Tricho-taxonomic study of Dorsal Guard Hairs of Indian Species of Rodents Belonging to Subfamily- Sciurinae (Sciuridae: Rodentia: Mammalia)

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ABSTRACT: Tricho-taxonomic studies of dorsal guard hairs of different mammals have often been carried out by various workers around the world including India. But few works are available on animals belonging to Order—Rodentia. Although a few species of rodents and some small groups in particular have been studied by scientists both outside and within India, but proper and systematic study to develop an identification key for identification of parts of skin of wildlife animals seized from illegal trade is still wanting. The key is prepared on the basis of combination of characters such as transverse section, medullary configuration, medullary index, scale margin distance, scale pattern, scale count, Side to Side cuticular scale length, Proximo-distal scale length, etc.

Keywords: Dorsal guard hair, Tricho-taxonomy, Identification key, Illegal trade.

INTRODUCTION

Taxonomic studies on hairs – the most important morphological characteristic of mammals has often been used in food habitat studies, forensic sciences, taxonomy, archeological studies, etc. (Kennedy, 1982; Valente, 1983; Hess et al., 1985; Oli, 1993; Wallis, 1993; Dagnall et al., 1995; Meyer et. al., 1995; Dove et al., 2001, Amman et al., 2002). Previous studies on Rodents can be traced back to the 18th century by Pennant (1769) and later in 20th century by Williams (1938). Dorsal guard hair studies on Rodents have been made by Homan and Genoways (1978) on Heteromyid rodents where they found hair structure to be useful for identification only at the generic level. Stang and Grimes (1987) found features of pelage useful in examining generic relationships among Sciurids. Bahuguna (2007, 2008, 2010) made some works on primary guard hairs of Petaurista petaurista, Funambulus pennantii, three species of Callosciurus and three species of Ratufa. Studies on hairs of squirrels were also done by Krapp (1998) and Menon (2003). Cavia et. al. (2008) studied hair structure of small rodents from Central Argentina and provided a dichotomic key to identify hair at the species level.

However although all previous workers attempted to study only one or two or a few species belonging to a family or a subfamily, but this is the first time that an attempt has been made to study dorsal guard hair of all the Indian species belonging to a particular subfamily.

The main objective of this study is to develop an identification key to identify the species from scanty available sample such as skin parts, body parts, or handmade items and which in turn helps different enforcement agencies engaged for implementation of Wildlife (Protection) Act, 1972.

17 species of Subfamily – Sciurinae are found in India, among which 15 species were available in the National Zoological Collections present in the Zoological Survey of India, Kolkata. Once considered as pests, habitat destruction and dwindling population of many species have resulted in their inclusion in Schedule I and II in the Indian Wildlife (Protection) Act, 1972 as well as in CITES.

MATERIAL AND METHODS

10-15 tufts of dorsal guard hairs from the mid-dorsal region were collected randomly from 5-6 specimens of each species present in the Zoological Survey of India. The samples were washed in acetone and kept in Carbon Tetra Chloride overnight following the method of Chakraborty et. al. (1996). Macroscopical study i.e. diameter, total length were measured by dial caliper and nomenclature of colour is after Ridgway (1886). Microscopical study such as surface structure, scale pattern, scale margin, scale margin distance, scale count, side to side cuticular scale length (SS), and proximo-distal cuticular scale length (PD) of hair were studied after Chakraborty et al. (1996) and Brunner and Coman, (1974).
Structural nomenclature in respect of surface structure, scale pattern, medullary configuration etc. are followed after Moore et al. (1974) and Teerink (1991). Hair cross sections (TS) are also made for formulation.

RESULTS AND DISCUSSION

Details of the findings of the study of dorsal guard hairs are summarized in Table I and II.

Most of the species belonging to Subfamily-Sciurinae possesses different shades of grey, black or brown colour. Study of colour variation and band pattern indicates that combination of band pattern and corresponding colour variation can be used to distinguish the male and female of same species along with interspecies identification of adult animals.

Among the three species of Callosciurus, dorsal guard hair of C. caniceps has 7 bands with Prouts Brown and Raw Umber alternately in female, and Broccoli Brown and Clove Brown in males alternately; both males and females of C. erythraeus has 3 bands with Tip-Black, Mid-Broccoli Brown and Base- Clove Brown respectively; males of C. pygerythrus have 5 bands with Broccoli Brown and Black alternately, while females have 7 bands with Broccoli Brown and Clove Brown alternately.

The three species of Dremomys show colour variation. Both male and female species of D. lokriah have 3 bands with Tip-Black, Mid-Drab grey and Base- Clove Brown respectively; D. pernyi is devoid of any band with Mouse Grey colour; and both male and females of D. rufigenis have 3 bands with Tip-Clove Brown, Mid-Cinnamon and Base-Prout’s Brown respectively.

Among the four species of Funambulus, both male and female species of F. tristriatus has 5 bands with Clove Brown and Sepia alternately; males of F. palmarum has 5 bands with Bistre and Clove Brown alternately, while females have 3 bands with same colour variation; males of F. pennantii has 3 bands with Clove Brown and Broccoli Brown alternately, while females also have 3 bands with Prout’s Brown and Drab colour alternately; although both males and females of F. sublineatus has 3 bands, males are Clove Brown and Hair Brown in color, while females are Sepia and Clove Brown in colour. However Koppiker and Sabnis (1976) found hairs of Funambulus to be black or with alternate white and brown bands.

Both male and female species of Ratufa bicolor and Ratufa indica are devoid of any bands, and are Mummy Brown and Prout’s Brown respectively; while the female of Ratufa macroura has 3 bands with Tip-Broccoli Brown, Mid - Prout’s Brown, Base-Fawn colour, and the male species is Vandyke Brown with no bands.

Both males and females Marmota himalayana have 3 bands, with Tip-Clove brown, Mid-Pinkish Buff and Base-Mummy brown. Tamiops macclellandi shows 3 bands each, with Bistre and Clove brown in males, while Smoke grey and Black in females. The profile of hairs of all the species are ‘Straight’. Average length of hair varies in different genus and also among species belonging to same genus. From Table I it can be said that among the 3 species of Callosciurus, it is maximum (21.9±2.1) mm in C. erythraeus and minimum (18±0.9) mm in C. pygerythrus; among 3 species in Dremomys, it is lowest (12.7±1.8) mm in D. pernyi and highest (17.6±2.1) mm in D. rufigenis. Among the 4 species of Funambulus, the average length is highest (13.8±1.5) mm in F. sublineatus and lowest (10.8±1.5) mm in F. palmarum. However 2 species of Ratufa, as R. bicolor and R. macroura has almost same length of hair, i.e. (30.4±3.7) mm and (30.4±2.9) mm respectively, while R. indica is a little longer (37.1±3.1) mm; in Marmota himalayana it is (26.5±1.3) mm, and in Tamiops macclellandi length is (11.7±2.8) mm respectively. Koppiker and Sabnis (1976) reported that the length of hair of F. palmarum varies from 1.4 to 2 cm, while that of R. indica as 3.2 cm (Koppiker and Sabnis, 1977), which is close to that found in the present study.

Diameter of guard hairs also varies from species to species, i.e. highest (11±5.7) in C. pygerythrus, and lowest (8.8±4.9) in C. erythraeus among the 3 species of Callosciurus; maximum (10±4.7) in D. pernyi, and minimum (7.7±5.4) in D. lokriah among the 3 species of Dremomys; highest (10±6.7) in F. pennantii, and lowest (8±6.3) in F. palmarum among 4 species of Funambulus; maximum (20±6.7) in R. indica, and minimum (11±7.4) in R. bicolour among 3 species of Ratufa. Diameter of dorsal guard hairs of Marmota himalayana is taken as (14±6.9) , whereas that of Tamiops macclellandi is (10±6.6) . Koppiker and Sabnis (1976, 1977) reported the diameter of hair of F. palmarum is 27 , while that
of *R. indica* is 60, and this findings are however quite different from the present study.

“Scale count” per millimeter of hair length is quite consistent among the different species of Sub-family—Sciurinae. Among the Genus *Callosciurus*, *C. caniceps* has minimum (1627.1±33.9) scale count and *C. pygerythrus* has maximum (3222.6±58.6); *D. rufigenis* has minimum (1825.4±290.9) and *D. pernyi* has maximum (3326.2±23.1); *F. pennantii* has maximum (2619.2±25.7) and *F. sublineatus* has minimum (1566.2±83.4) scale count among the 4 species. *M. himalayana* has scale count of (1254.9±40.4), while that of *T. macclellandi* is (2812.7±54.9). “Scale pattern” of *M. himalayana* is ‘irregular wave’, while that of all the other 14 species is ‘regular wave’. ‘Scale margin distance’ of *F. pennantii* is ‘near’, and that of all others is ‘distant’.

However all species of Sub-family—Sciurinae have ‘smooth’ scale margin. However females of *C. erythraeus* and *R. indica* have ‘crenate’ scale margin. Koppiker and Sabnis (1976) found imbricate scales with plain edges in hair of *F. palmarum*, and coronal scales with serrate edges in *R. indica* (1977), which is quite different from the present study although scales of female species of *R. indica* support the view of Koppiker and Sabnis (1977). Except *F. pennantii* (which has ‘Near’ scale margin distance) all others have ‘Distant’ scale margin distance. Bahuguna (2010) however reported regular wave of scale pattern with rippled scale margin for all species of *Ratufa*. ‘SS’ varies considerably with (11.4±0.7) as minimum in *C. caniceps* and (23.9±0.5) as maximum in *C. erythraeus*. In *D. pernyi* it is minimum (2.9±0.2) and in *D. rufigenis* it is maximum (14±0.42). Among the 4 species of *Funambulus*, *SS* is maximum in *F. pennantii* and *F. tristriatus*, i.e. (18.9±1.3) and (18.6±2.1) respectively, while minimum in *F. sublineatus* (8.8±0.8). In *R. bicolor* it is maximum (17±2.1) and minimum in *R. macroura* (9.9±1.5). ‘PD’ of all species are more or less similar, i.e. (5.7±0.3), (5.8±0.6), and (5.9±0.8) in *C. caniceps*, *C. erythraeus*, and *C. pygerythrus* respectively. In *D. lokriah* and *D. rufigenis* it is (5.4±0.2) and (5.1±0.8) respectively, while that of *D. pernyi* is (1.9±0.3). ‘PD’ of *Funambulus* is almost consistent with (4.6±0.4), (5.2±0.4), (6.4±1.2), and (6±0.5) in *F. palmarum*, *F. pennantii*, *F. sublineatus*, and *F. tristriatus* respectively. ‘PD’ in *Ratufa* varies considerably, with (6.4±0.8) in *R. bicolor*, (5.2±1.2) in *R. indica*, and (3.9±0.8) in *R. macroura*. ‘SS’ and ‘PD’ in *M. himalayana* is (7.9±1.1) and (6.2±0.6) respectively, while that of *T. macclellandi* is (10.2±0.3) and (4.8±0.8) respectively.

‘Medullary configuration’ does not vary considerably among the different species of Subfamily—Sciurinae. *C. caniceps* and *C. erythraeus* have ‘Wide medulla lattice’ and *C. pygerythrus* has ‘Narrow medulla lattice’; *D. lokriah* and *D. rufigenis* has Wide medulla lattice, whereas *D. pernyi* has ‘Narrow medulla lattice’; *F. palmarum* and *F. sublineatus* has ‘Narrow medulla lattice’, but *F. pennantii* and *F. tristriatus* has ‘Wide medulla lattice’; *R. bicolor* and *R. macroura* has ‘wide aeriform lattice’ and *R. indica* has ‘simple’ medulla; and *M. himalayana* and *T. macclellandi* both have ‘wide medulla lattice’. Koppiker and Sabnis (1976) reported fragmented type of medulla arranged in double rows for hairs of *F. palmarum*, while that of *R. indica* (1977) is discoidal type, which is not observed in the present study. However Bahuguna (2010) reported ‘wide aeriform lattice’ for *R. bicolor* and *R. macroura*, and ‘simple medulla’ for *R. indica*, which is at par with the present study.

“Medullary Index” varies considerably among the different species of a genus. Among the 3 species of genus *Callosciurus* it is lowest (0.87±0.01) in *C. caniceps*, and highest (0.95±0.06) in *C. pygerythrus*; highest (0.87±0.01) in *D. lokriah* and lowest (0.73±0.01) in *D. pernyi*; highest (0.90±0.01) in *F. tristriatus* and lowest (0.62±0.07) in *F. palmarum*; highest (0.93±0.02) in *R. indica* and lowest (0.78±0.05) in *R. bicolor*.

Transverse Section does not vary considerably among the different species of Sciurinae. Two species of *Ratufa*, i.e. *R. bicolor* and *R. indica* has ‘Oval’ shaped medulla and that of *F. palmarum* is ‘Round’; while all others i.e. *C. caniceps*, *C. erythraeus*, *C. pygerythrus*, *D. lokriah*, *D. pernyi*, *D. rufigenis*, *F. pennantii*, *F. sublineatus*, *F. tristriatus*, *T. macclellandi*, *R. macroura*, and *M. himalayana* have ‘Oblong’ transverse section.

Based on the above characteristics of the dorsal guard hairs, a key to identify the different species of a genus belonging to Subfamily—Sciurinae is described below.
Key to identify the Indian species belonging to the Genus—*Callosciurus*

1. Medullary configuration ‘wide medulla lattice’……………………..2
   Medullary configuration ‘narrow medulla lattice’……………………..3
2. Scale count/mm length of hair (1808.2±53.4), Medullary index (0.90±0.06), transverse section ‘oblong’…………………………….*C. erythraeus*
   Scale count/mm length of hair (1627.1±33.9), medullary index (0.87±0.01),………………*C. caniceps*
3. Scale count/mm length of hair (2022.6±58.6), medullary index (0.95±0.04)………………*C. pygerythrus*.

Key to identify the Indian species belonging to the Genus —*Dremomys*

1. Medullary configuration ‘wide medulla lattice’……………………..2
   Medullary configuration ‘narrow medulla lattice’……………………..3
2. Scale count/mm length of hair (11947.2±32.6), Medullary index (0.87±0.01), transverse section ‘oblong’………………….*D. lokriah*.
3. Scale count/mm length of hair (3326.2±23.1), medullary index (0.73±0.01)………………*D. pernyi*
   Scale count/mm length of hair (1825.4±290.9), medullary index (0.80±0.07)………………*D. rufigenis*.

Key to identify the Indian species belonging to the Genus —*Funambulus*

1. Medullary index <0.80……………..2
   Medullary index >0.80……………………..3
2. Transverse section ‘round’, medullary configuration ‘narrow medulla lattice’, scale count/mm length of hair (2125±24.9)………………….F. palmarum
   Transverse section ‘oblong’, medullary configuration ‘narrow medulla lattice’, scale count/mm length of hair (1566.2±83.4)………………….F. sublineatus
3. Medullary configuration ‘wide medulla lattice’, scale count per mm length of hair (2012.4±34.1)………………….F. tristriatus
   Medullary configuration ‘wide medulla lattice’, scale count per mm length of hair (2619.2±25.7)… F. pennantii.

Key to identify the Indian species belonging to the Genus —*Ratufa*

1. Transverse section ‘oblong’…………..2
   Transverse section ‘oval’………………..3
2. Medullary index (0.79±0.03), medullary configuration ‘wide aeriform lattice’, scale count/mm length of hair (2229.1±41.1)………………….R. macroura
3. Medullary index (0.78±0.05), medullary configuration ‘wide aeriform lattice’, scale count/mm length of hair (2783.7±261.6)………………….R. bicolor
   Medullary index (0.93±0.02), medullary configuration ‘simple’, scale count/mm length of hair (1777.3±69)………………….R. indica.
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Species</th>
<th>Colour</th>
<th>No. of bands</th>
<th>Length (mm)</th>
<th>Diameter (μ)</th>
<th>Scale pattern</th>
<th>Scale margin distance</th>
<th>Scale margin</th>
<th>Scale count/mm hair length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Callosciurus caniceps (Gray, 1842)</td>
<td>Prouts Brown and Clove Brown alternately</td>
<td>7</td>
<td>18-21</td>
<td>0-20 (9+7.4)</td>
<td>Regular wave</td>
<td>Distant</td>
<td>Smooth</td>
<td>1563.6-1665.3 (1627.1+33.9)</td>
</tr>
<tr>
<td>2</td>
<td>Callosciurus erythraeus (Pallas, 1779)</td>
<td>Tip-Black, Mid-Broccoli brown, Base-Clove brown</td>
<td>3</td>
<td>19-26</td>
<td>0-15 (8.8+4.9)</td>
<td>Regular wave</td>
<td>Distant</td>
<td>Smooth</td>
<td>1723.6-1876.9 (1808.2+53.4)</td>
</tr>
<tr>
<td>3</td>
<td>Callosciurus pygerythrus (I. Geoffroy Saint Hilarie, 1831)</td>
<td>Broccoli Brown and Black alternately</td>
<td>5</td>
<td>17-20</td>
<td>0-20 (11+5.7)</td>
<td>Regular wave</td>
<td>Distant</td>
<td>Smooth</td>
<td>1952.9-2090.7 (2022.6+58.6)</td>
</tr>
<tr>
<td>4</td>
<td>Dremomys lokriah (Hodgson, 1836)</td>
<td>Tip-Black, Mid-Drab Grey, Base-Clove</td>
<td>3</td>
<td>13-20</td>
<td>0-14 (7.7+5.4)</td>
<td>Regular wave</td>
<td>Distant</td>
<td>Smooth</td>
<td>1912.5-1988.3 (1947.2+32.6)</td>
</tr>
<tr>
<td>5</td>
<td>Dremomys purnyi (Milne-Edwards, 1867)</td>
<td>Mouse Grey</td>
<td>No band</td>
<td>10-15</td>
<td>0-20 (10+4.7)</td>
<td>Regular wave</td>
<td>Distant</td>
<td>Smooth</td>
<td>3298.5-3357.8 (3326.2+23.1)</td>
</tr>
<tr>
<td>6</td>
<td>Dremomys rufigenis (Blanford, 1878)</td>
<td>Tip-Clove Brown</td>
<td>3</td>
<td>15-21</td>
<td>0-20 (8+6.3)</td>
<td>Regular wave</td>
<td>Distant</td>
<td>Smooth</td>
<td>1511.1-2285.7 (1825.4+290.9)</td>
</tr>
<tr>
<td>7</td>
<td>Funambulus palmarium (Linnaeus, 1766)</td>
<td>Bistre and Clove brown alternately</td>
<td>5</td>
<td>9-14</td>
<td>0-20 (8+6.3)</td>
<td>Regular wave</td>
<td>Distant</td>
<td>Smooth</td>
<td>2097-2151 (2125+24.9)</td>
</tr>
<tr>
<td>8</td>
<td>Funambulus pennantii (Wroughton, 1905)</td>
<td>Clove brown and Broccoli brown alternately</td>
<td>3</td>
<td>8-15</td>
<td>0-20 (10+6.7)</td>
<td>Regular wave</td>
<td>Near</td>
<td>Smooth</td>
<td>2592.7-2655.6 (2619.2+25.7)</td>
</tr>
<tr>
<td>9</td>
<td>Funambulus sublineatus (Waterhouse, 1838)</td>
<td>Clove brown and hair brown alternately</td>
<td>3</td>
<td>11-16</td>
<td>0-20 (9+7.4)</td>
<td>Regular wave</td>
<td>Distant</td>
<td>Smooth</td>
<td>1466.7-1649.6 (1566.2+83.4)</td>
</tr>
<tr>
<td>10</td>
<td>Funambulus tristriatus (Waterhouse, 1837)</td>
<td>Clove brown and Sepia alternately</td>
<td>5</td>
<td>10-15</td>
<td>0-20 (9+5.7)</td>
<td>Regular wave</td>
<td>Distant</td>
<td>Smooth</td>
<td>1960-2046.5 (2012.4+34.1)</td>
</tr>
<tr>
<td>11</td>
<td>Marmota himalayana (Hodgson, 1841)</td>
<td>Tip-Clove brown, Mid-Pinkish Buff Base-Mummy brown</td>
<td>3</td>
<td>25-29</td>
<td>0-30 (14+6.9)</td>
<td>Irregular wave</td>
<td>Distant</td>
<td>Smooth</td>
<td>1196.4-1298.2 (1254.9+40.4)</td>
</tr>
<tr>
<td>12</td>
<td>Ratufa bicolor (Sparmann, 1778)</td>
<td>Mummy Brown</td>
<td>No band</td>
<td>26-36</td>
<td>0-20 (11+7.4)</td>
<td>Regular wave</td>
<td>Distant</td>
<td>Smooth</td>
<td>2433.3-3166.7 (2783.7+261.6)</td>
</tr>
<tr>
<td>13</td>
<td>Ratufa indica (Erxleben, 1777)</td>
<td>Prout’s Brown</td>
<td>No band</td>
<td>32-42</td>
<td>0-20 (13+6.7)</td>
<td>Regular wave</td>
<td>Distant</td>
<td>Smooth</td>
<td>1682.5-1864.7 (1777.3+69)</td>
</tr>
<tr>
<td>14</td>
<td>Ratufa macroura (Pennant, 1769)</td>
<td>Tip-Broccoli Brown Base-Fawn colour</td>
<td>3</td>
<td>26-35</td>
<td>0-20 (13+6.7)</td>
<td>Regular wave</td>
<td>Distant</td>
<td>Smooth</td>
<td>2187.5-2285.7 (2229.1+41.1)</td>
</tr>
<tr>
<td>15</td>
<td>Tamiops macceleandi (Horsfield, 1840)</td>
<td>Bistre and Clove brown alternately</td>
<td>3</td>
<td>9-17</td>
<td>0-20 (10+6.6)</td>
<td>Regular wave</td>
<td>Distant</td>
<td>Smooth</td>
<td>2741.6-2885.4 (2812.7+54.9)</td>
</tr>
</tbody>
</table>
Table 2: Comparative account of the characteristics of guard hairs of 15 Indian species of Subfamily - Sciurinae, Family - Sciuridae, Order—Rodentia, (Mean & SD are given in parenthesis); ‘SS’ = Side to side cuticular scale length; ‘PD’= Proximodistal cuticular scale length; ‘TS’= Transverse section.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Species</th>
<th>SS (μ)</th>
<th>PD (μ)</th>
<th>Medullary Configuration</th>
<th>Medullary Index</th>
<th>T. S.</th>
<th>Common name / Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Callosciurus caniceps</td>
<td>10.6-12.2 (11.4+0.7)</td>
<td>5.4-6.1 (5.7+0.3)</td>
<td>Wide medulla lattice</td>
<td>0.86-0.88 (0.87+0.01)</td>
<td>Oblong</td>
<td>Golden Back Squirrel Not known</td>
</tr>
<tr>
<td>2</td>
<td>Callosciurus erythraeus</td>
<td>23.3-24.4 (23.9+0.5)</td>
<td>5.0-6.1 (5.8+0.6)</td>
<td>Wide medulla lattice</td>
<td>0.83-0.97 (0.9+0.06)</td>
<td>Oblong</td>
<td>Palla’s Squirrel CAMP: LRnt (Nat.), DD (Glob.)</td>
</tr>
<tr>
<td>3</td>
<td>Callosciurus pygerythrus</td>
<td>13.3-15.6 (14.2+0.8)</td>
<td>5.0-7.2 (5.9+0.8)</td>
<td>Narrow medulla lattice</td>
<td>0.90-0.99 (0.95+0.04)</td>
<td>Oblong</td>
<td>Hoary Bellied Himalayan Squirrel or Irrawady squirrel CAMP: LRnt (Nat.), DD (Glob.)</td>
</tr>
<tr>
<td>4</td>
<td>Dremomys lokriah</td>
<td>13.3-14.4 (13.7+0.4)</td>
<td>5.0-5.6 (5.4+0.2)</td>
<td>Wide medulla lattice</td>
<td>0.85-0.88 (0.87+0.01)</td>
<td>Oblong</td>
<td>Orange Bellied Squirrel CAMP: LRnt (Nat.), DD (Glob.)</td>
</tr>
<tr>
<td>5</td>
<td>Dremomys perryi</td>
<td>2.7-3.3 (2.9+0.2)</td>
<td>1.6-2.2 (1.9+0.3)</td>
<td>Narrow medulla lattice</td>
<td>0.72-0.75 (0.73+0.01)</td>
<td>Oblong</td>
<td>Perny’s long nose Squirrel Not known</td>
</tr>
<tr>
<td>6</td>
<td>Dremomys rufigenis</td>
<td>13.5-14.5 (14+0.4)</td>
<td>3.9-6.1 (5.1+0.8)</td>
<td>Wide medulla lattice</td>
<td>0.69-0.89 (0.80+0.09)</td>
<td>Oblong</td>
<td>Red Cheeked Squirrel Not known</td>
</tr>
<tr>
<td>7</td>
<td>Funambulus palmarum</td>
<td>14.4-15.5 (14.9+0.4)</td>
<td>4.0-5.0 (4.6+0.4)</td>
<td>Narrow medulla lattice</td>
<td>0.55-0.72 (0.62+0.07)</td>
<td>Round</td>
<td>Indian Palm squirrel CAMP: LRnt (Nat.), DD (Glob.)</td>
</tr>
<tr>
<td>8</td>
<td>Funambulus pennantii</td>
<td>17.4-20.3 (18.9+1.3)</td>
<td>4.4-5.6 (5.2+0.4)</td>
<td>Wide medulla lattice</td>
<td>0.83-0.86 (0.85+0.01)</td>
<td>Oblong</td>
<td>Northern Palm Squirrel IWPA: Sch IV; CAMP: LRlc (Nat.), DD (Glob.)</td>
</tr>
<tr>
<td>9</td>
<td>Funambulus sublineatus</td>
<td>7.2-9.9 (8.8+0.8)</td>
<td>5.0-7.8 (6.4+1.2)</td>
<td>Narrow medulla lattice</td>
<td>0.55-0.68 (0.63+0.05)</td>
<td>Oblong</td>
<td>Dusky Striped squirrel CAMP: Nationally and Globally</td>
</tr>
<tr>
<td>10</td>
<td>Funambulus tristriatus</td>
<td>16.2-20.9 (18.6+2.1)</td>
<td>5.3-6.8 (6.9+0.5)</td>
<td>Wide medulla lattice</td>
<td>0.89-0.92 (0.90+0.01)</td>
<td>Oblong</td>
<td>Jungle Striped Squirrel CAMP: LRnt (Nationally)</td>
</tr>
<tr>
<td>11</td>
<td>Marmota himalayana</td>
<td>6.6-9.4 (7.9+1.1)</td>
<td>5.7-7.2 (6.2+0.6)</td>
<td>Wide medulla lattice</td>
<td>0.59-0.69 (0.63+0.03)</td>
<td>Oblong</td>
<td>Himalayan Marmot CITES: App III</td>
</tr>
<tr>
<td>12</td>
<td>Ratufa bicolor</td>
<td>14.5-19.8 (17.5+2.1)</td>
<td>5.5-8.3 (6.4+0.8)</td>
<td>Wide aeriform lattice</td>
<td>0.70-0.83 (0.78+0.05)</td>
<td>Oval</td>
<td>Large Malay Squirrel IWPA: Sch II, p II ; CITES: App III</td>
</tr>
<tr>
<td>13</td>
<td>Ratufa indica</td>
<td>10.6-18.8 (14.5+3.3)</td>
<td>3.3-6.7 (5.2+1.2)</td>
<td>Simple</td>
<td>0.90-0.95 (0.93+0.02)</td>
<td>Oval</td>
<td>Indian Giant Squirrel IWPA: Sch I, p II; CITES: App II</td>
</tr>
<tr>
<td>14</td>
<td>Ratufa macroura</td>
<td>7.8-12.2 (9.9+1.5)</td>
<td>2.8-4.9 (3.9+0.8)</td>
<td>Wide aeriform lattice</td>
<td>0.76-0.83 (0.79+0.03)</td>
<td>Oblong</td>
<td>Grizzled Indian Squirrel IWPA: Sch I, p I; CITES: App II</td>
</tr>
<tr>
<td>15</td>
<td>Tamiops maclellandi</td>
<td>9.9-10.6 (10.2+0.3)</td>
<td>3.8-6.1 (4.8+0.8)</td>
<td>Wide medulla lattice</td>
<td>0.76-0.88 (0.83+0.05)</td>
<td>Oblong</td>
<td>Himalayan Striped Squirrel CAMP: LRnt (Nat.), DD (Glob.)</td>
</tr>
</tbody>
</table>
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