sibrica*** Pallas, Siberian Weasel

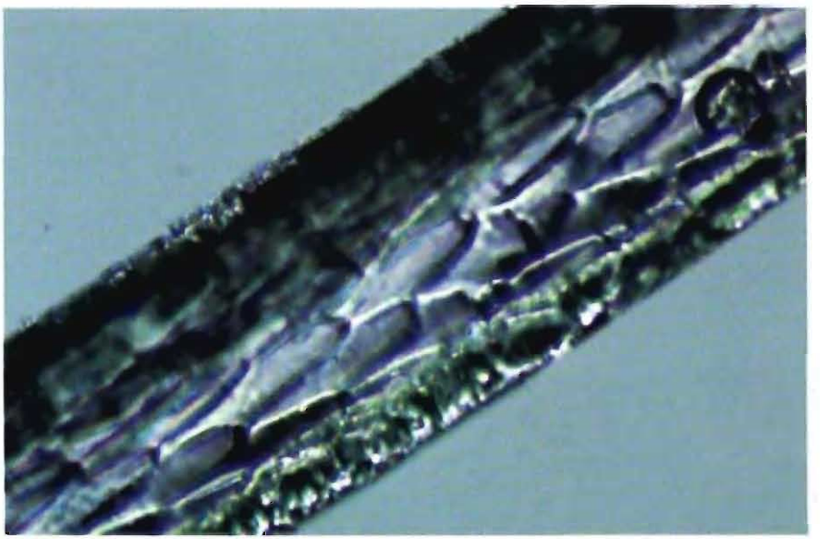
Tail



668. Cuticular at distal 200x

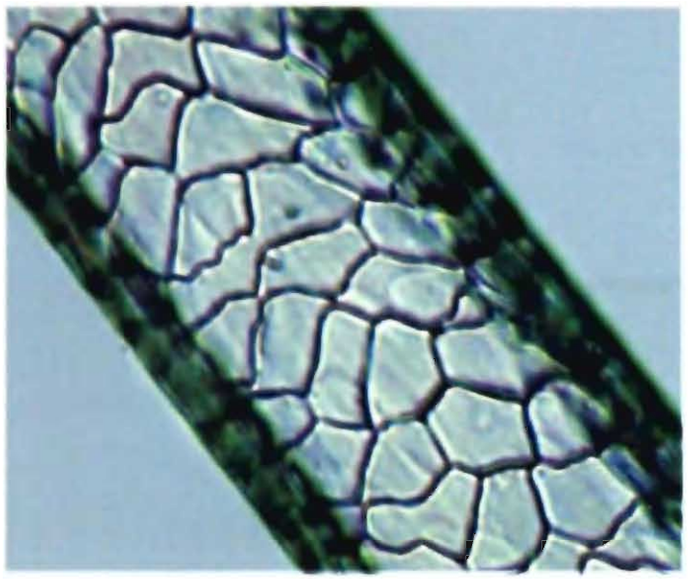


669. Cuticular towards mid 400x

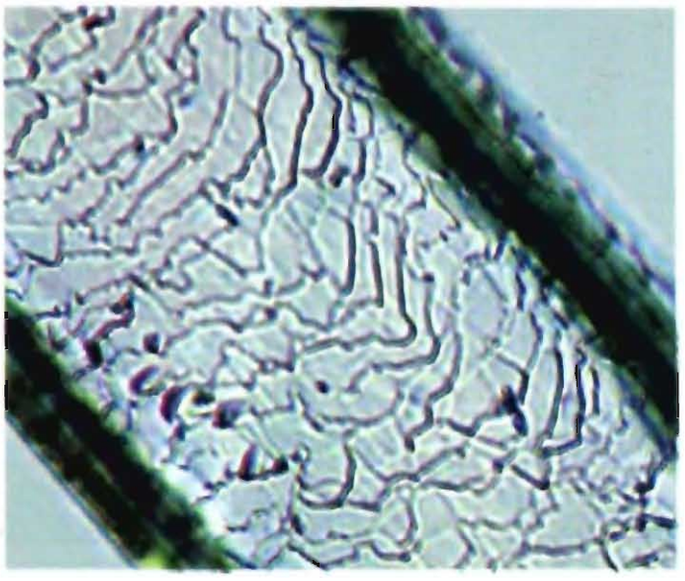


670. Cuticular at proximal (towards mid) 400x

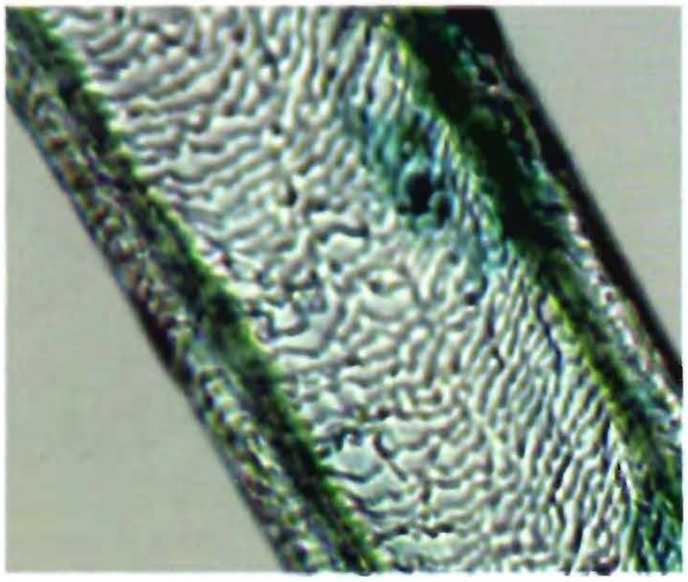
Dorsal



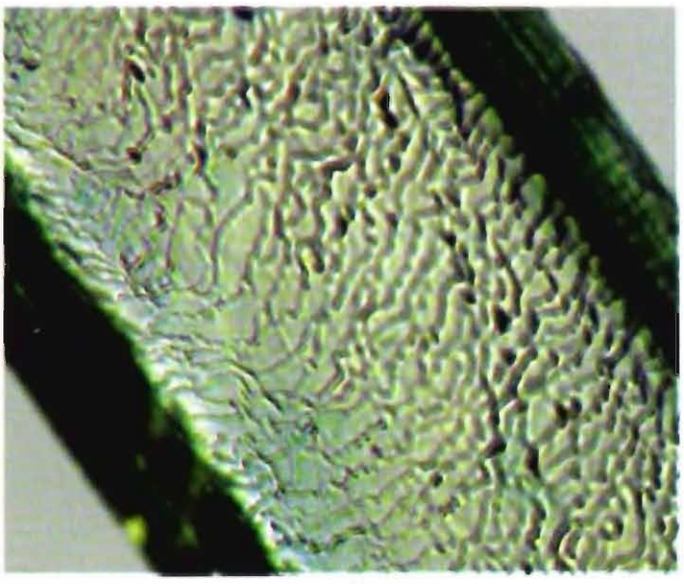
671. Cuticular at proximal



672. Cuticular towards proximal



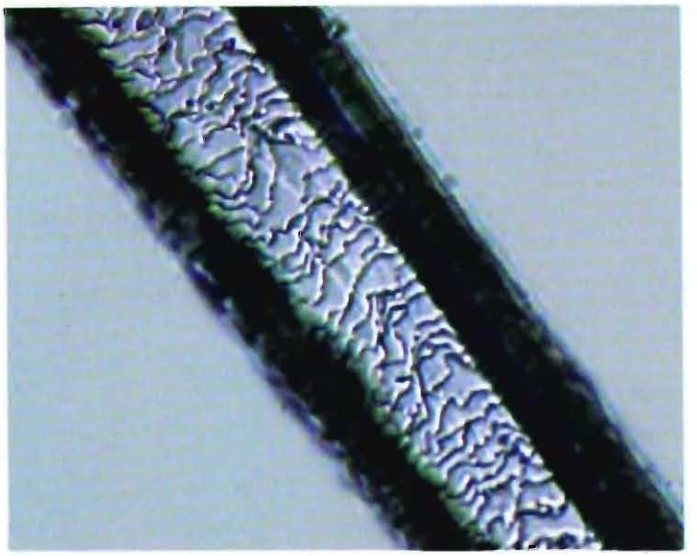
673. Cuticular at distal



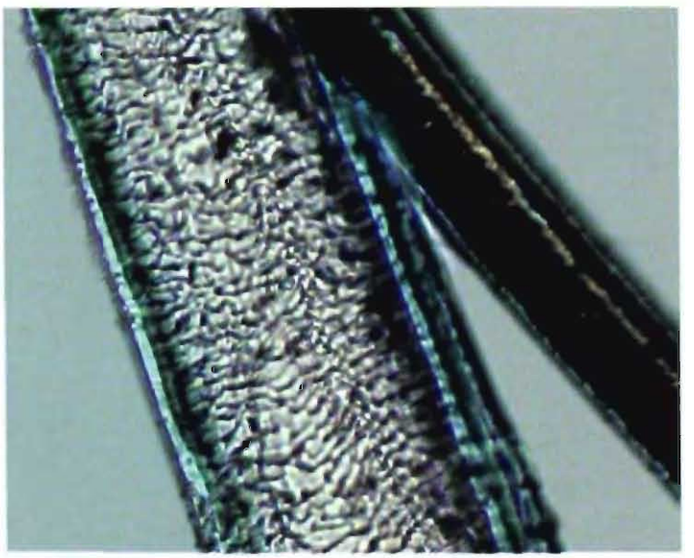
674. Cuticular at mid

Plate 41b. ***Martes flavigula*** (Boddaert), Yellow throated marten

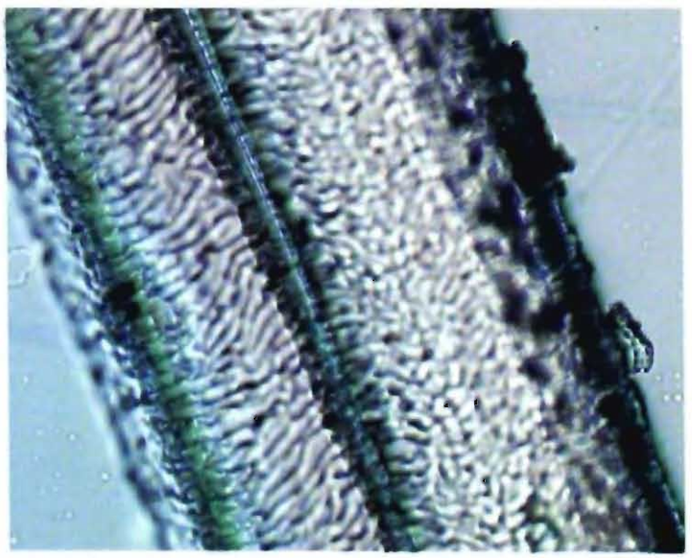
Ventral Photomicrographs



675. Cuticular at distal 400x



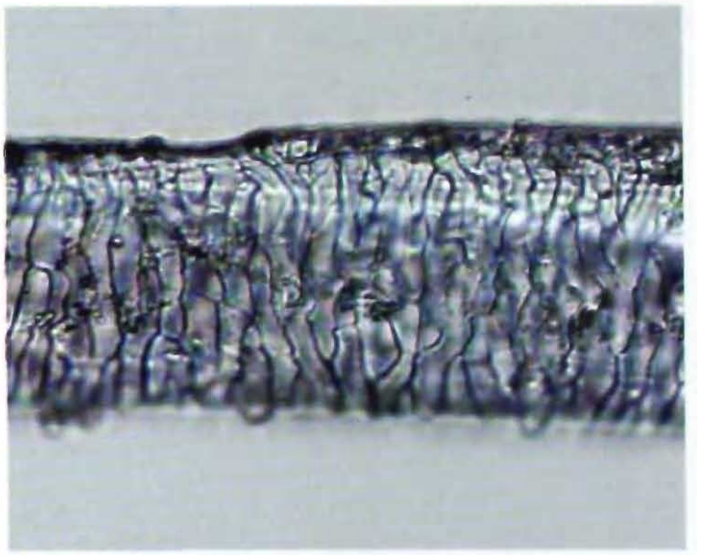
676. Cuticular at at proximal 400x



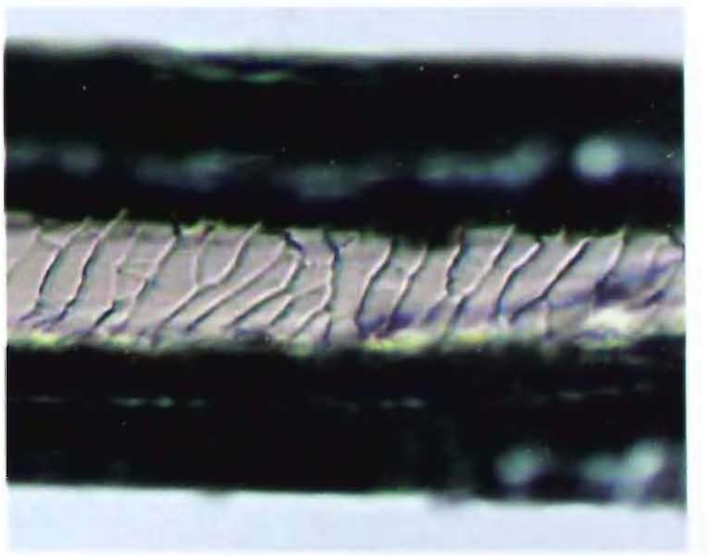
677. Cuticular at distal and proximal 400x

Plate 41c. ***Martes flavigula*** (Boddaert), Yellow throated marten

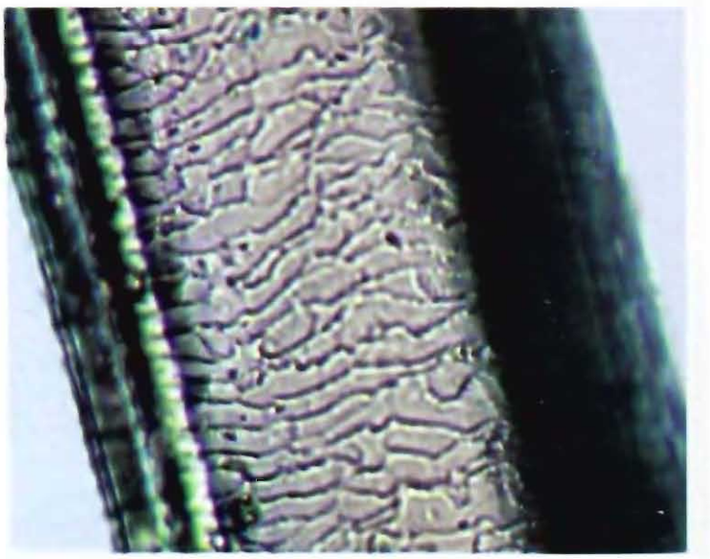
Head



678. Cuticular at proximal 400x

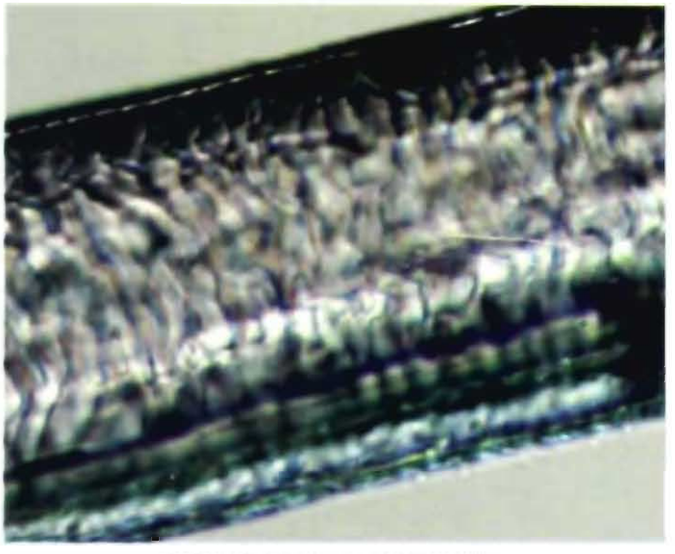


679. Cuticular at distal regular wave, smooth, close 400x

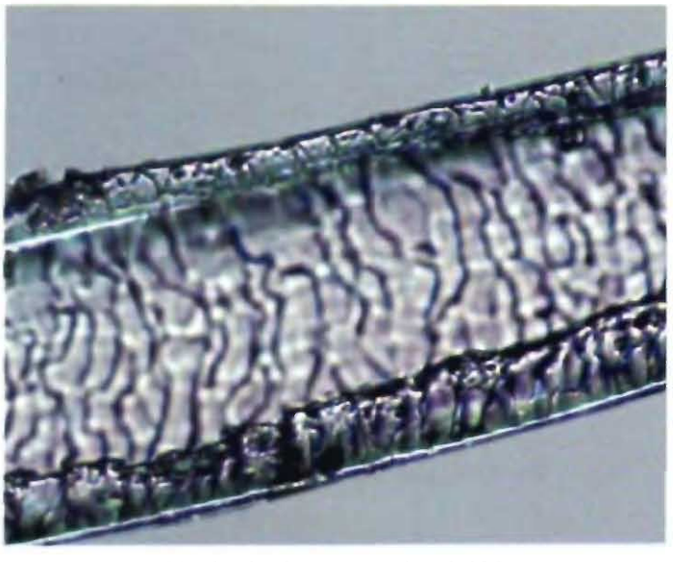


680. Cuticular at mid irregular wave, rippled, close 400x

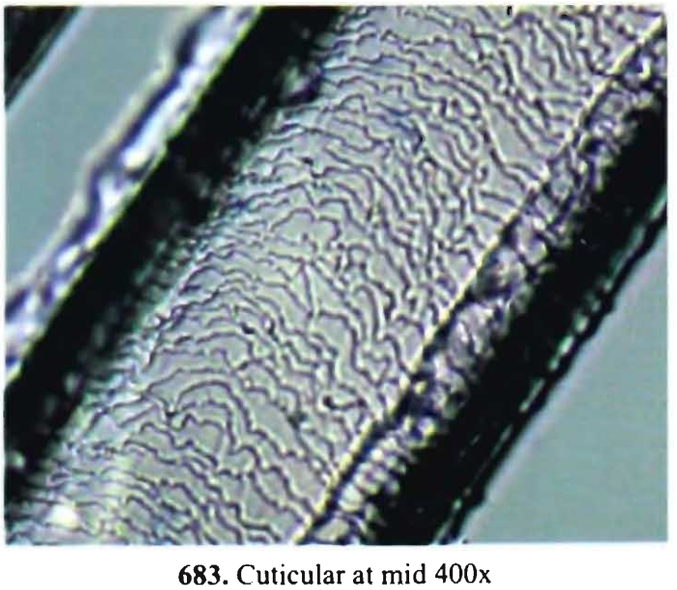
Plate 41d. ***Martes flavigula*** (Boddaert), **Tail**



681. Cuticular at distal 400x

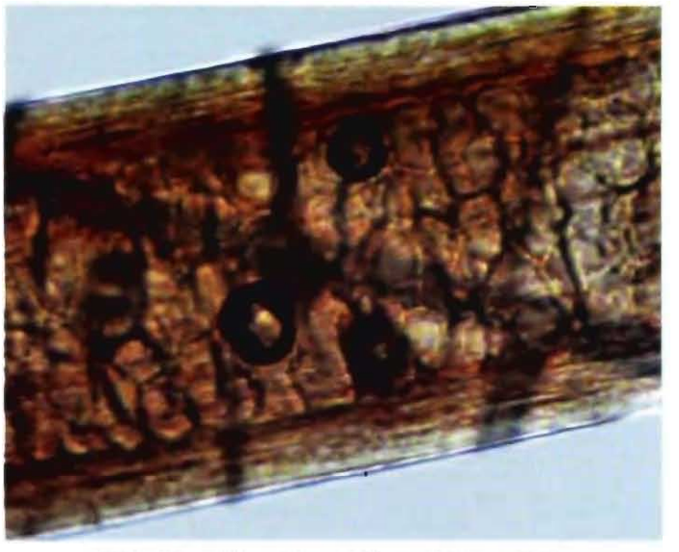


682. Cuticular at proximal 400x



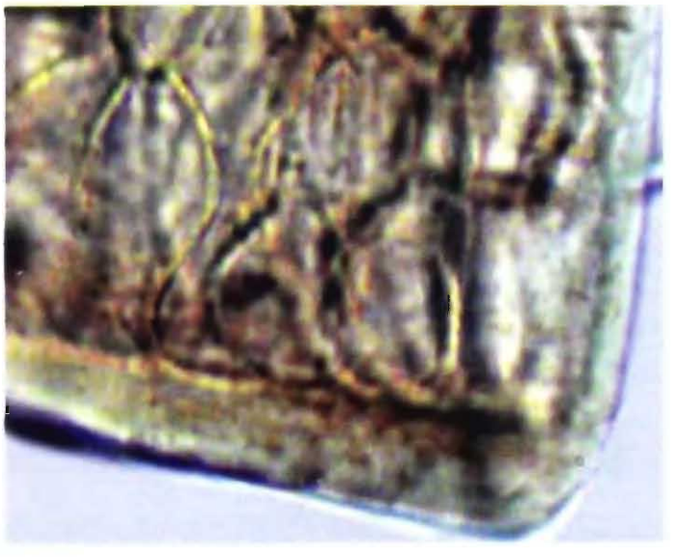
683. Cuticular at mid 400x

Plate 42a. ***Martes foina*** (Erxleben), Beach Marten **Dorsal**



684. Medulla wide aeriform lattice 400x

Plate 42b. ***Martes foina*** (Erxleben), Beach Marten **Ventral**



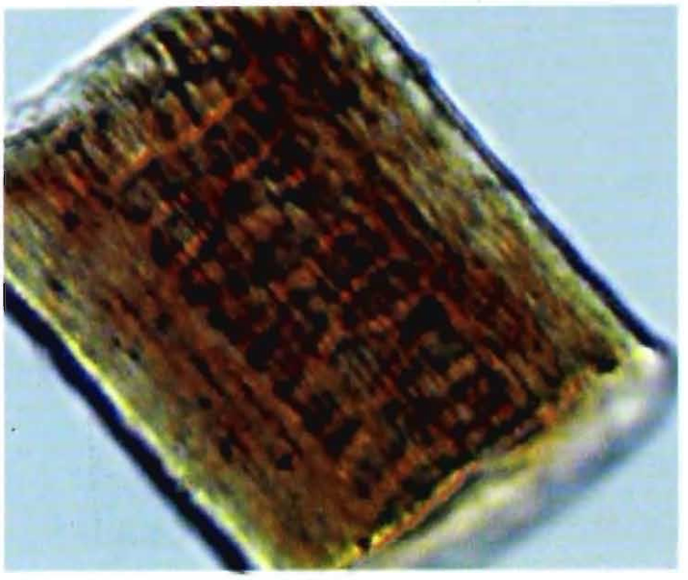
685. Medulla wideaeriform lattice 400x



686. Cross section oblong, large medulla 400x

Plate 42c. ***Martes foina*** (Erxleben),Beach Marten

Tail



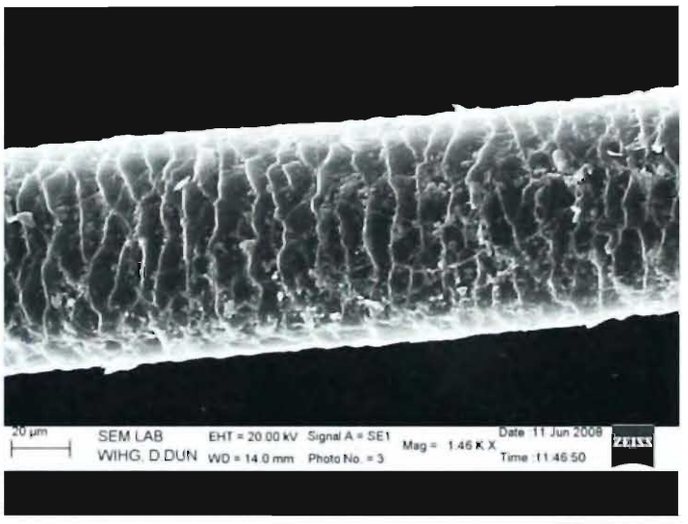
687. Medulla



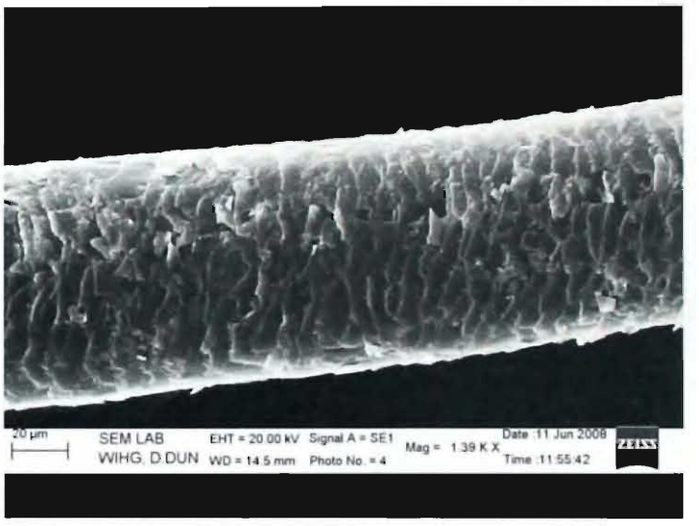
688. Cross section oblong

Scanning Electron Micrographs Dorsal

Martes foina **(Erxleben), Beach Marten**



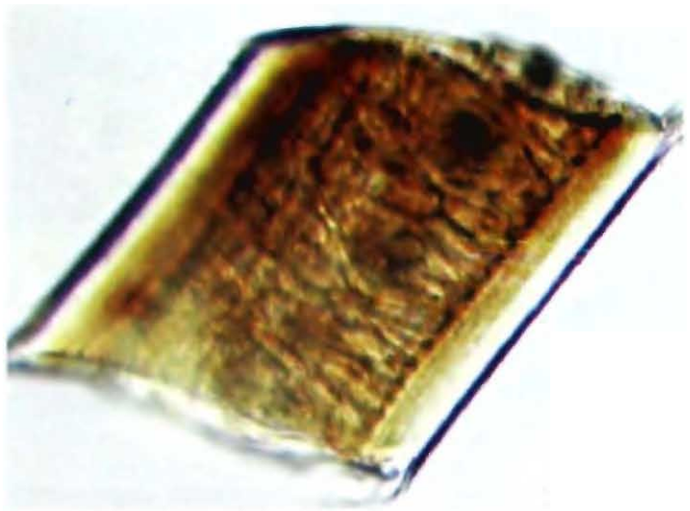
689. Cuticular at mid regular wave, rippled, near



690. At proximal irregular wave, rippled, near

Plate 43a. ***Herpestes palustris*** Ghose, Marsh mongoose

Dorsal



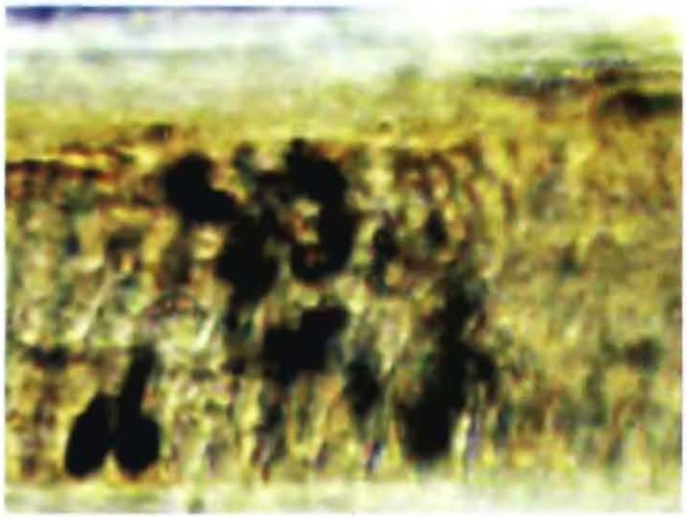
691. Medulla wide acriform lattice 400x



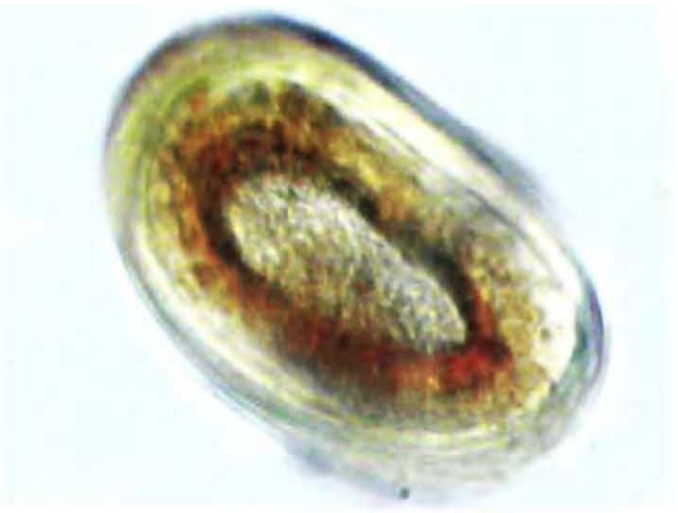
692. Cross ection oblong with large medulla 400x

Plate 43b. ***Herpestes palustris*** Ghose, Marsh mongoose

Ventral



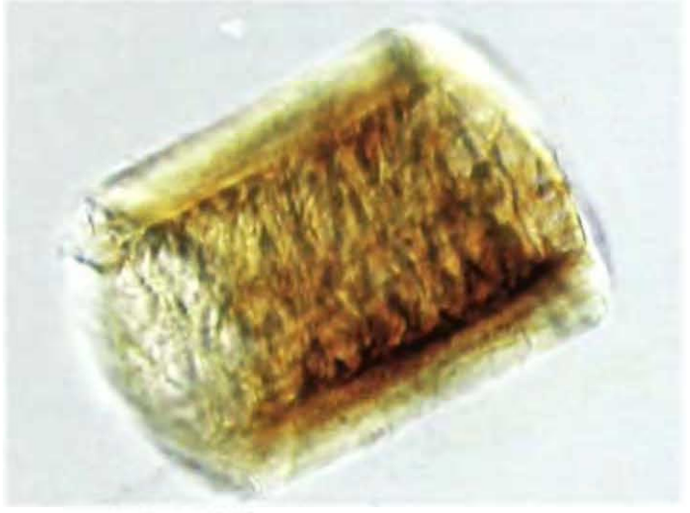
693. Medulla wide medulla lattice 400x



694. Cross ection reniform 400x

Plate 43c. ***Herpestes palustris*** Ghose, Marsh mongoose

Head



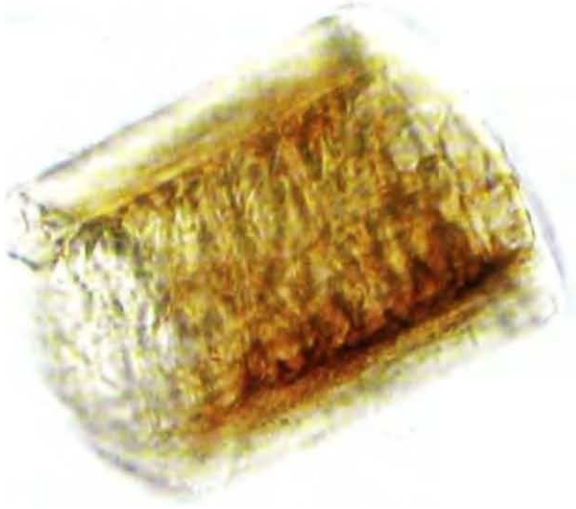
695. Medulla wide medulla lattice 400x



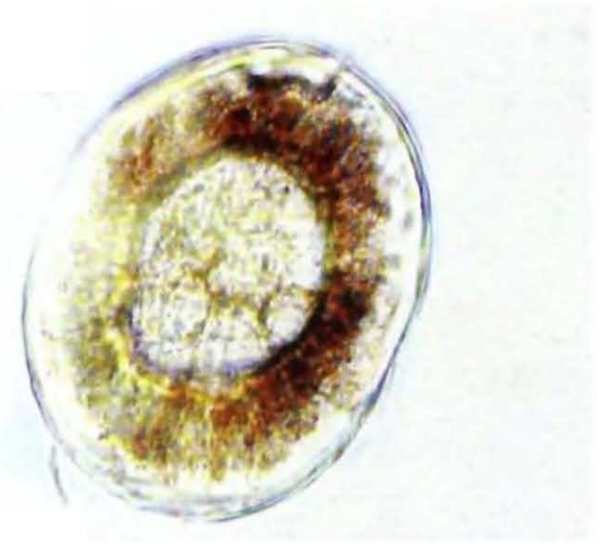
696. Cross sections circular medium medulla

Plate 43d. ***Herpestes palustris*** Ghose, Marsh mongoose

Tail



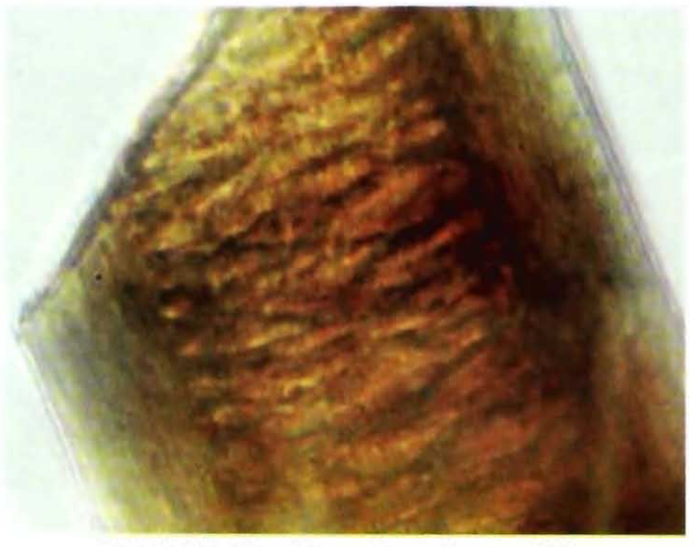
697. Medulla wide medulla lattice 800x



698. Section circular, medium medulla 800x

Plate 44a. ***Herpestes edwarsii*** (E. Geoffrey Saint-Hilaire), Indian Grey Mongoose

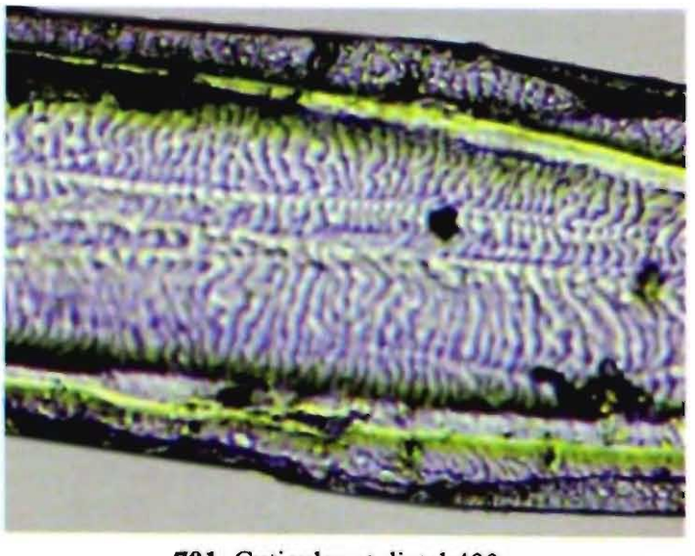
Dorsal



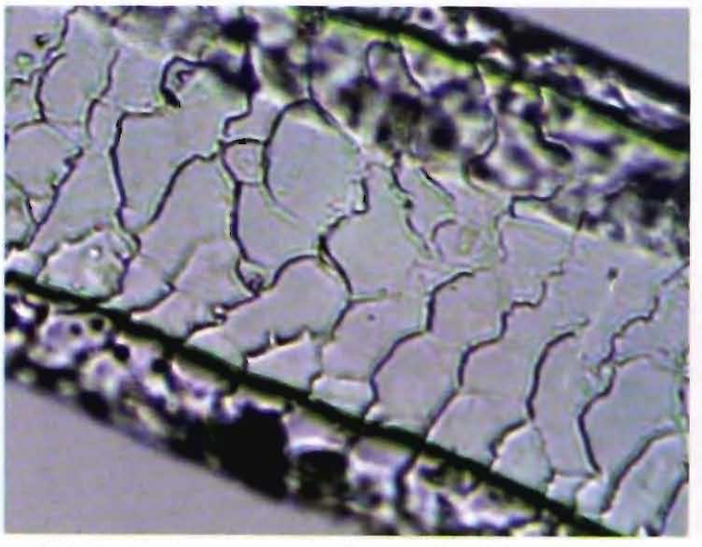
699. Medulla wide aeriform lattice 400x



700. Cross section oblong 400x



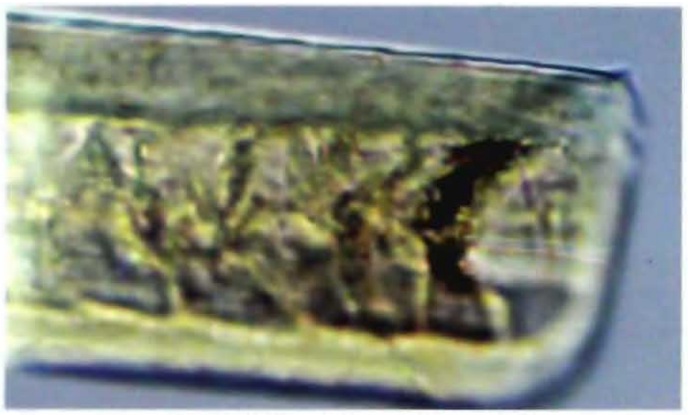
701. Cuticular at distal 400x



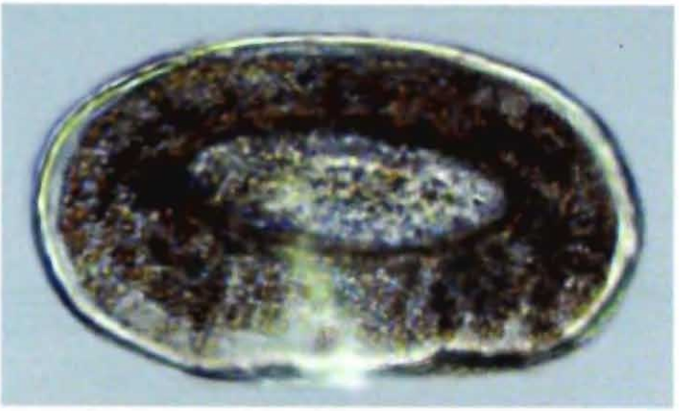
702. Cuticular at proximal towards mid region 400x

Plate 44b. ***Herpestes edwarsii*** (E. Geoffrey Saint-Hilaire), Indian Grey Mongoose

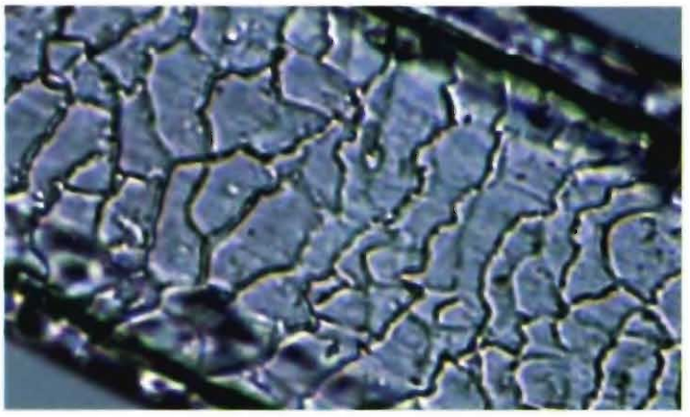
Ventral



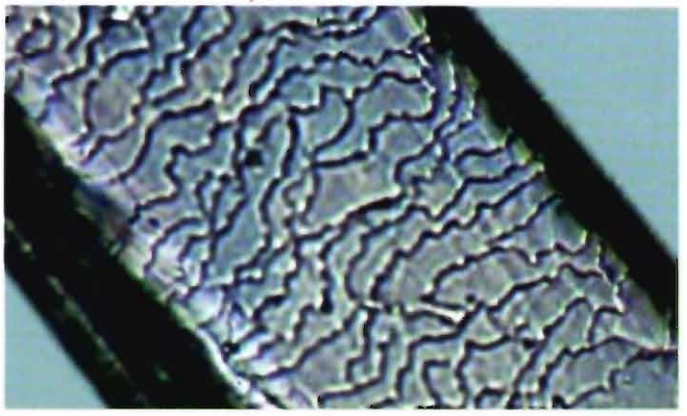
703. Medulla wide aeriform 400x



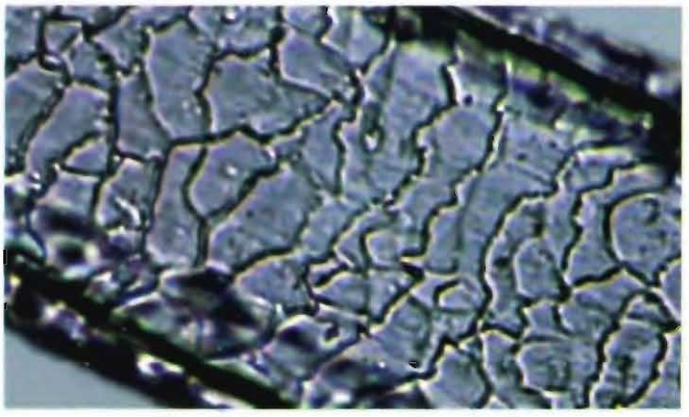
704. Cross section oblog, large medulla 400x



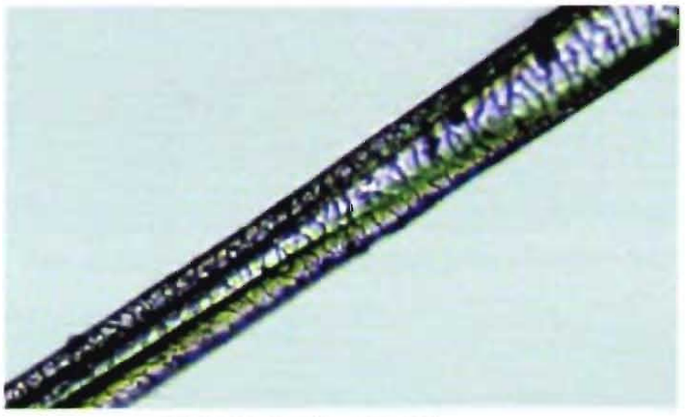
705. Cuticular at mid 800x



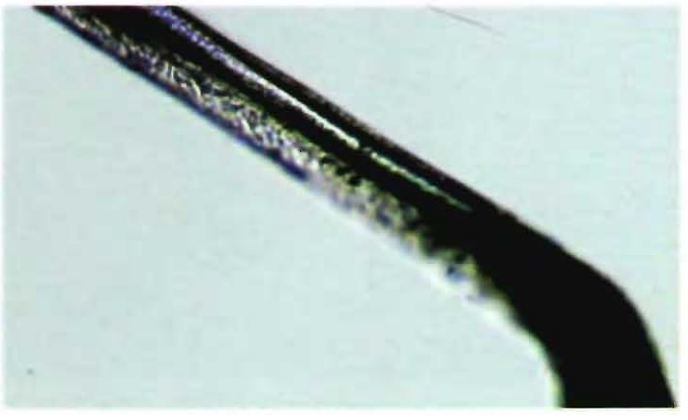
706. Cuticular at mid 800x



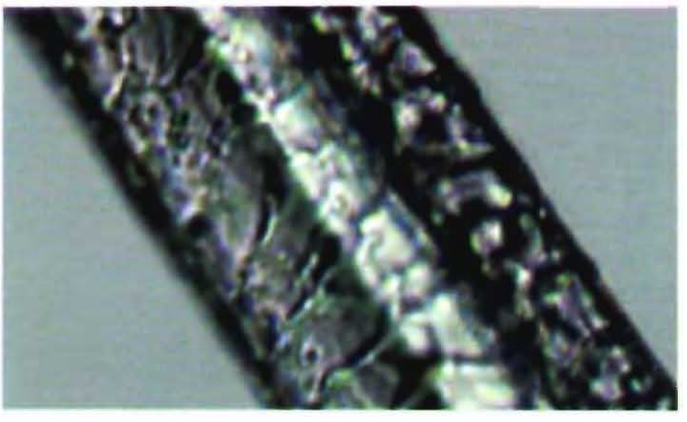
707. Cuticular at proximal 800x



708. Cuticular at distal 200x



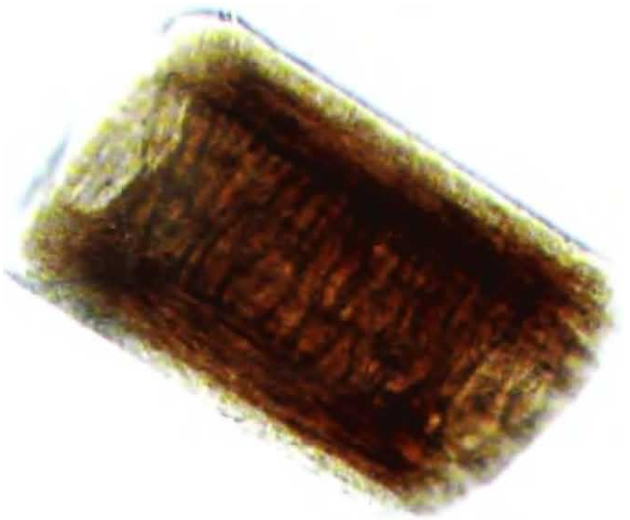
709. Cuticular at distal with follicle



710. Cuticular at distal with contour at mid 400x

Plate 44c. ***Herpestes edwarsii*** (E. Geoffrey Saint-Hilaire), Indian Grey Mongoose

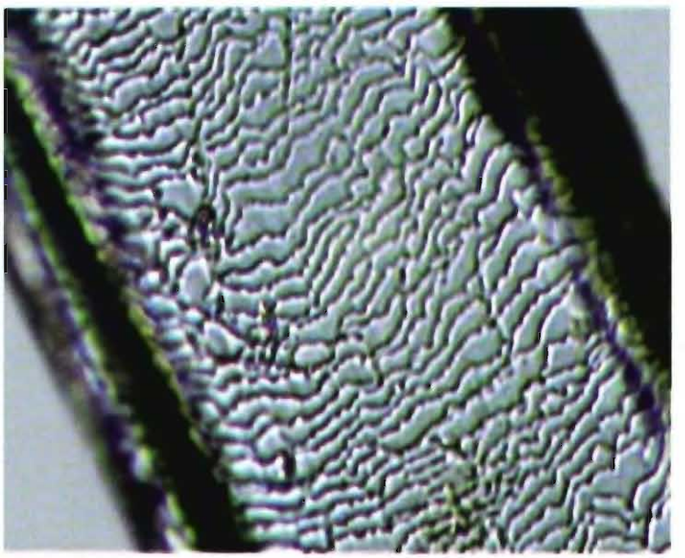
Head



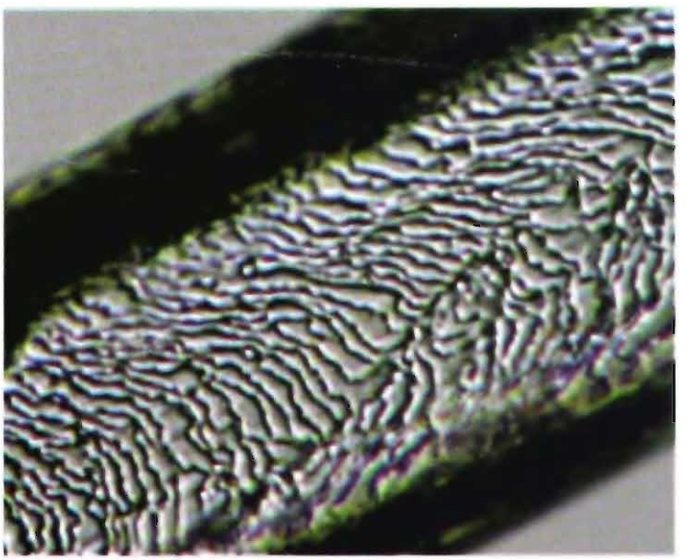
711. Medulla wide medulla lattice 400x



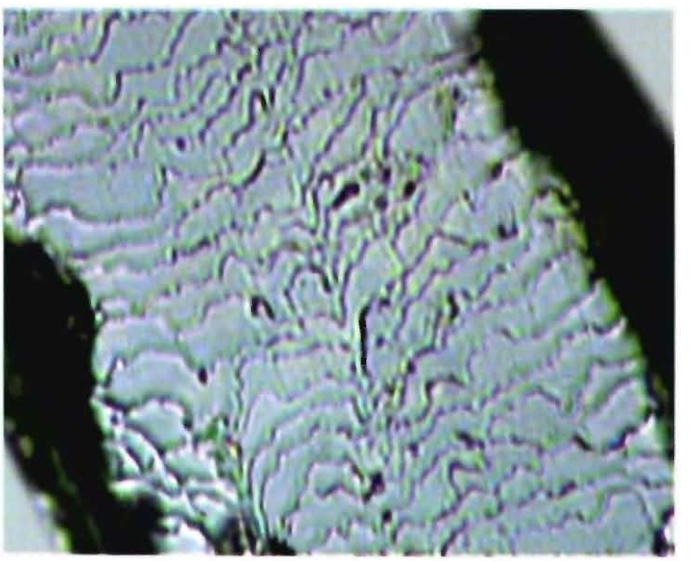
712. Cross section reniform 400x



713. Cuticular at mid regular wave, rippled, close 400x



714. Cuticular at proximal 400x



715. Cuticular at mid 800x

Tail



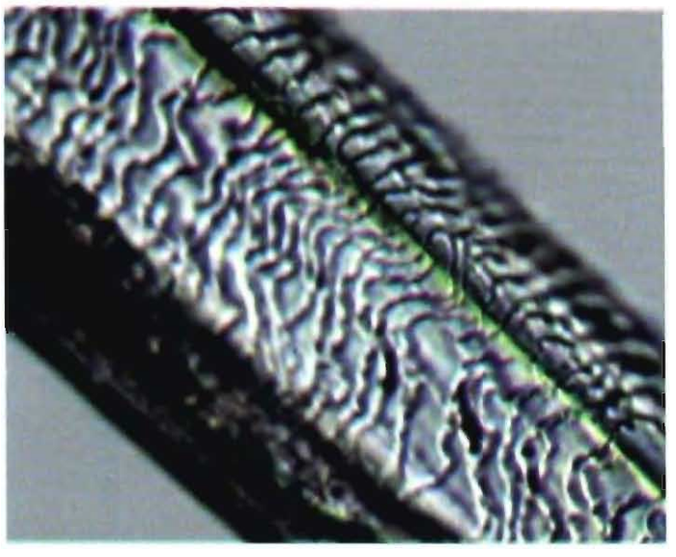
716. Medulla wide medulla lattice 400x



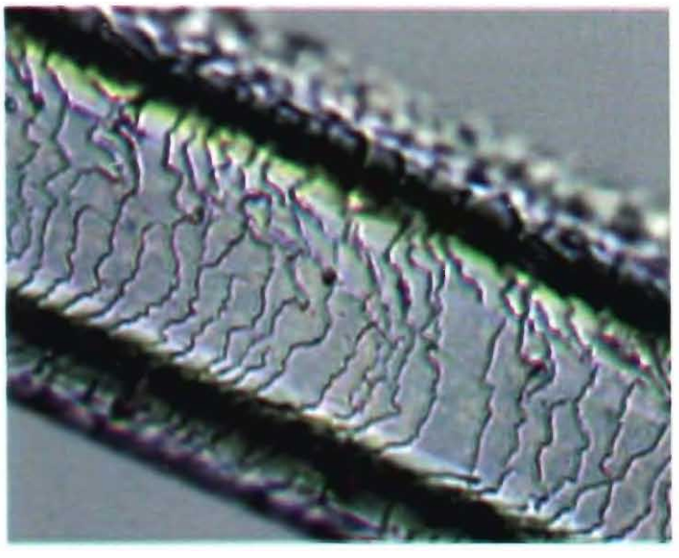
717. Cross section reniform 400x



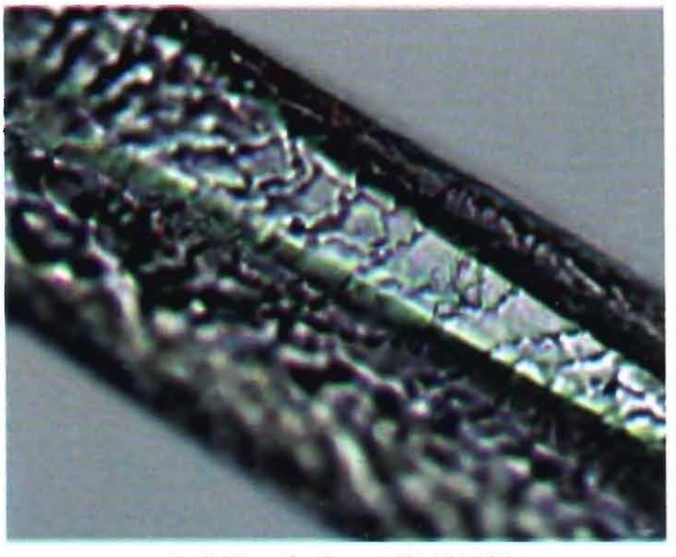
718. Oblong c.s. 400x



719. Cucuticular 400x



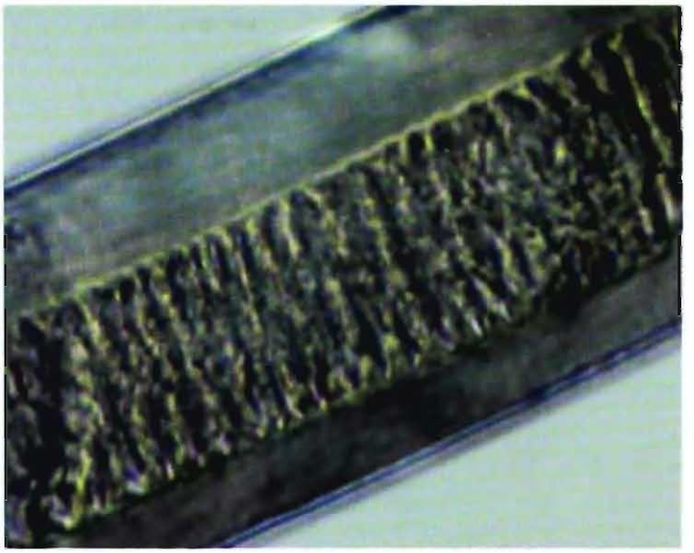
720. Cuticular at mid 400x



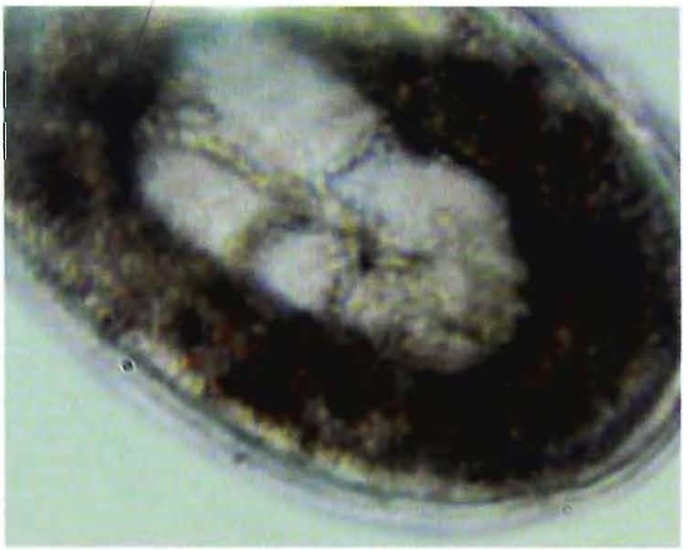
721. 742 cuticular at distal 400x

Plate 45a. ***Herpestes javanicus***
(E. Geoffroy Saint-Hillaire 1818)

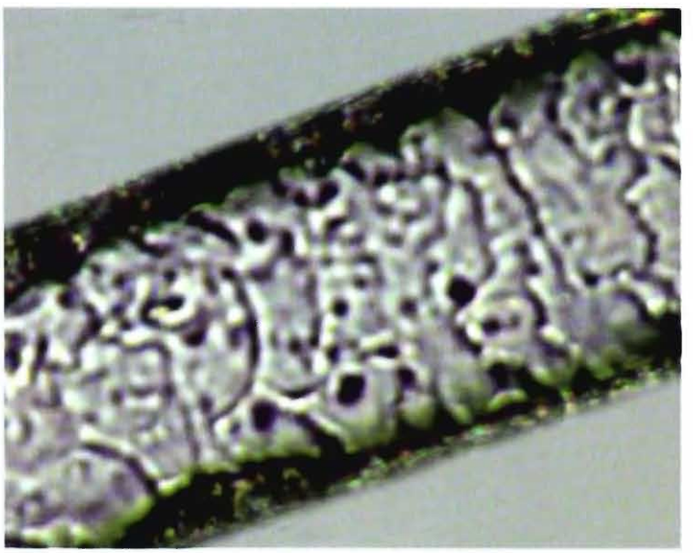
Dorsal



722. Medulla 800x



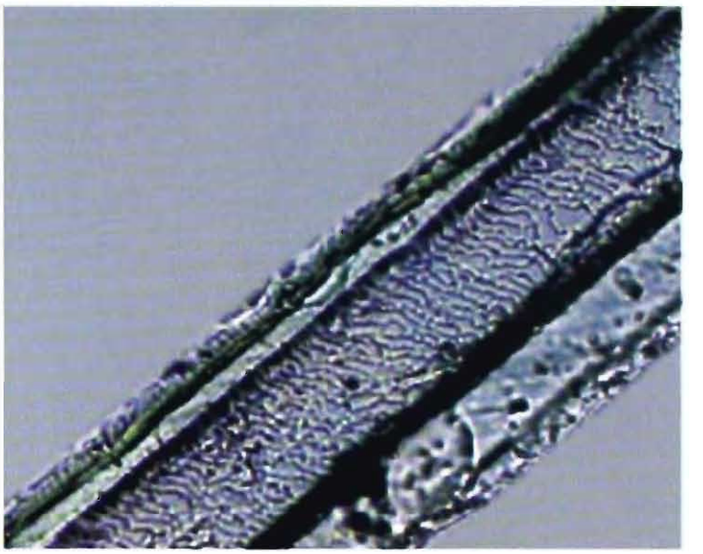
723. Cross section 800x



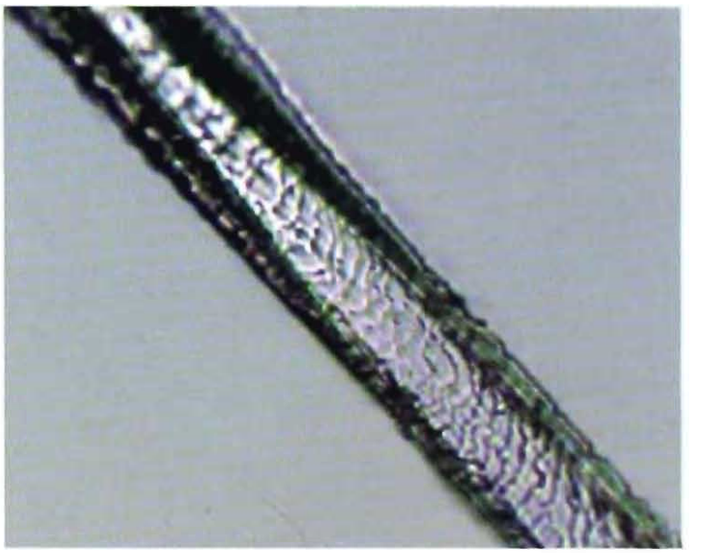
724. Cuticular at proximal 800x

Plate 45b. ***Herpestes javanicus***
(E. Geoffroy Saint-Hillaire 1818)

Ventral



725. Cuticular at proximal 400x



726. Cuticular at mid 200x

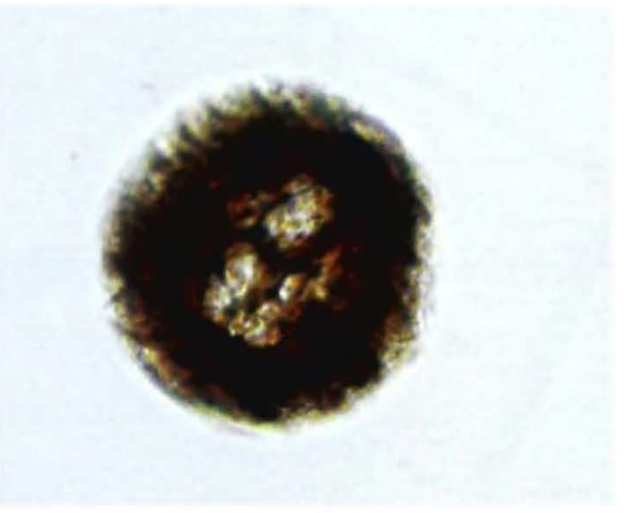


727. Cuticular of fur hair

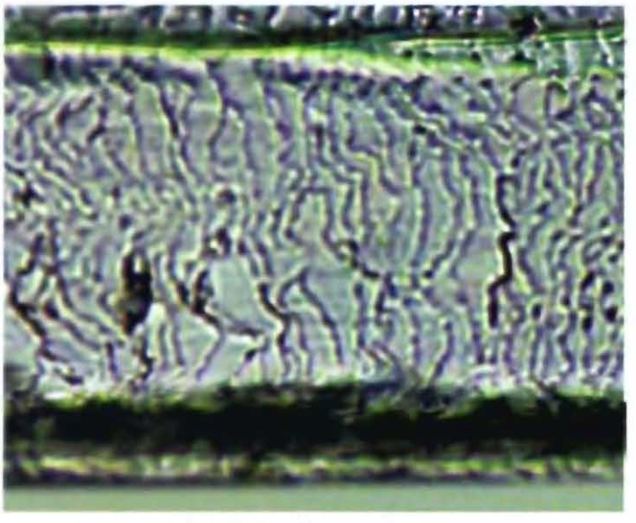
Head



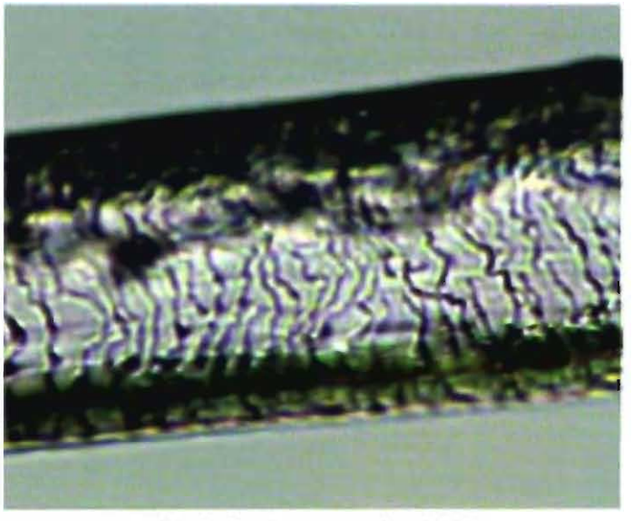
728. Medulla wide medulla lattice 400x



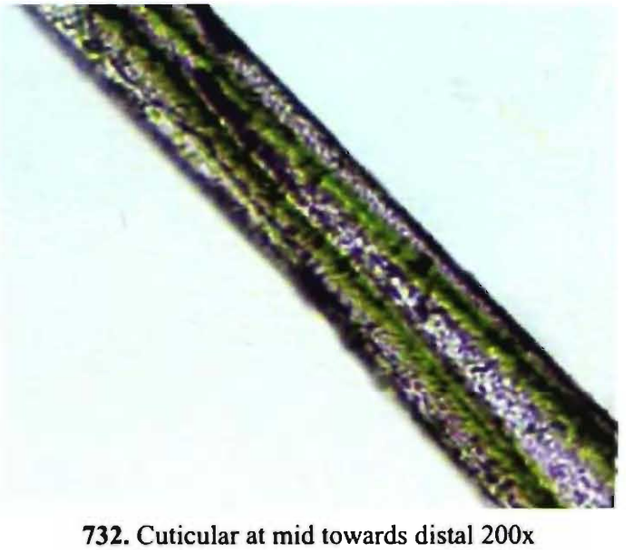
729. Cross section circular 400x



730. Cuticular at mid 400x



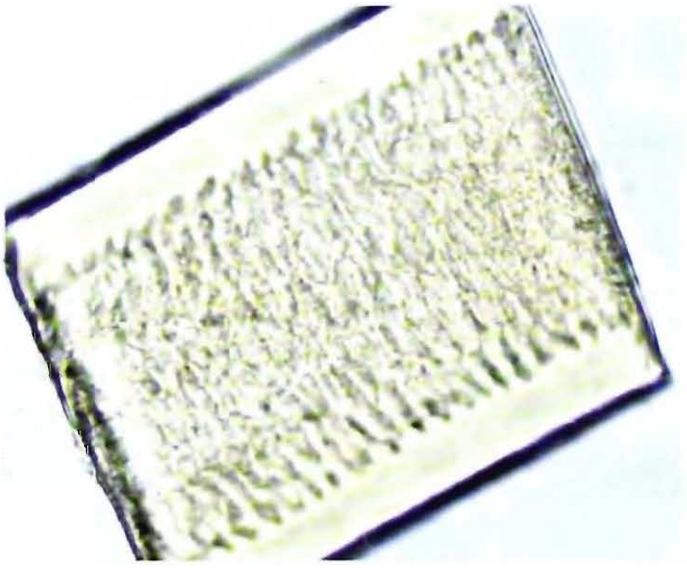
731. Cuticular at proximal 400x



732. Cuticular at mid towards distal 200x

Plate 45d. *Herpestes javanicus* (E. Geoffroy Saint-Hillaire 1818)

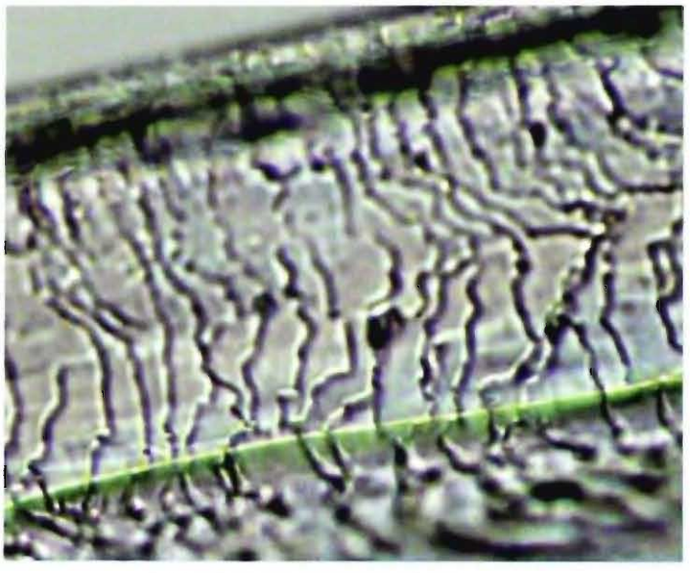
Tail



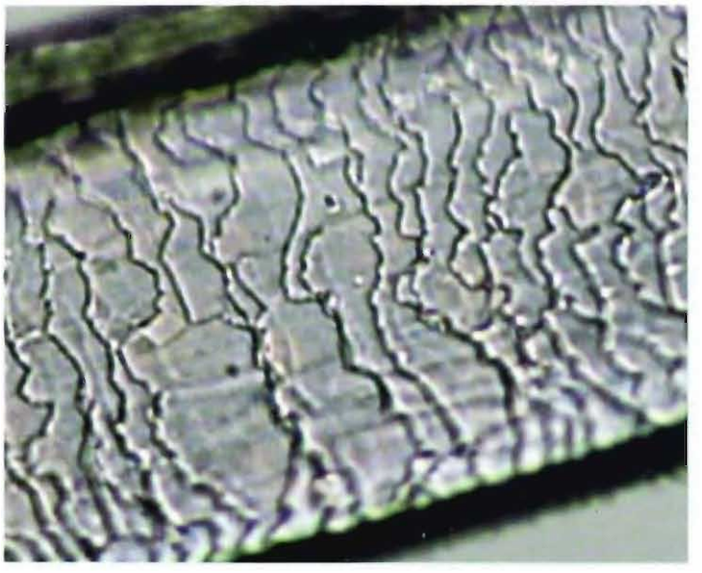
733. Medulla wide medulla lattice 800x



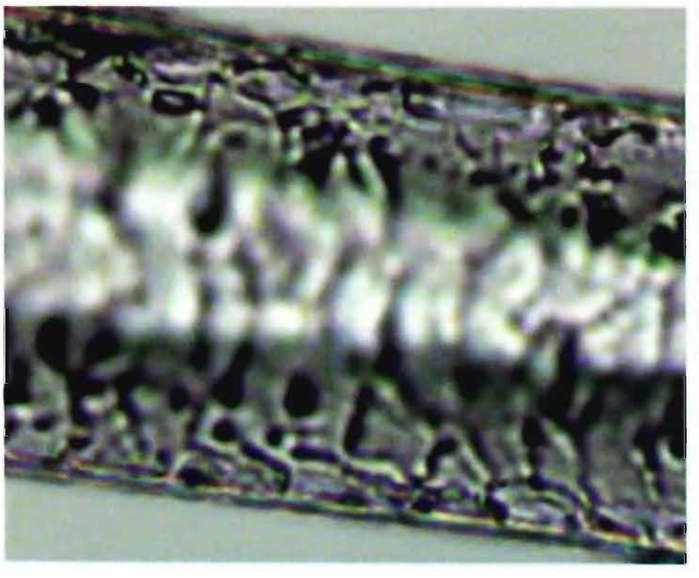
734. Cross section oblong 800x



735. Cuticular at proximal 800x



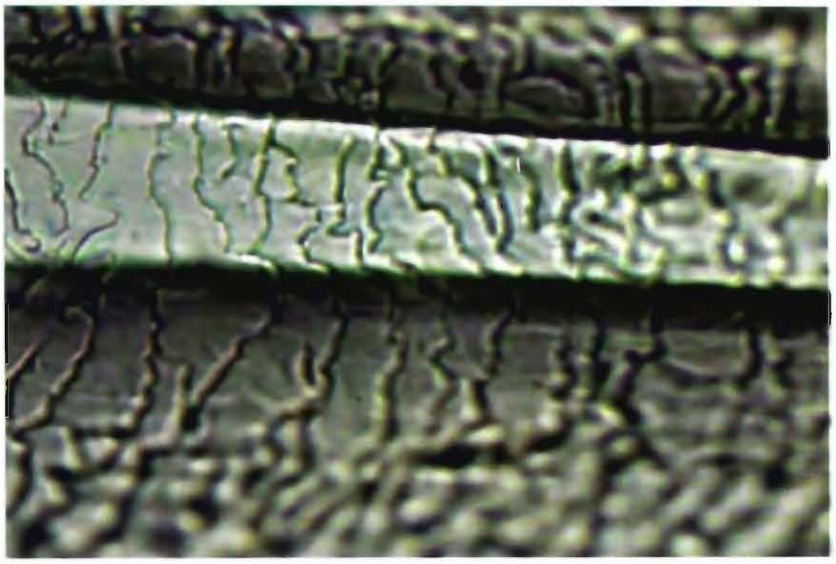
736. Cuticular at mid 800x



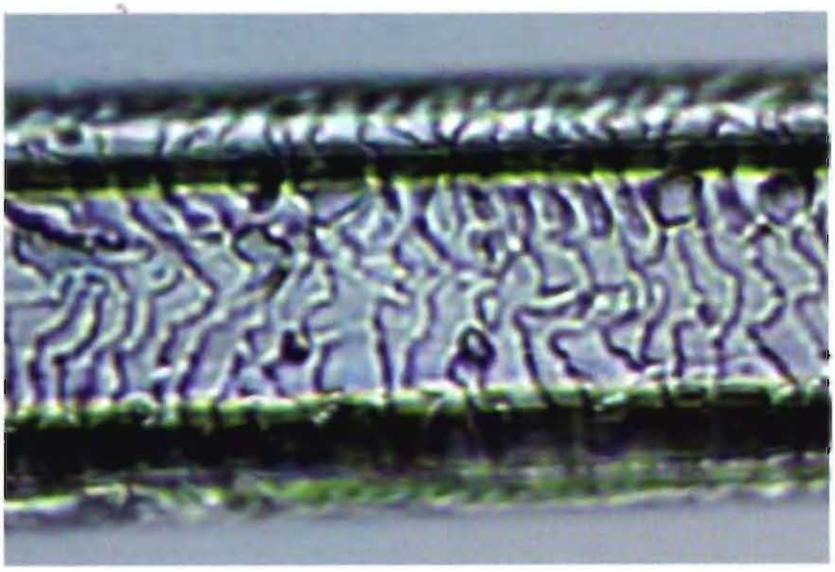
737. Cuticular at distal 800x

Plate 46a. ***Herpestes urva*** (Hodgson),Crab eating mongoose

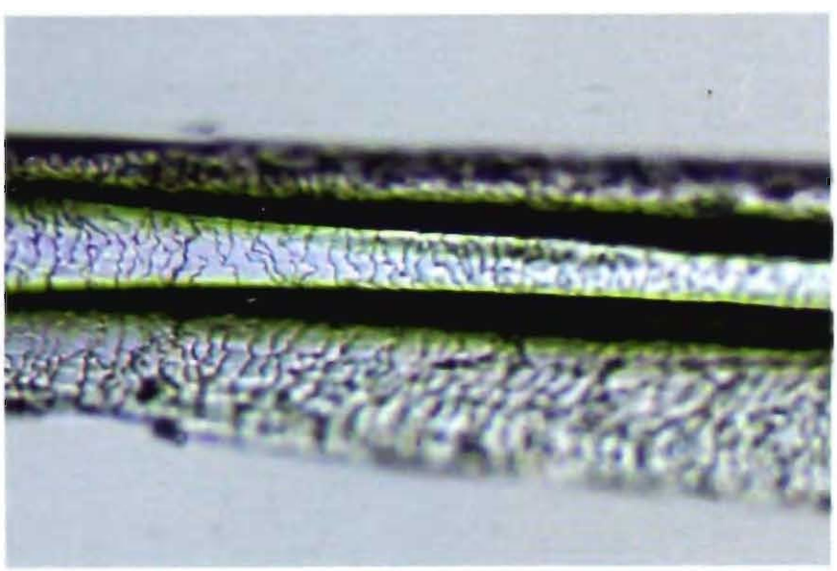
Dorsal



738. Cuticular at distal 400x



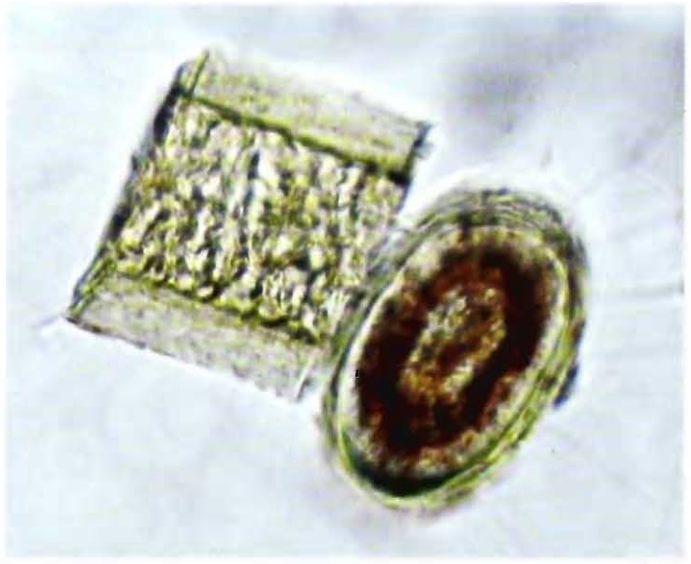
739. Cuticular at mid 400x



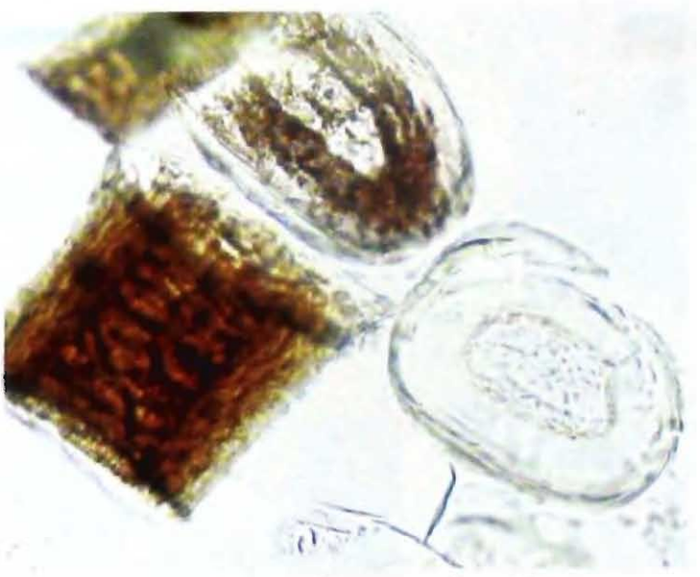
740. Cuticular towards proximal with contours 400x

Plate 46b. ***Herpestes urva*** (Hodgson),Crab eating mongoose

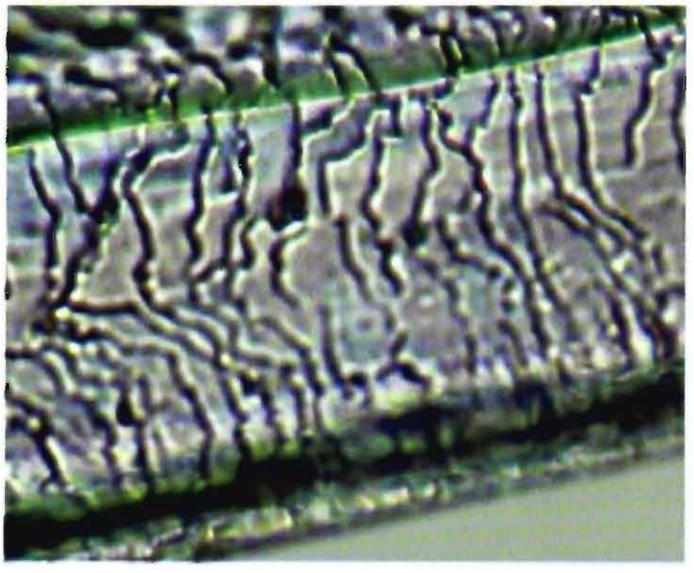
Dorsal



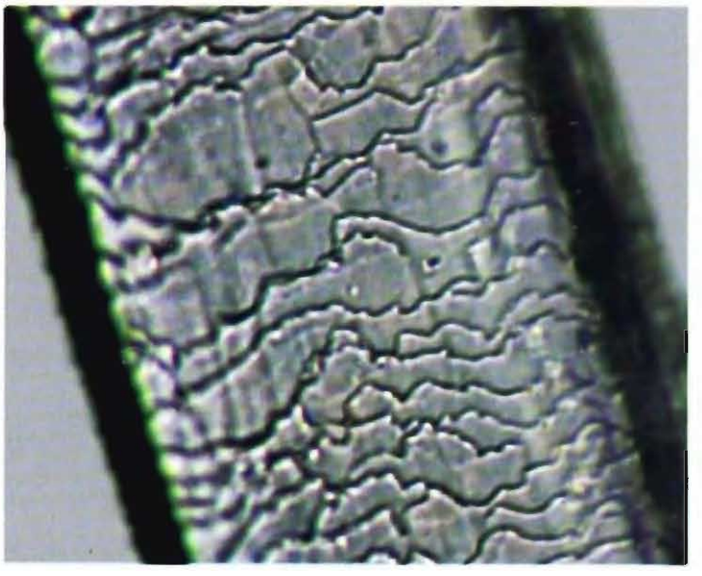
741. Medulla wide medulla lattice,cross section oblong 400x



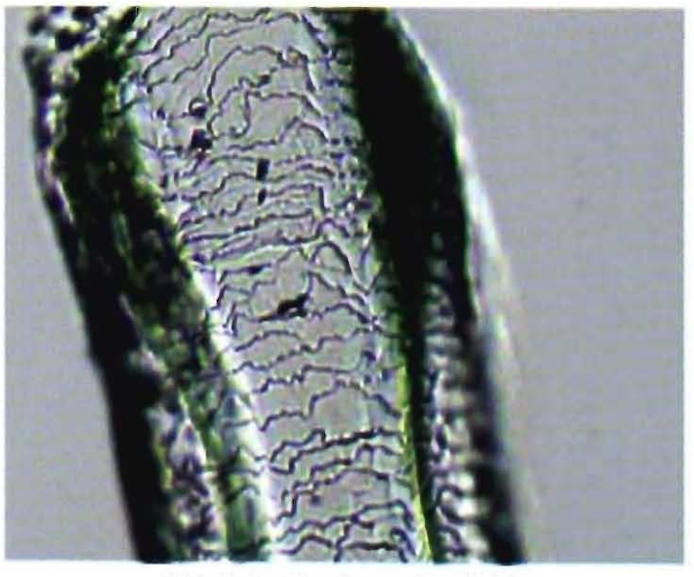
742. Medulla and cross section 400x



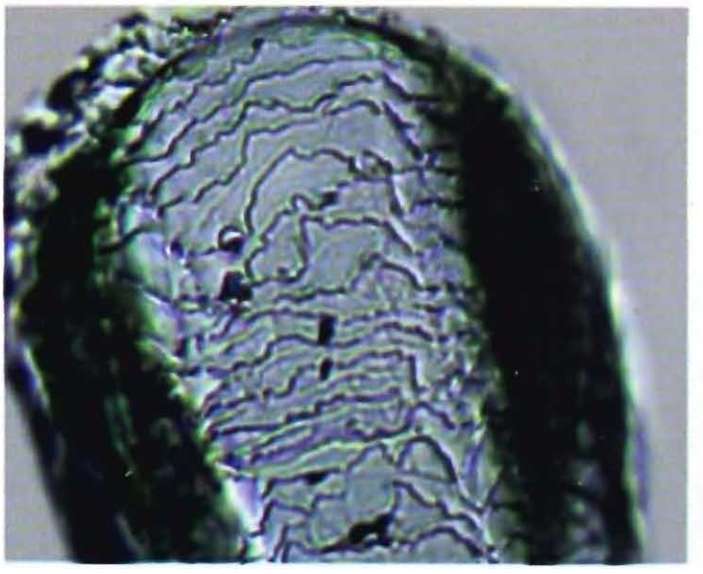
743. Cuticular at distal 400x



744. Cuticular at mid 400x



745. Cuticular at proximal 400x



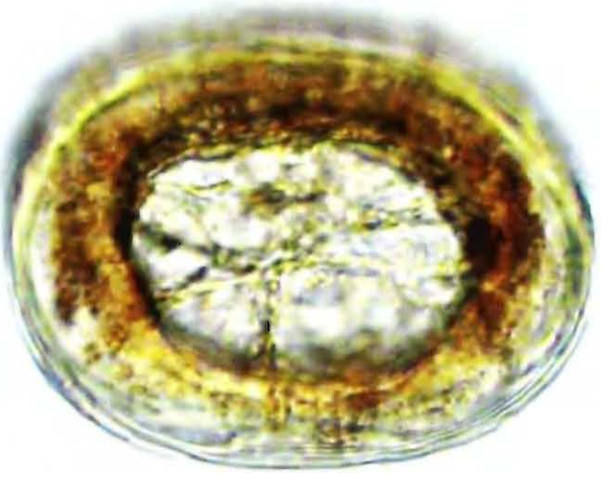
746. Cuticular at proximal 800x

Plate 46c. ***Herpestes urva*** (Hodgson), Crab eating mongoose

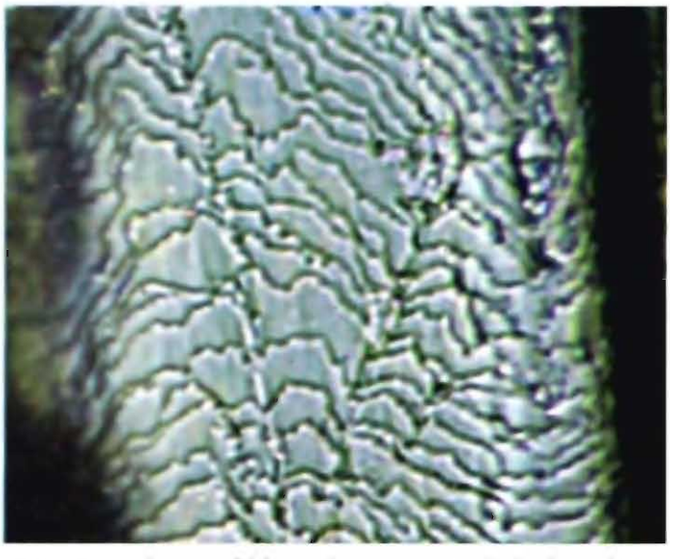
Head



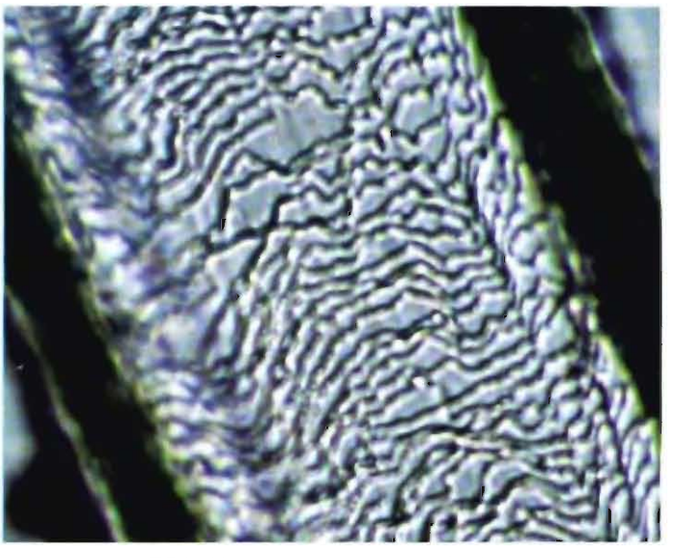
747. Medulla wide aeriform lattice 200x



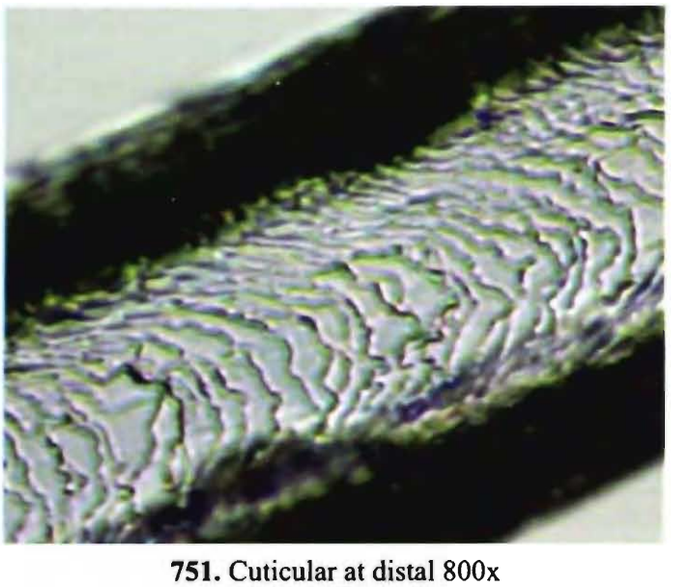
748. Cross section circular 400x



749. Cuticular at mid irregular wave, rippled, close 400x



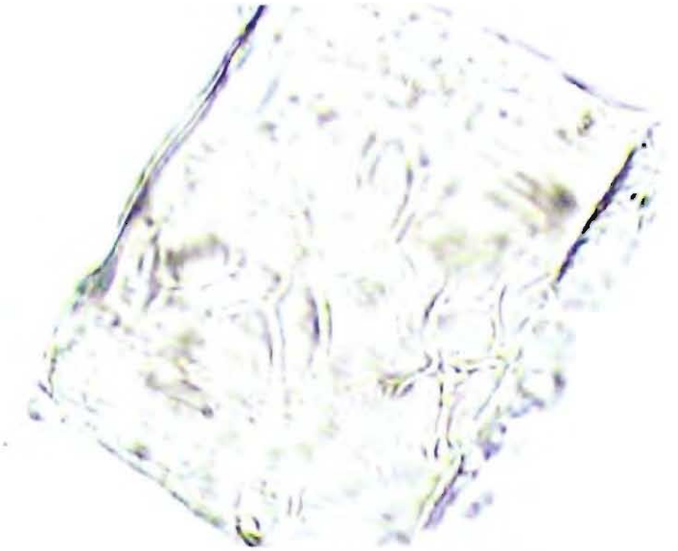
750. Cuticular at proximal 400x



751. Cuticular at distal 800x

Plate 46d. ***Herpestes urva*** (Hodgson), Crab eating mongoose

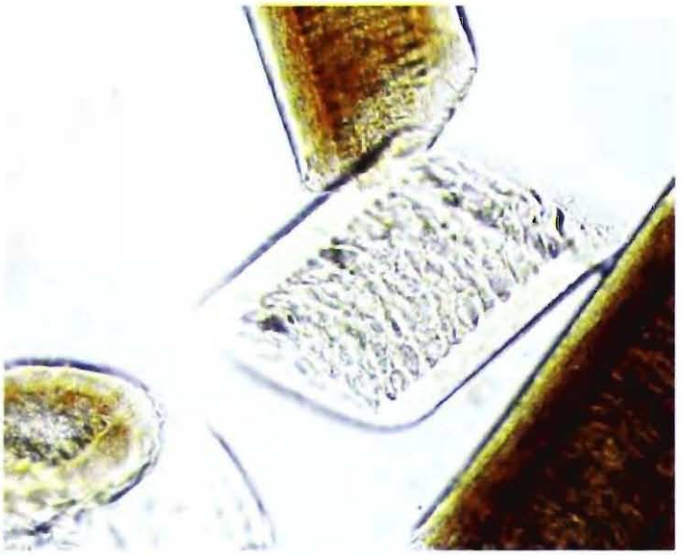
Tail



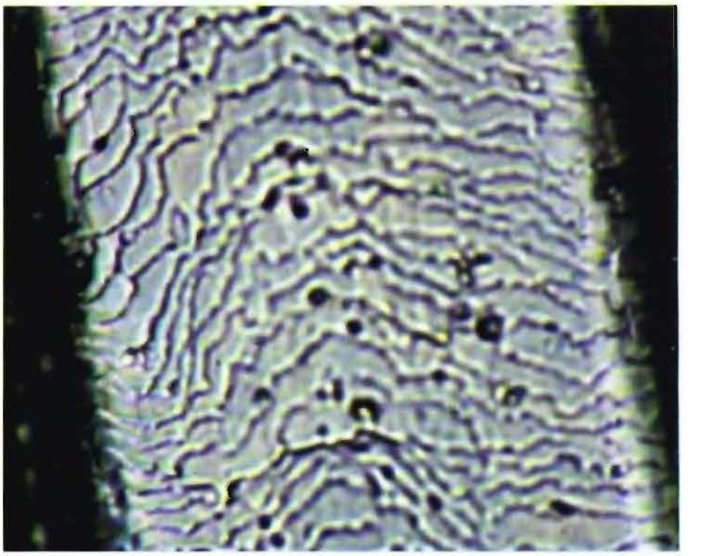
752. Rolled Medulla 400x



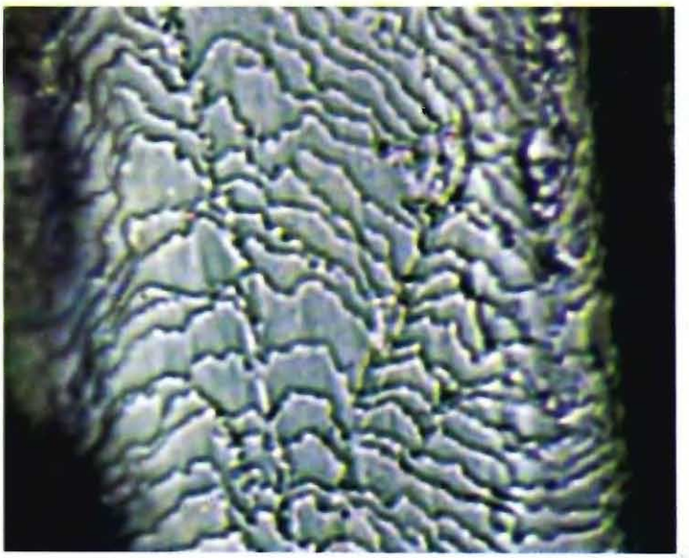
753. Cross sections cicular 400x



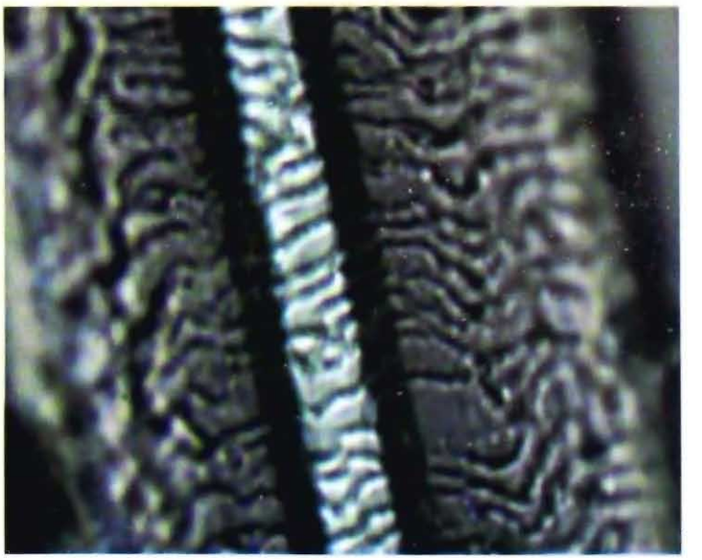
754. Medulla wide medulla lattice 400x



755. Cuticular at mid 400x



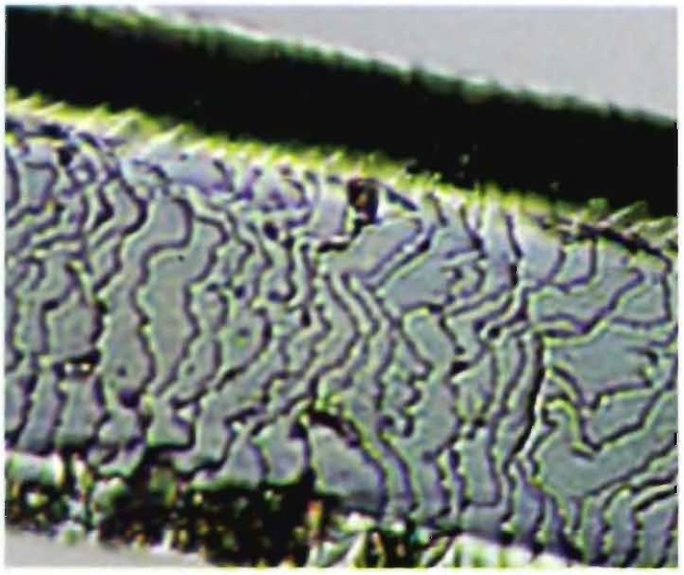
756. Cuticular at proximal 400x



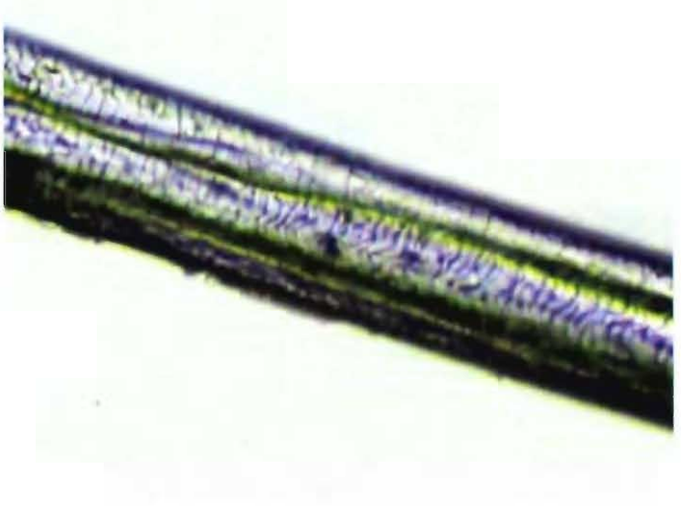
757. Cuticular at distal 400x

Plate 47a. ***Herpestes smithi*** Gray, Indian Ruddy Mongoose

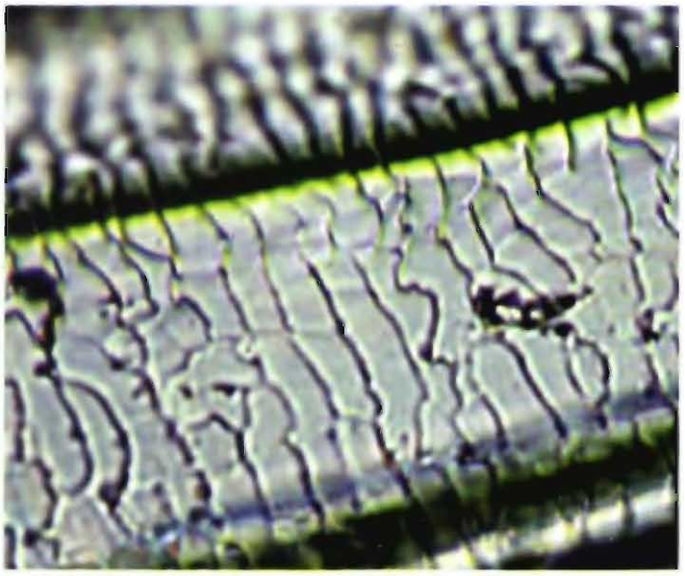
Dorsal



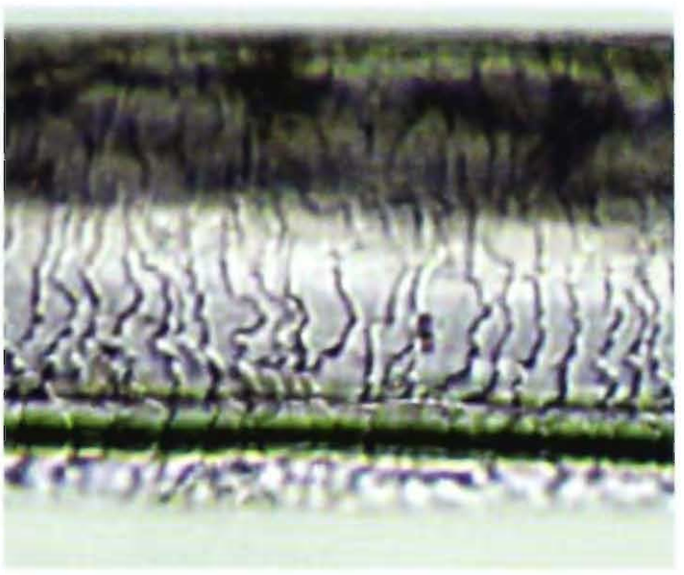
758. Cuticular at mid 400x



759. Cuticular at proximal 200x



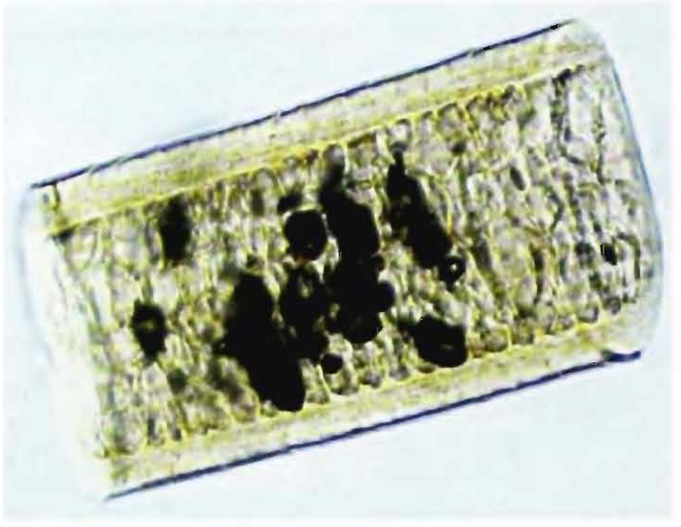
760. Cuticular at distal 400x



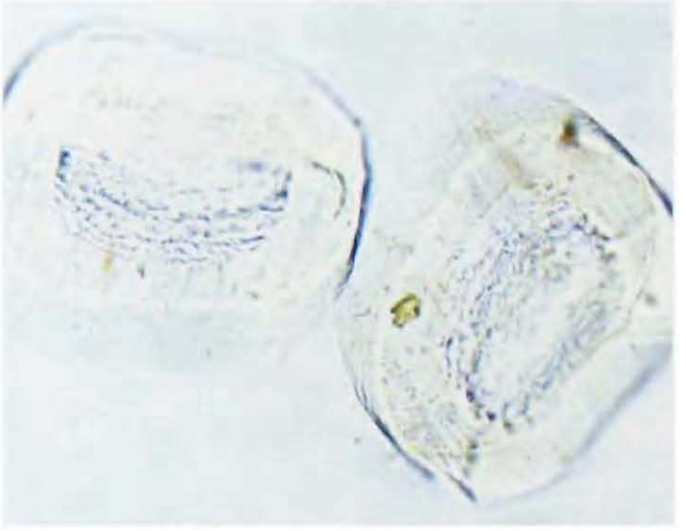
761. Cuticular at mid 400x

Plate 47b. ***Herpestes smithi*** Gray, Indian Ruddy Mongoose

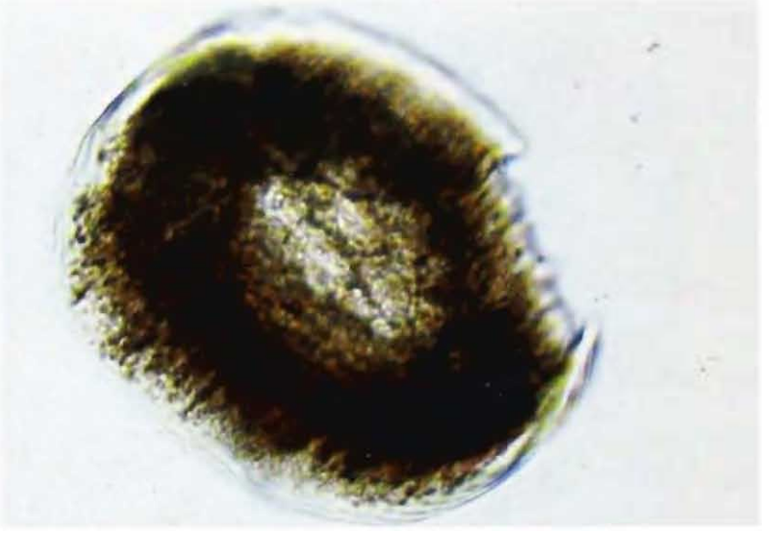
Ventral



762. Medulla wide medulla lattice 400x



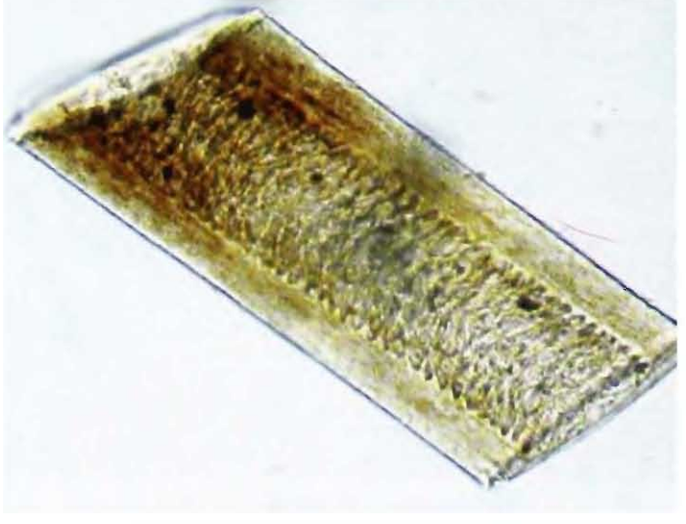
763. Cross section oblong 400x



764. Cross ection oblong 400x

Plate 47c. ***Herpestes smithi*** Gray, Indian Ruddy Mongoose

Head

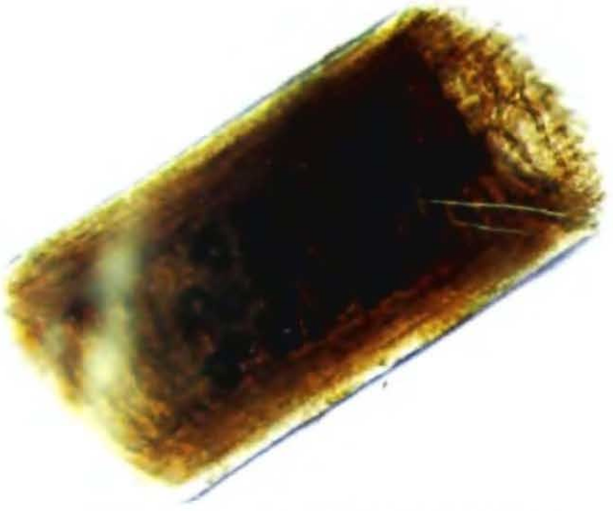


765. Medulla wide medulla lattice 400x

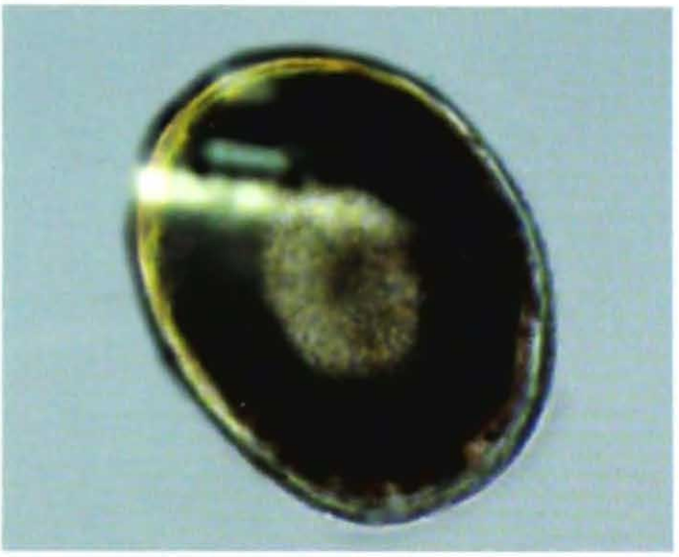


766. Cross section oblong

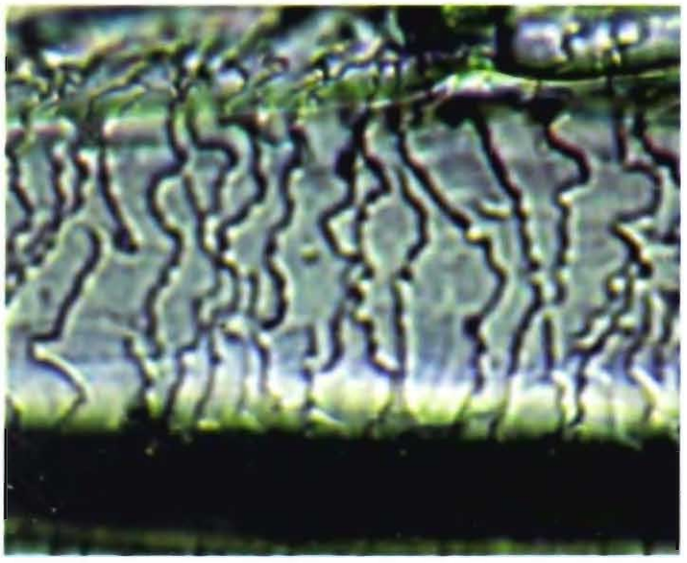
Tail



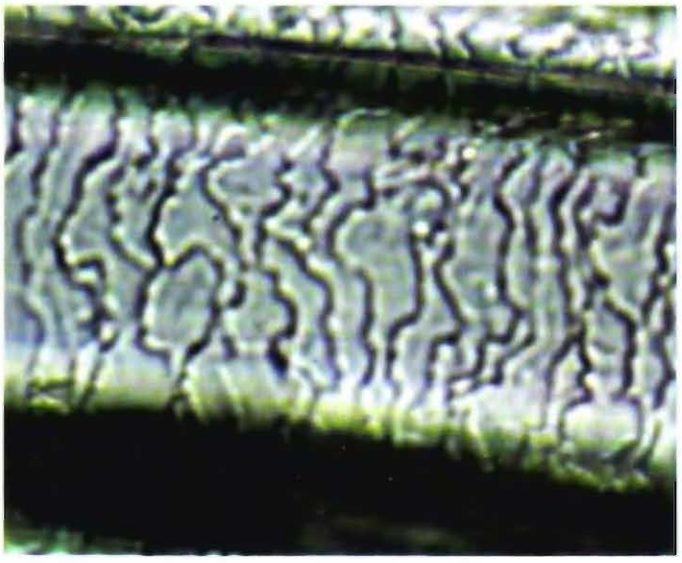
767. Medulla wide aeriform lattice 200x



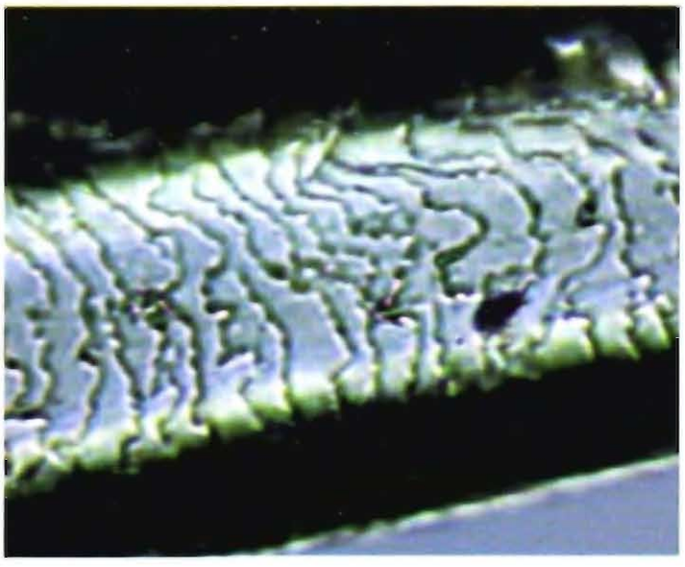
768. Cross section oblong medium medulla 400x



769. Cuticular at mid 400x



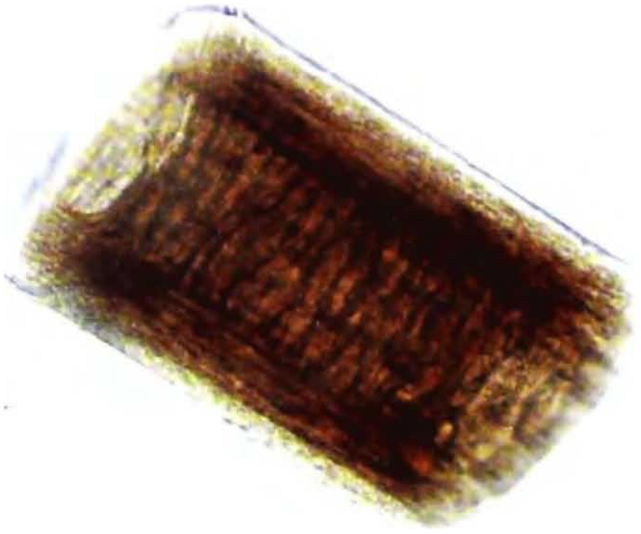
770. Cuticular at distal 400x



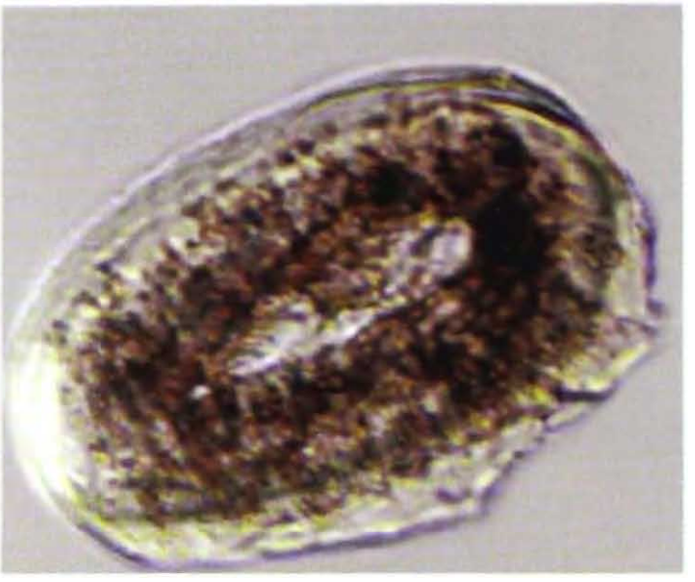
771. Cuticular at proximal 400x

Plate 48a. ***Herpestes vitticollis*** Bennett

Dorsal



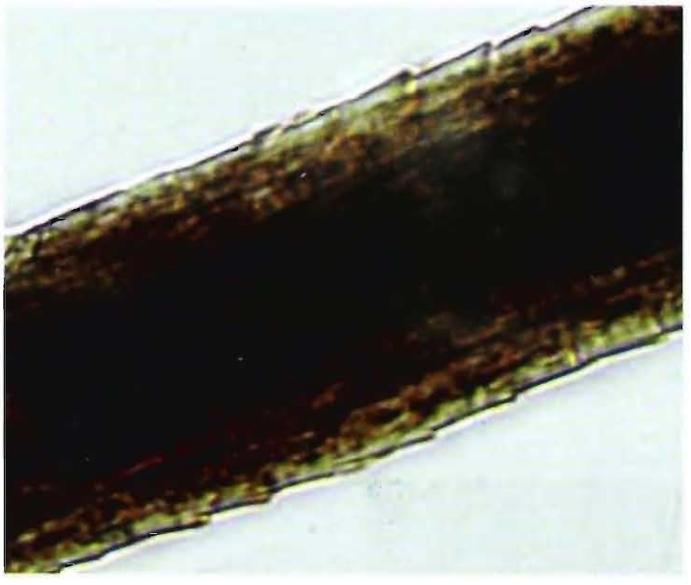
772. Medulla wide aeriform lattice 400x



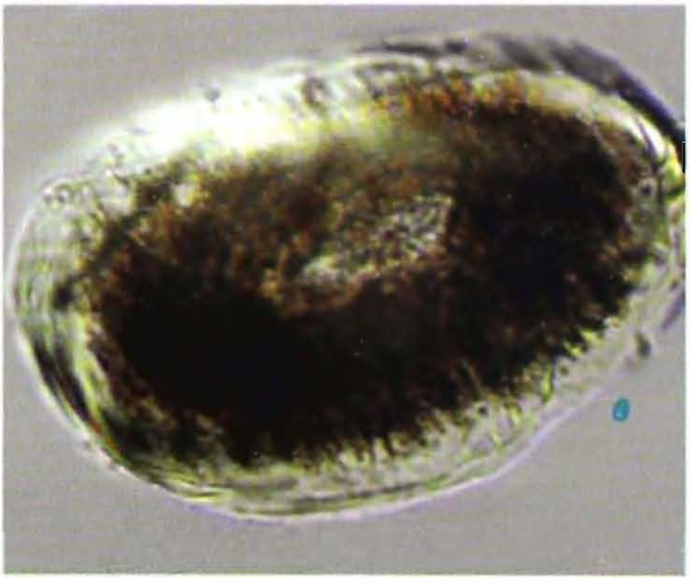
773. Cross section oblong,medium medulla 400x

Plate 48b. ***Herpestes vitticollis*** Bennett

Ventral



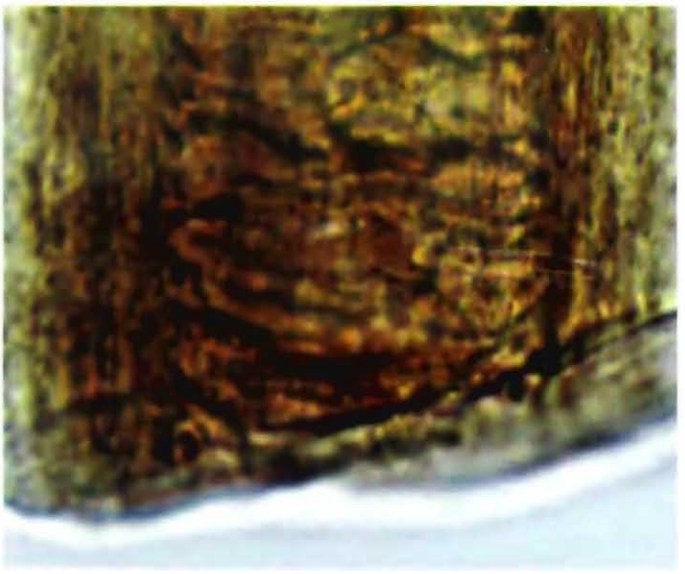
774. Medulla wide aeriform lattice 400x



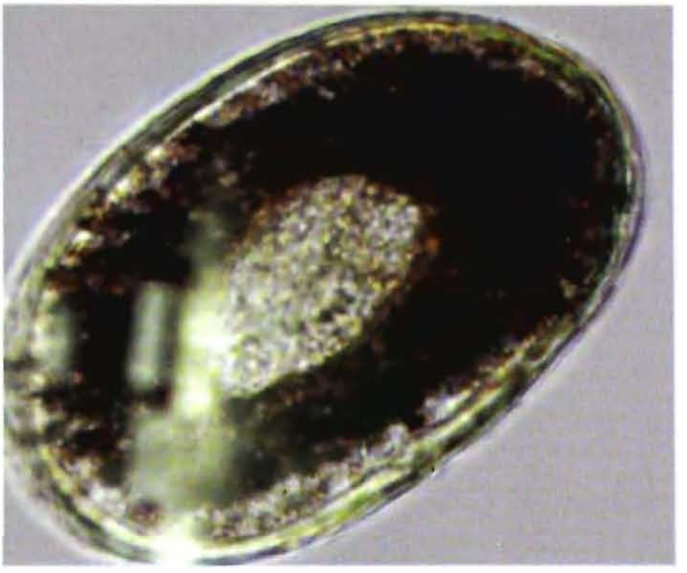
775. Cross section 400x

Plate 48c. ***Herpestes vitticollis*** Bennett

Head



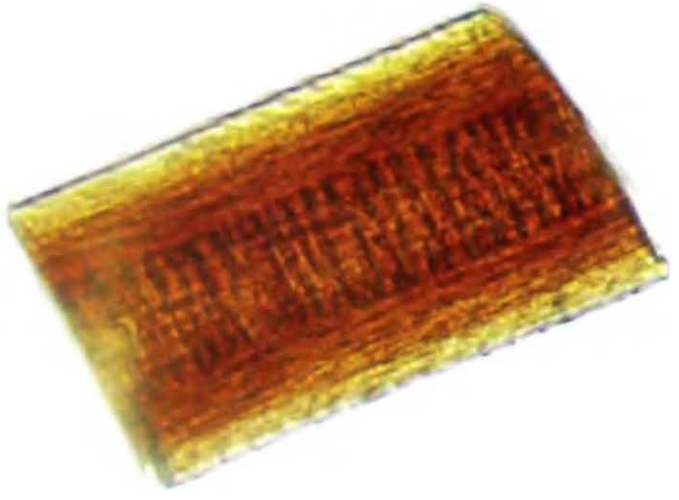
776. Medulla wide aeriform lattice 800x



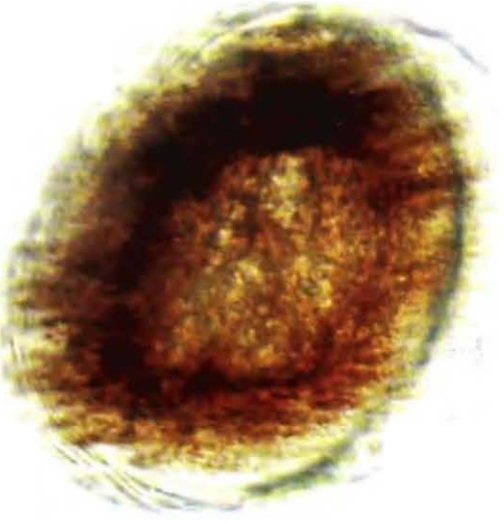
777. Cross section oblong, large medulla 800x

Plate 48d. ***Herpestes vitticollis*** Bennett

Tail



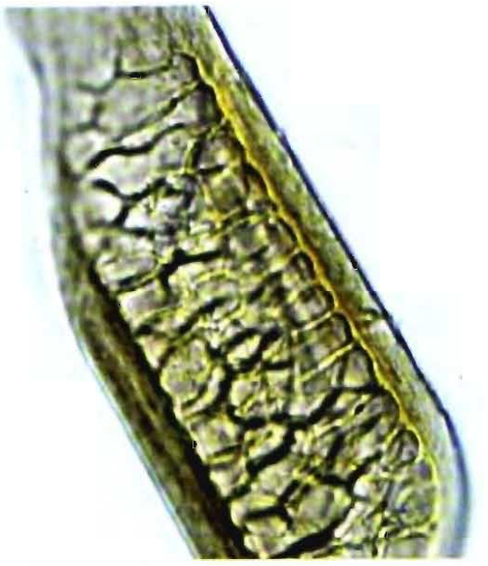
778. Medulla simple 400x



779. Cross section circular,large medulla 400x

Family - Tragulidae, Plate 49a. ***Moschiola meminna*** (Erxleben) Mouse deer

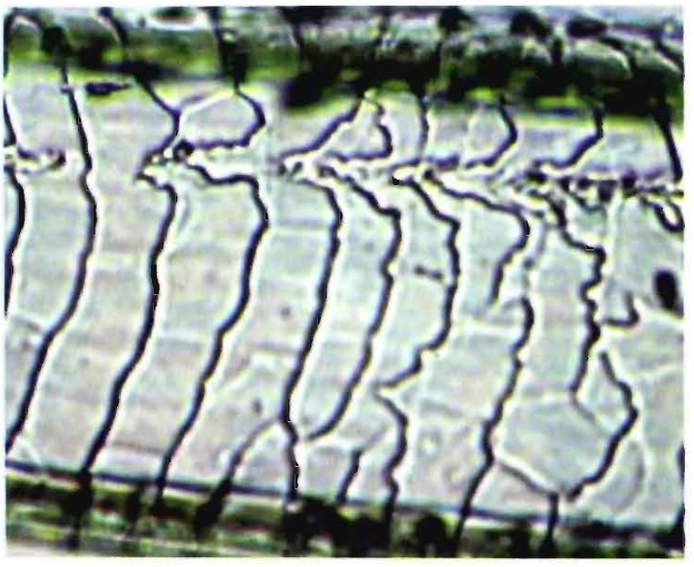
Dorsal



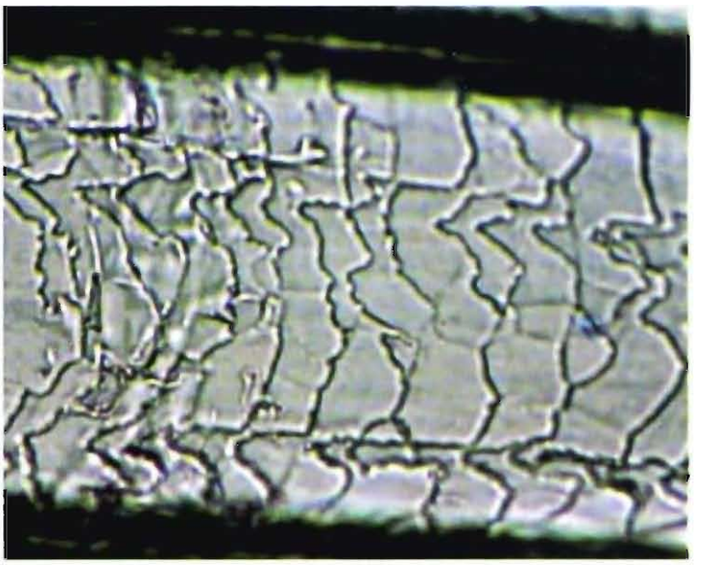
780. Medulla wide aeriform lattice 200x



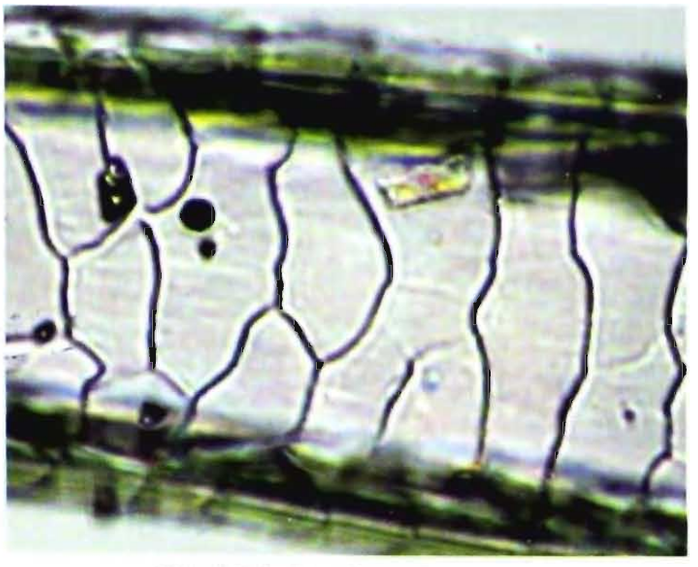
781. Cross section oblong, large medulla 200x



782. Cuticular at mid 400x

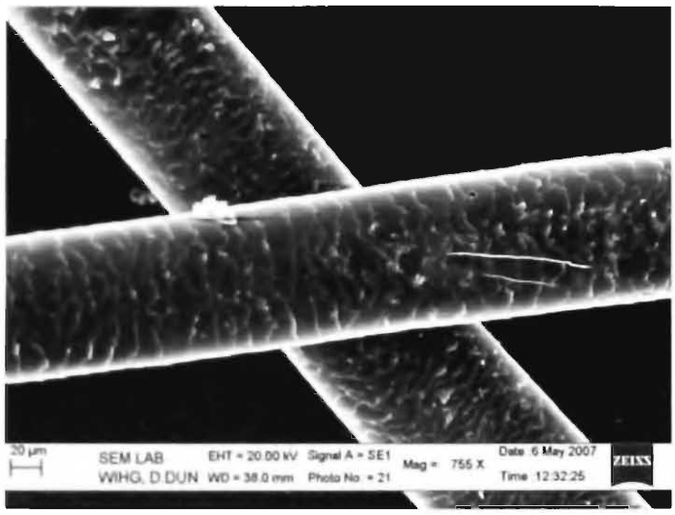


783. Cuticular at distal 400x

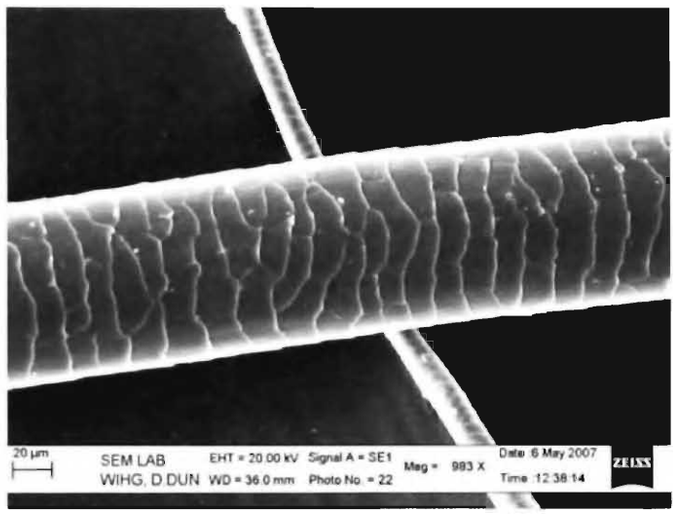


784. Cuticular at proximal 400x

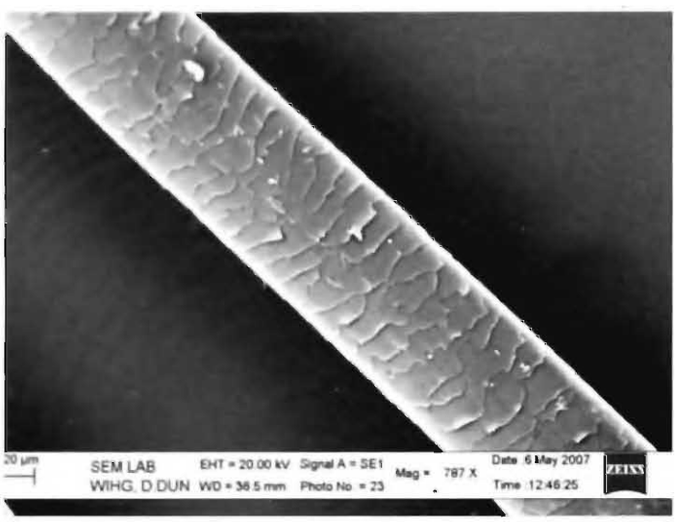
Dorsal



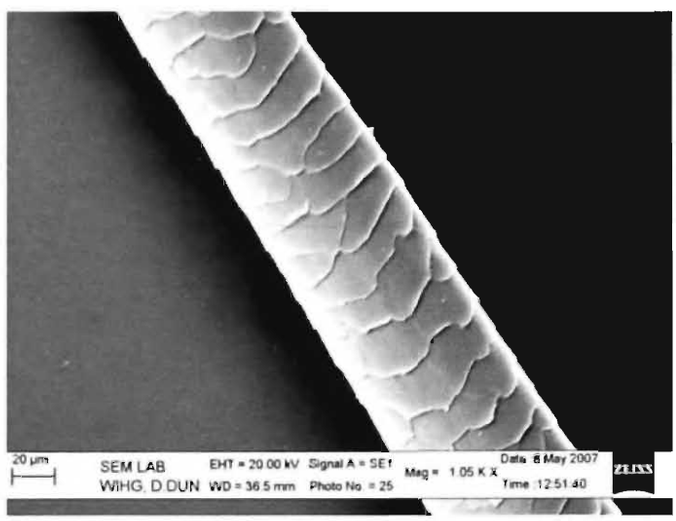
785. Cuticular at mid



786. Cuticular at distal



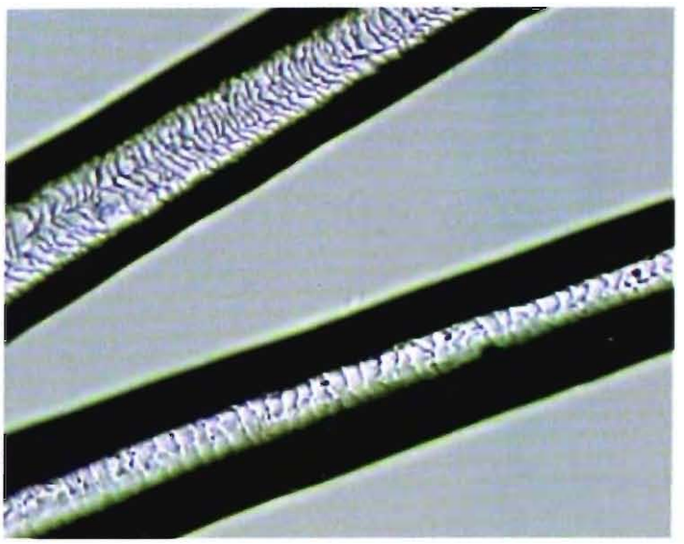
787. Cuticular at proximal



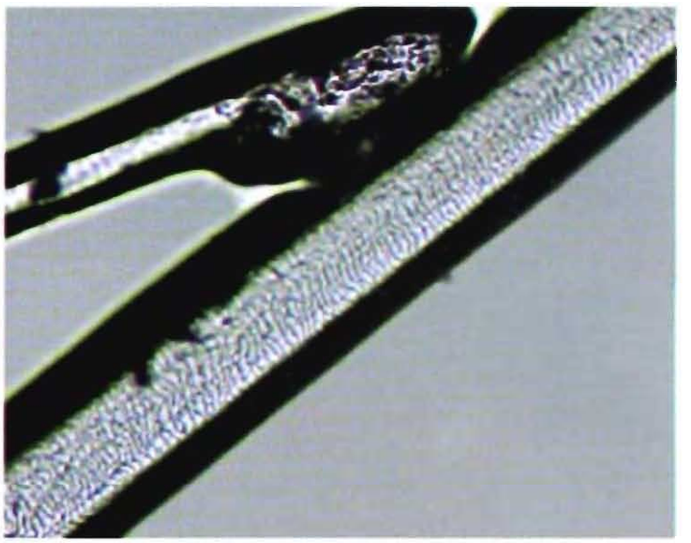
788. Cuticular at proximal

Plate 49b. ***Moschiola meminna*** (Erxleben) Mouse deer

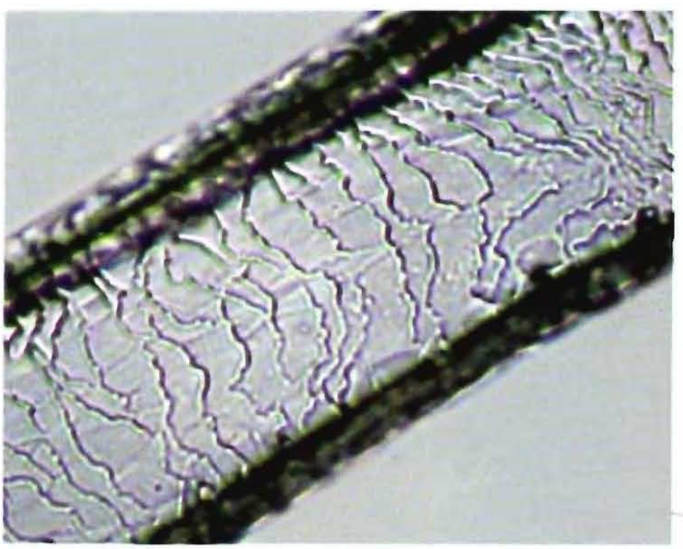
Ventral



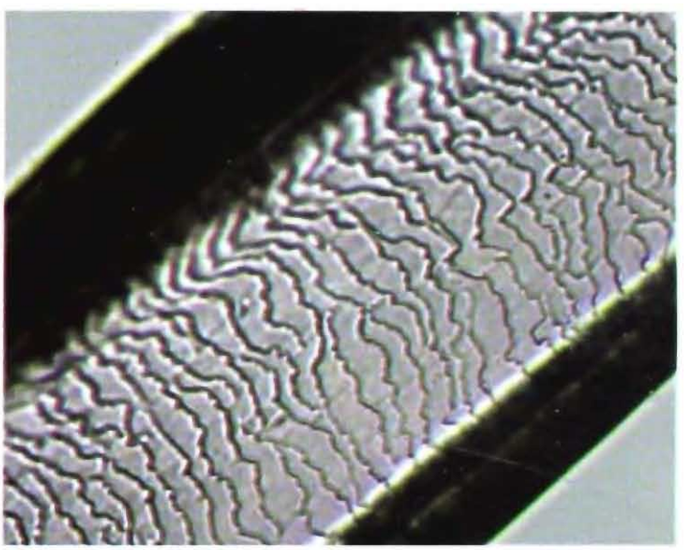
789. At tip and base 200x



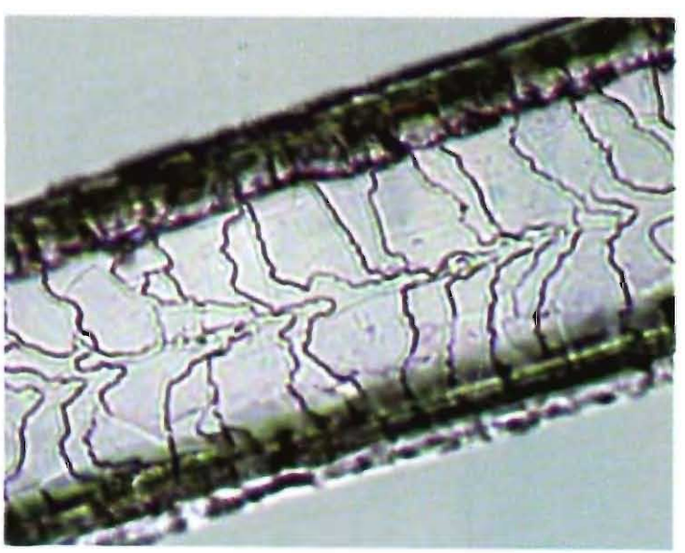
790. Cuticular at proximal, follicle and tip 200x



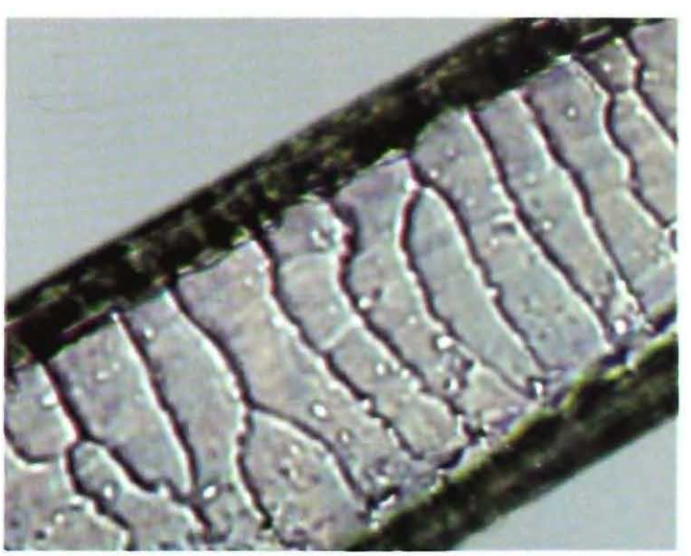
791. Cuticular at mid 800x



792. Cuticular at mid 400x



793. Cuticular at proximal 800x



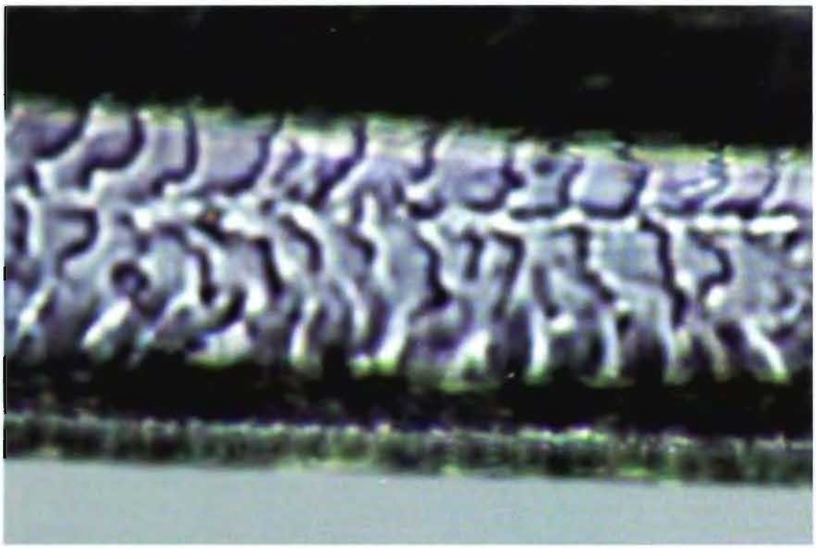
794. Cuticular at proximal 800x

Plate 49c. ***Moschiola meminna*** (Erxleben) Mouse deer

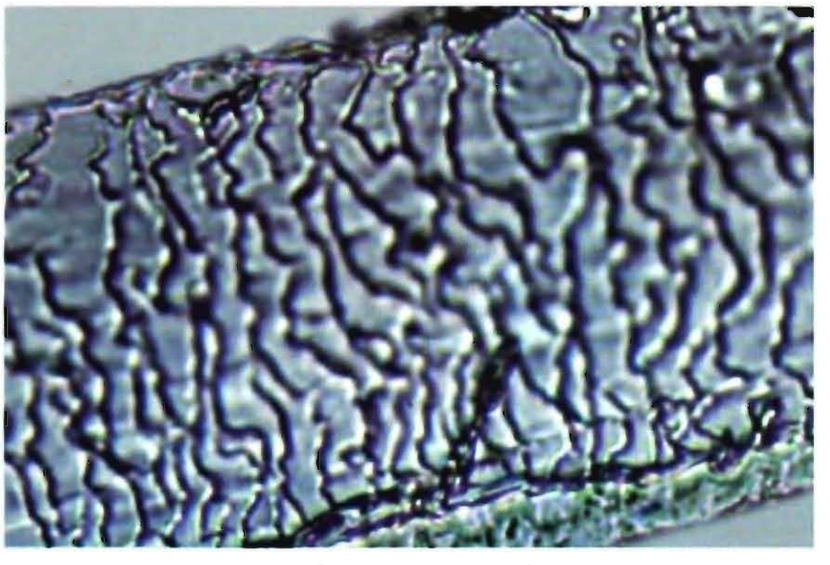
Head



795. Cross section oblong large medulla 400x



796. Cuticular at distal 400x



797. Cuticular at mid 400x