Table 1. Effect of alcoholic extract of M. pruriens on stress-induced (6 h, 37°C) and alloxan-induced (20 mg/100 g body wt.) lipid peroxidation (n = 6)

<table>
<thead>
<tr>
<th>Group</th>
<th>Stress</th>
<th>Alloxan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>433.73 ± 26.60</td>
<td>433.73 ± 26.60</td>
</tr>
<tr>
<td>Only extract</td>
<td>313.33 ± 20.14</td>
<td>313.33 ± 20.14</td>
</tr>
<tr>
<td>Only inducer</td>
<td>822.92 ± 12.67</td>
<td>779.78 ± 46.22</td>
</tr>
<tr>
<td>Extract + inducer</td>
<td>447.81 ± 33.81</td>
<td>346.51 ± 23.13</td>
</tr>
</tbody>
</table>

Extract was given orally at the dose of 60 mg/100 g body wt. to the animals for 30 days.

radicals are considered to be important for normal physiology when produced in excess, they cause cellular damage. The radicals initiate a chain reaction of lipid and protein peroxidation by attacking on the double bonds of these molecules. About 40 diseases are now being considered as free radical-mediated. Most of them are metabolic, nervous or other old age diseases. Radical-induced oxidation of peptides generates reactive carboxyl derivatives (RCD), which are involved in rheumatoid arthritis, Alzheimer’s disease, smoking-related pathologies, muscle dystrophy, re-perfusion injuries, etc.12 In our previous communication, we have reported the dose- and time-dependent response of M. pruriens on lipid peroxidation.8 Its clinical use for several free radical diseases, especially the age-related male infertility and Parkinson’s disease is well documented.2 Its protective response on these in vivo models suggests two possibilities. Either it is acting on the nervous system or else it is removing the free radicals generated due to catecholamine and iron interaction13. Stress is another factor which induces lipid peroxidation, both directly at the tissue level and also through the high release of catecholamines13. Stress causes 50% increase in protein oxidation as measured by its carbonyl content and about 40% decrease in the glutathione content of the fundic stomach, suggesting oxidative damage by stress. It also causes time-dependent increase in the superoxide dismutase activity in mitochondria and a decrease in the glutathione peroxidase activity.14 Since this extract is inhibiting the lipid peroxidation induced by alloxan and also by FeSO4, it could be concluded that its action is through the removal of free radicals. The mechanism could be through the removal of hydroxyl radicals, which are produced by the interaction of catecholamines with iron or by direct chelation of free iron. In vitro studies have already shown its role in the removal of *OH radicals. Effects on alloxan-induced model could be due to its property of trapping the superoxides, because it is reported that alloxan initiates the process of lipid peroxidation through the production of superoxides.


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Bats of the Indian subcontinent – An update

Uncertainty on the exact number of taxa of chiropterans occurring in the Indian subcontinent has been a matter of debate.1–4 One of the 26 mammalian orders, Chiroptera includes about 925 to 950 species of bats the world over in two rather unequal sub-orders – the Megachiroptera and the Microchiroptera.5,6 The former is represented by only one family (Pteropodidae) which is restricted to the Old World tropics of Africa and Asia, while the latter includes 17 families (Rhinopomatidae, Emballonuridae, Craseonycteridae, Nycteridae, Megadermatidae, Rhinolophidae, Hipposideridae, Noctilionidae, Mormoopidae, Phyllostomidae, Natalidae, Furipteridae, Thyropteridae, Myzopodidae, Vespertilionidae, Mystacinidae and Molossidae).7 About a quarter of known mammals in India are bats. A recent checklist of Indian mammals8 lists 105 species of bats belonging to 35 genera and 7 families. Agrawal9’s puts on record a total of 110 species of bats belonging to 36 genera and 6 families based on an earlier publication.8 The most comprehensive and up-to-date revision of the Chiroptera of

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Indian subcontinent was published in 1997 (ref. 6). According to this publication there are 119 species of bats belonging to 37 genera and 8 families in the Indian subcontinent encompassing India, Pakistan, Nepal, Sri Lanka, Maldives, Afghanistan, Tibet and northern Myanmar (Table 1). The authors of this work relied mainly on the earlier work of Corbet and Hill10 for assigning taxonomic status of many species.

In India, a total of 110 species of bats belonging to 33 genera and 8 families have been recorded8. Species not recorded within Indian limits are Rousettus aegyptiacus [Megachiroptera: Pteropodidae], Rhinolophus blasii [Microchiroptera: Rhinolophidae], Triambops persicus, Asellia tridens [Microchiroptera: Hipposideridae], Eptesicus bottae, Eptesicus gobiensis, Eptesicus nasutus, Vespertilio murinus, and Philetor brachypterus [Microchiroptera: Vespertilionidae].

The senior author had an opportunity to interact with Paul J. J. Bates of Harrison Zoological Museum, London and Y. P. Sinha of Zoological Survey of India in Madurai last year while attending the practical workshop on field techniques, taxonomy and conservation of bats of India and south Asia. During discussions with them, it was felt that there exist some uncertainties regarding the taxonomic status of a few species of bats and an update is required. This note attempts to update the information on bats of the Indian subcontinent.

Following the trend of accepting the latest publication and improvising thereon, we accept the number of species listed by Bates and Harrison as 119 for the Indian subcontinent, including 110 species recorded within Indian limits, excepting the case of E. gobiensis Bobrinskii, 1926.

After careful observation of existing information on bats, we find that the taxonomic status of two species add to the existing confusion of the numbers that were given earlier. The first is the Bellary leaf-nosed bat Hipposideros schistaceus Andersen, 1918 [Microchiroptera: Hipposideridae]. Bates and Harrison considered it synonymous with Hipposideros lankadiva indus, based on its affinities in forearm and skull morphometry. The first taxonomic reference of Hipposideros lankadiva was given by Kelnar11, while Andersen12 described Hipposideros indus (based on a specimen from Gersoppa), H. i. mixtus (Kolar), H. i. swinii (Mundra, Sangor) and H. schistaceus (Vijayanagar). Presently valid is the taxonomic status of H. lankadiva, including subspecies H. l. lankadiva (relatively larger with average forearm length of 90.3 mm and condylo-canine length of 30.8 mm) from Sri Lanka and H. l. indus (with average forearm length of 83.0 mm and condylo-canine length of 27.4 mm) from India. The second species is Eptesicus nilssonii (Keyserling and Blassius, 1839) that has been included among Indian mammals as endemic to India, recorded only from Jammu and Kashmir. The current taxonomic status of this species is uncertain due to lack of museum specimens. Bates and Harrison do not mention anything about this species, yet the synonyms provided under the entry of E. gobiensis Bobrinskii, 1926 include mention of three subspecies Eptesicus nilssonii gobiensis, E. n. centralsiaticus and E. n. kasaghacis. Probably, following Corbet and Hill10 Bates and Harrison included it as E. gobiensis Bobrinskii, 1926, and whatever little information is provided is based on Chakraborty who mentions about two possible specimens collected from Gilgit (presently in Pakistan-occupied-Kashmir) way back in 1879. These changes bring down two species and one species, respectively, from the total number of Indian chiropterans provided by Walker and Nameer8.

A recent publication by Sinha refers to Pipistrellus australianus Dobson, 1871 [Microchiroptera: Vespertilionidae] based on a specimen from Cherapunji, Meghalaya as a distinct species closely related to Pipistrellus abramus and Rhiocolus sinicus.

### Table 1. Bats of Indian subcontinent

<table>
<thead>
<tr>
<th>Sub-order</th>
<th>Family</th>
<th>No. of genus/genera</th>
<th>No. of species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Megachiroptera</td>
<td>Pteropodidae (Old World fruit bats)</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Microchiroptera</td>
<td>Rhinopomatidae (mouse-tailed bats)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Emballonuridae (sheath-tailed bats)</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Megadermatidae (false vampire bats)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Rhinolophidae (horsehoe bats)</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Hipposideridae (leaf-nosed bats)</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Molossidae (free-tailed bats)</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Vespertilionidae (evening bats)</td>
<td>19</td>
<td>59</td>
</tr>
</tbody>
</table>

*After Bates and Harrison*

### Table 2. External, cranial and dental measurements (mm) of Pipistrellus abramus and Rhinolophus sinicus

<table>
<thead>
<tr>
<th></th>
<th>Pipistrellus abramus</th>
<th>Rhinolophus sinicus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>Range</td>
<td>n</td>
</tr>
<tr>
<td>Head-body length</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Tail length</td>
<td>7.1</td>
<td>6.4–7.6</td>
</tr>
<tr>
<td>Foot</td>
<td>11.9</td>
<td>10.8–13.0</td>
</tr>
<tr>
<td>Forearm</td>
<td>32.65</td>
<td>31.4–34.4</td>
</tr>
<tr>
<td>Ear</td>
<td>12.4</td>
<td>12.1–13.2</td>
</tr>
<tr>
<td>Greatest length of skull</td>
<td>12.4</td>
<td>11.4–12.8</td>
</tr>
<tr>
<td>Condyle-basal length</td>
<td>12.2</td>
<td>11.4–12.8</td>
</tr>
<tr>
<td>Condyle-canine length</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Zygomatic breadth</td>
<td>8.2</td>
<td>8.2</td>
</tr>
<tr>
<td>Breadth of braincase</td>
<td>6.6</td>
<td>6.5–6.8</td>
</tr>
<tr>
<td>Interorbital constriction</td>
<td>3.95</td>
<td>3.8–4.1</td>
</tr>
<tr>
<td>Postorbital constriction</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Mandal bone</td>
<td>9.4</td>
<td>8.6–10.0</td>
</tr>
<tr>
<td>Maxillary tooth row</td>
<td>4.5</td>
<td>4.2–4.9</td>
</tr>
<tr>
<td>Mandibular tooth row</td>
<td>4.9</td>
<td>4.6–5.3</td>
</tr>
<tr>
<td>Posterior palatal width</td>
<td>5.5</td>
<td>5.0–6.0</td>
</tr>
</tbody>
</table>

*Recorded as Rhinolophus rouxi sinicus by Bates and Harrison.*
to *P. savi* (Bonaparte, 1837) that was
earlier synonymized to the latter species
by Bates and Harrison.

The need to update the existing infor-
mation on bats of the Indian subcon-
tinent has been felt since the work of
Bates and Harrison, as the authors inad-
vertently missed inclusion of Japanese
pipistrelle *P. abramus* Temminck, 1840
[Microchiroptera: Vespertilionidae] in their
work. Also important was to review the
status of *Rhinolophus rousci sinicus* [Micro-
chiroptera: Rhinolophidae] in the light of the
recent work carried out by Nikky
Thomas of Harrison Zoological Museum
(Bates, P. J. J., pers. commun.).

Temminck[12] based on a specimen from
Nagasaki in Kyushu, Japan gave the first
taxonomic reference of *P. abramus.*
Although reported earlier to be present in
India[13],[14], the first authentic report of its
occurrence is based on specimens from
two localities in Arunachal Pradesh[15] that
are present in the collection of Zoological
Survey of India, Kolkata[1]. They were
identified to be *P. abramus* by Hill and
Harrison[16], though the earlier collector[17]
identified it as a ‘Common Indian Pipi-
strelle’. Further studies on specimens
present in the National Zoological Collec-
tion of India (Zoological Survey of
India, Kolkata) yielded two more records
of this species from the Indian subconti-
nent—one from Uttar Pradesh [1 female,
Allahabad, collected by J. Cockburn, 19
March 1977; misidentified as *Pipistrellus
maurus* (= *savi*)], and another from
northern Myanmar [1 female, Namkam,
Northern Shan State, collected by R. B.
S. Swell, 25 November 1926][18]. Extern-
al, cranial and dental measurements for this
species on record are given in Table 2.

Nikky Thomas’ work on the rhino-
lodophils of Africa and Asia elevates the
status of *R. r. sinicus* (subspecies) to
*R. sinicus* (Bates, P. J. J., pers. com-
mun.). Andersen[19] based on specimen
from Chinteh in Anhui, China made the
first taxonomic reference to *R. r. sinicus.*

Within India, *R. sinicus* (formerly a sub-
species) has been reported from the foot-
hills of the Himalayas and north-east
India, including Nagaland, Arunachal
Pradesh and Meghalaya[20]. External,
cranial and dental measurements for this
species on record are given in Table 2.

Thus with the addition of these two
species, namely *P. abramus* and *R. sinicus*,
the chiropteran diversity in the Indian
subcontinent is presently represen-
ted by 121 species belonging to 37
genera and 8 families, with 112 species
belonging to 33 genera and 82 families
within Indian limits.

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