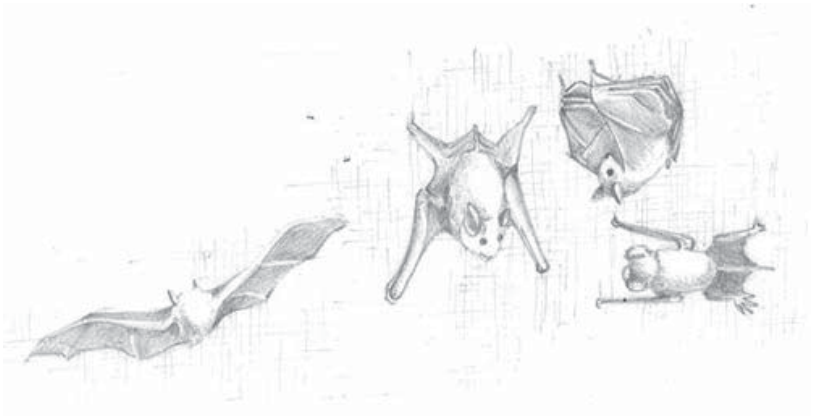
Summary of the *Status of South Asian Chiroptera*

Compiled by Sally Walker and Sanjay Molur

Illustrations by Arnab Roy

Extracted from Status of South Asian Chiroptera:
Conservation Assessment and Management Plan (C.A.M.P.) Workshop Report, 2002



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Credits

The workshop was facilitated and coordinated by the IUCN SSC Conservation Breeding Specialist Group's regional network for South Asia (CBSG, South Asia).

The workshop was endorsed by the IUCN SSC Chiroptera Specialist Group

Other organizers and collaborators were the:
Chiroptera Conservation and Information Network of South Asia (CCINSA),
Department of Animal Behaviour & Physiology, Madurai Kamaraj University,
Zoo Outreach Organisation (ZOO), and
Wildlife Information & Liaison Development Society (WILD).

The workshop was sponsored by Chester Zoo/North of England Zoological Society, Bat Conservation International, Columbus Zoo Conservation Fund and Metro-Toronto Zoo.

The South Asian Chiroptera Education Programme, of which this summary is a part, is sponsored by Chester Zoo/North of England Zoological Society, Bat Conservation International, Columbus Zoo Conservation Fund, and Flora and Fauna International.

Illustrations by Arnab Roy.

Inauguration of Bat C.A.M.P. Tony Hutson Co-Chair IUCN SSC Chiroptera Specialist Group speaking, seated are Sally Walker, Administrative Chair, CCINSA and J.C. Daniel, Honorary Secretary, Bombay Natural History Society and Paul Bates, Harrison Zoological Museum, author of *Bats of the Indian Subcontinent.*

Participants from six countries take a break from their 12 to 14 hour work-days for a group photograph at the South Asian Regional Chiroptera Conservation Assessment and Management Plan (C.A.M.P.) Workshop.

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Conservation Assessment and Management Plan (C.A.M.P.) Workshop for Chiroptera of South Asia

Executive Summary

A Conservation Assessment and Management Plan (C.A.M.P.) Workshop for South Asian Chiroptera assessed a total of 120 of the 123 species of bats occurring in South Asia according to the 2001 IUCN Red List Criteria and made conservation, research and management recommendations on the basis of the assessments. The five-day workshop was conducted from 21-25 January 2002 at the Department of Animal Behaviour and Physiology, School of Biological Sciences, Madurai Kamaraj University, Madurai. A total of 43 bat experts including currently active field biologists from 25 scientific institutions from Nepal, Sri Lanka, India, Myanmar, U.K. and U.S.A. participated in the workshop.

The workshop was facilitated and coordinated by the IUCN SSC Conservation Breeding Specialist Group's regional network for South Asia (CBSG, South Asia). The IUCN/SSC Chiroptera Specialist Group was represented by its Co-Chair, Tony Hutson (at dias in photograph). Other organizers and collaborators were the Chiroptera Conservation and Information Network of South Asia (CCINSA), Department of Animal Behaviour & Physiology, Madurai Kamaraj University, Zoo Outreach Organisation (ZOO), and Wildlife Information & Liaison Development Society (WILD). The workshop was sponsored by Chester Zoo/North of England Zoological Society, Bat Conservation International, Columbus Zoo Conservation Fund and Metro-Toronto Zoo.

The workshop was also a five-year review of an earlier C.A.M.P. for Mammals of India conducted in 1997 at the Centre for Ecological Sciences, Bangalore, under the auspices of the Biodiversity Conservation Prioritisation Project (BCPP) for India. The current exercise extended its mandate to the political unit of South Asia. The review aimed to rectify the 50% Data Deficient species that characterized the 1997 assessments of Indian bats by increasing the number of chiroptera specialists participating. For this a network of chiroptera field biologists was formed and provided with information and a series of tasks, which helped in bringing together biologists and data for the workshop.

The workshop was a C.A.M.P. process and used its unique combination of objective facilitation, human social dynamics, careful selection of participants, extensive preparation, ground rules, and the IUCN Red List criteria to cover and collect a very large amount of information about Chiroptera of South Asia in a single meeting. The C.A.M.P. Process and IUCN Red List Criteria and Categories are interesting in itself and have been described in sidebars throughout this Report.

The Workshop

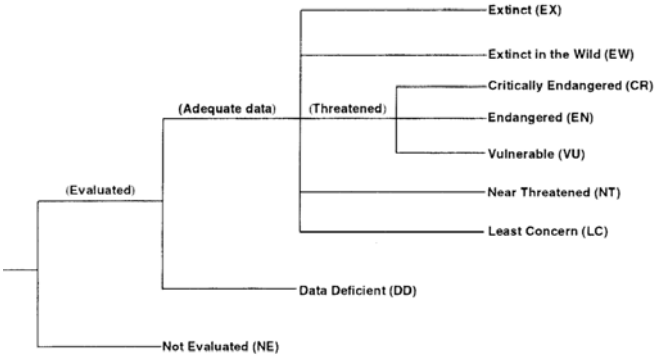
The Order Chiroptera contains 1,001 species of bats globally, which are the only volant (flying) mammals. Bats are sub-categorized as Megachiroptera (fruit bats) and Microchiroptera (insectivorous bats), on the basis of their specialization in feeding habits and morphological adaptations. Chiroptera is the second largest mammal group.

Bats are not popular mammals. They are viewed with fear and revulsion for such habits as poaching ripe fruits from orchards and defecating on public pathways. Conflict with fruit farmers provoked the Indian government to list fruit bats as "vermin" in 1972 in the Indian Wildlife (Protection) Act, which persists even today.
In other South Asian countries bats are given no protection, or are listed negatively, e.g. being specifically exempted from protective legislation! A strong motivation for organizing and conducting the C.A.M.P. workshop was to collect information for use in generating support for basic legal protection of

The 2001 IUCN Red List Criteria (Version 3.1)

The C.A.M.P. workshop process employs the IUCN Red List Criteria as a tool in assessing species status in a group of taxa. The structure of the categories includes extinct, threatened, non-threatened, data deficient and not evaluated sections. In the last decade IUCN has improved the method of assessment of species by incorporating numerical values attached to the different criteria for threat categories. The 2001version of the Red List threatened categories are derived through a set of 5 criteria (population reduction, restricted distribution, continuing decline and fluctuation; restricted population and probability of extinction) based on which the threatened category is assigned. The term "threatened" according to the 2001 IUCN Red List Criteria means Critically Endangered, Endangered or Vulnerable.

Structure of the 2001 IUCN Categories



Status of bats which are endemic to South Asia

Critically Endangered
Murina grisea Peters, 1872 (India only)

Endangered
Hipposideros durgadasi Khajuria, 1970 (India only)
Hipposideros hypophyllus Kock & Bhat, 1994 (India only)
Latidens salimalii Thonglongya, 1972 (India only)
Pteropus faunulus Miller, 1902 (India only)

Vulnerable
Myotis sicarius Thomas, 1915 (India, Nepal)
Rhinolophus cognatus Andersen, 1906 (India only)
Rhinolophus ferrumequinum Schreber, 1774 (India only)
Rhinolophus mitratus Blyth, 1844 (India only)

Near Threatened
Rhinolophus beddomei Andersen, 1905 (India, Sri Lanka)
Scotoecus pallidus (Dobson, 1876) (India, Pakistan)

Least Concern
Hipposideros lankadiva Kelaart, 1850 (Bangladesh, India, Sri Lanka)
Hipposideros speoris (Schneider, 1800) (India, Sri Lanka)
Pipistrellus dormeri (Dobson, 1875) (Bangladesh, Bhutan, India, Pakistan)
Taphozous perforatus E. Goeffroy, 1818 (India, Pakistan)

Data Deficient
Eptesicus tatei Ellerman and Morrison-Scott, 1951 (India only)
Myotis csorbai Topal, 1997 (Nepal only)

these biotically useful animals. The role of bats in regeneration of forests, dispersing seeds and pollen and in consumption of harmful insects has been well documented in scientific papers from around the world. Unfortunately, such ecological studies are sparse in South Asia and the lack of this information was noted at the workshop.

South Asian Chiroptera number 123 species with about 139 valid subspecies designated within. The C.A.M.P. assessment was conducted only at the species level. Chiroptera species constitute about one third of the mammalian diversity of the (political) region.

Status of South Asian Chiroptera
The final assessment figures are given numerically in the Table below :

Status of Chiroptera of South Asia – C.A.M.P. 2002

Category	Endemic	Not endemic	Total
Critically Endangered CR	1	1	2
Endangered EN	4	5	9
Vulnerable VU	4	16	20
Near Threatened NT	2	30	32
Least Concern LC	4	45	49
Data Deficient DD	2	6	8
Not Evaluated NE	0	3	3
Total	17	106	123

Seventeen species of bats are endemic to South Asia. Only 8 of the 123 species of South Asian Chiroptera assessed in the C.A.M.P. workshop have been categorized as Data Deficient, a high contrast to 52 out of 102 Indian species, which were assessed at the 1997 Mammal C.A.M.P. workshop.

Threats to bats include human interference leading to habitat loss, loss of habitat quality, deforestation, direct human interference both in forest areas and in human settlements where bats have colonized. Although 40% of Chiroptera were assessed and categorized as Least Concern there is yet reason for vigilance even for these species. The assessment was conducted at the species level only, which did not include at least 139 subspecies, some of them highly restricted to small areas such as Andaman & Nicobar Islands and Sri Lanka. These subspecies and even individual populations of species may be under tremendous pressure leading to loss of biodiversity and resulting ecological impact.

Recommendations
Research recommendations confirmed that bats are one of the least studied mammalian groups in the region. Information for many species is based only on museum or literature references, with no recent population or distributional information. Therefore, chiroptera surveys make up the primary research recommendation for nearly all bats (120 species). Ecological studies were also very strongly recommended for better understanding of the status and economic value of species as well as to provide justification for upgrading bats in national legislation. Other research recommendations include life history studies, limiting factor research, taxonomic studies, genetic studies, and population and habitat viability analysis.

Management recommendations focused on the need for periodic monitoring to follow surveys, the lack of which has hindered the understanding of population structure and dynamics of bats of the region. Other recommendations included habitat management and public awareness. Habitat management is crucial

from not only conserving roost areas such as caves, trees, old buildings, temples and wells, but also in conserving its sources of food, be it fruits or insects. Education should form a part of management as man is the only genuine threat to bats.

Field surveys, monitoring and conservation priorities were discussed by the working group. The group recommended surveys in unknown or unsurveyed localities, surveys of all the 8 Data Deficient species and resurveys in some areas where bats seemed to have disappeared. Modern scientific field techniques for field studies should be utilized with conservation as the first priority of the studies. Training was recommended for this as well as for identification of bat species so that monitoring is effective. In regard to monitoring, bats should be included in association with routine wildlife monitoring as well as in Environmental Impact Assessment (including effect of pesticides). Threatened species should be prioritised so that their population trends can be ascertained. Study and documentation of pollination and seed dispersal by bats in different ecosystems, would help improve the image of bats. For captive management, two Indian endemic bats were recommended for captive breeding programmes, *Hipposideros durgadasi* (Khajuria, 1970) and *Latidens salimalii* Thonglongya, 1972. Forty species were recommended for captive management for education and public awareness.

Legislation and policy issues included a priority recommendation as the removal of Megachiroptera or fruit bats from Schedule V (Vermin) of the Indian Wildlife (Protection) Act, 1972 with legislation to extend to other species of Chiroptera. Over time, legislation and forest management plans and guidelines should include control measures for disturbance, selling, bartering whole or parts of bats, protection of key roosting sites and important habitats of bats, particularly of threatened and endemic species. Migratory bat species should be identified and appropriate international agreement drafted.

Bat taxonomy was discussed by working group members with particular focus on rectifying the ever growing lacunae in qualified bat taxonomists, coordinating access to collections in the region, capacity building and development of taxonomic keys for easier identification.

A temple bats working group recommended simple but effective methods to promote the need for protecting bats in temples and tourism sites. The group recommended that when the need for disturbing bats in tourism sites such as caves and temples arises, the cave authority and tourism authority should investigate and arrange alternate habitat for bats.

Education working group members discussed a strategy for tackling the negative attitudes towards bats which consisted of a variety of educational activities, items and projects aimed at audiences of different ages and in different strata of society.

During a session devoted to personal commitments there were many pledges to conduct educational and awareness activities for all levels of people, to start bat clubs, and to conduct a variety of research projects. Some of the projects included to study Nepal and Myanmar cave bats, pollination and seed dispersal in a forest ecosystem; to coordinate the import of bat detectors; develop a model for a bat box appropriate for South Asian environment. Other commitments included working against illegal trade of bats, adopting of orphaned bats, mapping of bats in South Asia, working for upgradation of legislation, making available the Bombay Natural History Society collections for study and preparation of bat education materials for use by all participants and zoos.

The C.A.M.P. Process

The Conservation Assessment and Management Plan (C.A.M.P.) Process was developed by the IUCN SSC Conservation Breeding Specialist Group (CBSG) initially to assist zoos to prioritise species for conservation breeding.

Now C.A.M.P.s are tools for other uses as well, such as for assessing species for IUCN's Red List of Threatened Animals and also for national biodiversity strategic activities.

A C.A.M.P. workshop brings together a variety of professional wildlife managers, biologists, representatives of the academic community or private sector, researchers, government officials, zoo managers, etc. We call these people "stakeholders" because their job concerns the vital issues which come up in such a workshop.

The "stakeholders" contribute several types of information which is used by the workshop to evaluate the current status of species, populations and habitats and make recommendations for specific conservation-oriented research, management and public education.

C.A.M.P.s are run according to a philosophy of sharing information, resolving conflict, putting conservation of species first and achieving consensus to forward conservation action. There is a set of Groundrules which people commit to follow so that the workshop runs efficiently.

C.A.M.P.s are very different and exciting kinds of workshops. Read more about different parts of a C.A.M.P. in these sidebars throughout this book.

IUCN
The World Conservation Union

List of South Asian Chiroptera assessed in the C.A.M.P. Workshop with IUCN categories and criteria

Areilulus circumdatus (Temminck,1840) - LC
Asellia tridens (Geoffroy,E.,1813) - NE
Barbastella leucomelas (Cretzschmar,1830/31) - NT
Coelops frithii Blyth,1848 - NT
Cynopterus brachyotis (Muller,1838) - LC
Cynopterus sphinx (Vahl,1797) - LC
Eonycteris spelaea (Dobson,1871) - LC
Eptesicus bottae (Peters,1869) - DD
Eptesicus gobiensis Bobrinskii,1926 - DD
Eptesicus nasutus (Dobson,1877) - DD
Eptesicus pachyotis (Dobson,1871) - DD
Eptesicus serotinus (Schreber,1774) - NT
Eptesicus tatei * Ellerman and Morrison-Scott,1951 - DD
Harpiocephalus harpia (Temminck,1840) - NT
Harpiocephalus mordax Thomas,1923 - DD
Hesperoptenus tickelli (Blyth,1851) - LC
Hipposideros armiger (Hodgson,1835) - LC
Hipposideros ater Templeton,1848 - LC
Hipposideros cineraceus Blyth,1853 - NT
Hipposideros diadema (E. Geoffroy,1813) - VU - D2
Hipposideros durgadasi * (Khajuria,1970) - EN - D
Hipposideros fulvus Gray,1838 - LC
Hipposideros galeritus Cantor,1846 - NT
Hipposideros hypophyllus * Kock & Bhat,1994 - EN - B1ab(ii,iii) + 2ab(ii,iii)
Hipposideros lankadiva * Kelaart,1850 - LC
Hipposideros larvatus (Horsfield,1823) - NT
Hipposideros pomona Andersen,1918 - LC
Hipposideros speoris * (Schneider,1800) - LC
Ia io Thomas,1902 - EN - B1ab(iii)+2ab(iii)
Kerivoula hardwickii (Horsfield,1824) - LC
Kerivoula papillosa Temminck,1840 - NT
Kerivoula picta (Pallas,1767) - LC
Latidens salimalii * Thonglongya,1972 - EN -B1ab(iii)+2ab(iii)
Macroglossus sobrinus (K. Andersen,1911) - NT
Megaderma lyra E. Geoffroy,1810 - LC
Megaderma spasma (Linnaeus,1758) - LC
Megaerops niphanae Yenbutra & Felten,1983 - NT
Miniopterus pusillus Dobson,1876 - VU - B2ab(iii,iv)
Miniopterus schreibersii (Kuhl,1819) - LC
Murina aurata (Milne-Edwards,1872) - NT
Murina cyclotis Dobson,1872 - LC
Murina grisea * Peters,1872 - CR - B1ab(iii)
Murina huttonii (Peters,1872) - LC
Murina leucogaster (Milne-Edwards,1872) - NT
Murina tubinaris (Scully,1881) - NT
Myotis annectans (Dobson,1871) - VU - D2
Myotis blythii (Tomes,1857) - VU - D1
Myotis csorbai * Topal,1997 - DD
Myotis daubentonii (Kuhl,1819) - EN - B1ab(iii)+2ab(iii)
Myotis formosus (Hodgson,1835) - LC
Myotis hasseltii (Temminck,1840) - NT
Myotis horsfieldii (Temminck,1840) - LC
Myotis longipes (Dobson,1873) - NT
Myotis montivagus (Dobson,1874) - VU - B2ab(iii)
Myotis muricola (Gray,1846) - LC
Myotis mystacinus (Kuhl,1819) - VU - D1
Myotis sicarius * Thomas,1915 - VU - B2ab(iii)
Myotis siligorensis (Horsfield,1855) - NT
Nyctalus leisleri (Kuhl,1819) - EN - D
Nyctalus montanus (Barrett-Hamilton,1906) - NT
Nyctalus noctula (Schreber,1774) - LC
Otomops wroughtoni (Thomas,1913) - CR - B2ab(iii)
Otonycteris hemprichii Peters,1859 - NT
Philetor brachypterus (Temminck,1840)- VU -B1ab(iii)+2ab(iii)
Pipistrellus abramus (Temminck,1840) - DD
Pipistrellus affinis (Dobson,1871) - NT
Pipistrellus cadornae Thomas,1916 - NT
Pipistrellus ceylonicus (Kelaart,1852) - LC
Pipistrellus coromandra (Gray,1838) - LC
Pipistrellus dormeri * (Dobson,1875) - LC
*Pipistrellus javanicus (*Gray,1838) - LC
Pipistrellus kuhlii (Kuhl,1819) - LC
Pipistrellus paterculus Thomas,1915 - LC
Pipistrellus pipistrellus (Schreber,1774) - LC
Pipistrellus savii (Bonaparte,1837) - VU - B1ab(iii)
Pipistrellus tenuis (Temminck,1840) - LC
Plecotus auritus (Linnaeus,1758) - NT
Plecotus austriacus (Fischer,1829) - NT
Pteropus faunulus * Miller,1902 - EN - B1ab(iii)+2ab(iii)
Pteropus giganteus Brunnich,1782 - LC
Pteropus hypomelanus Temminck,1853 - EN - B1ab(iii) + 2ab(iii)
Pteropus melanotus Blyth,1863 - VU - B1ab(iii),2ab(iii)
Pteropus vampyrus Linnaeus,1758 - EN - B1ab(iii)+2ab(iii)
Rhinolophus affinis Horsfield,1823 - LC
Rhinolophus beddomei * Andersen,1905 - NT
Rhinolophus blasii Peters,1866 - NT
*Rhinolophus cognatus** Andersen,1906 - VU - D2
*Rhinolophus ferrumequinum** (Schreber,1774) VU - B2ab(iii)
Rhinolophus hipposideros (Bechstein,1800) - VU - B1ab(iii)+2ab(iii)
Rhinolophus lepidus Blyth,1844 - LC
Rhinolophus luctus Temminck,1835 - NT
Rhinolophus macrotis Blyth,1844 - NT
Rhinolophus mitratus * Blyth,1844 - VU - D2
Rhinolophus pearsonii Horsfield,1851 - LC
Rhinolophus pusillus Temminck,1834 - LC
Rhinolophus rouxii Temminck,1835 - NT
Rhinolophus sinicus (Andersen,1905) - LC
Rhinolophus subbadius Blyth,1844 - VU - B2ab(iii)
Rhinolophus trifoliatus Temminck,1834 - VU - B1ab(iii)+2ab(iii)
Rhinolophus yunanensis Dobson,1872 - VU - B1ab(iii)+2ab(iii)
Rhinopoma hardwickii Gray,1831 - LC
Rhinopoma microphyllum (Brünnich,1782) - LC
Rhinopoma muscatellum Thomas,1903 - NT
Rousettus aegyptiacus (E. Geoffroy,1810) - VU - B1ab(iii)
Rousettus leschenaulti (Desmarest,1820) - LC
Scotoecus pallidus * (Dobson,1876) - NT
Scotomanes ornatus (Blyth,1851) - LC
Scotophilus heathii Horsfield,1831 - LC
Scotophilus kuhlii Leach,1821 - LC
Sphaerias blanfordi (Thomas,1891) - NT
Tadarida aegyptiaca (E. Geoffroy,1818) - LC
Tadarida plicata (Buchannan,1800) - LC
Tadarida teniotis (Rafinesque,1814) - NE
Taphozous longimanus Hardwicke,1825 - LC
Taphozous melanopogon Temminck,1841 - LC
Taphozous nudiventris Cretzschmer,1830-31 - LC
*Taphozous perforatus** E. Geoffroy,1818 - LC
Taphozous saccolaimus Temminck,1838 - LC
Taphozous theobaldi Dobson,1872 - VU - A2a
Triaenops persicus Dobson,1871 - VU - D2
Tylonycteris pachypus (Temminck,1840) - NT
Tylonycteris robustula Thomas,1915 - NE
Vespertilio murinus Linnaeus,1758 - NT

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* Endemic to South Asia
Non-endemic assessment for South Asian region only

Conservation Assessment and Management Plan (C.A.M.P.) Workshop for Chiroptera of South Asia -- REPORT

The Order Chiroptera contains 1,001 species of bats, which are the only volant mammals. Bats are sub-categorized as Megachiroptera and Microchiroptera, on the basis of their specialization in feeding habits and morphological adaptations. While Megachiroptera are predominantly fruit eaters, Microchiroptera, which form the majority of bat species globally, feed on insects. There are 834 species of insectivorous bats in the world and 167 fruit bats. Among the world's mammals, bats make up 20% of the total number. Bats are found all over the world except the Arctic, the Antarctic and some islands (Mickleburgh *et al*., 2002)

Almost everywhere they are found, they are viewed with mild disdain to revulsion due to a combination of fictitious information and their natural habits. They have found a place in almost all folklore -- not for the right reasons -- but to depict evil, bad omen, spirits of the night, vampires, etc. Even in recent times farmers frown upon fruit bats for inflicting heavy losses to their crops. Landlords, homeowners and authorities complain of bats dirtying houses, buildings, places of worship, wells and other man-made structures. The common perception of bats is negative, particularly in Asian countries, where they have had few champions such as Bat Conservation International in USA or Bat Conservation Trust in the United Kingdom. This has led to many ignorant and shortsighted policies such as the Indian legislation, which has categorised fruit bats as vermin for three decades. Slowly, this is beginning to change.

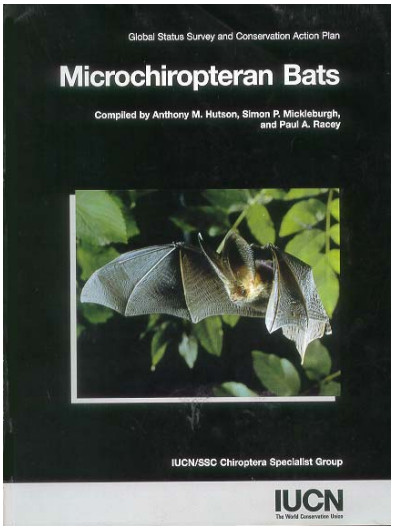
In South East Asia, the importance of the positive role of bats in the ecosystem was recognized in 1998, by the Malaysian government whose Parliament of the state of Sarawak in Borneo passed a Wild Life Protection Ordinance which includes protection for all bats. Domestic possession of bats or any part or derivative is legal only when held in accordance with the terms and conditions of a license issued under the 1998 law. In 1999, another law provided that a license is required for the sale and use of all mistnets, with a penalty of both imprisonment and fine for sale and/or use of mistnets in the country (Gumal & Racey, 1999).

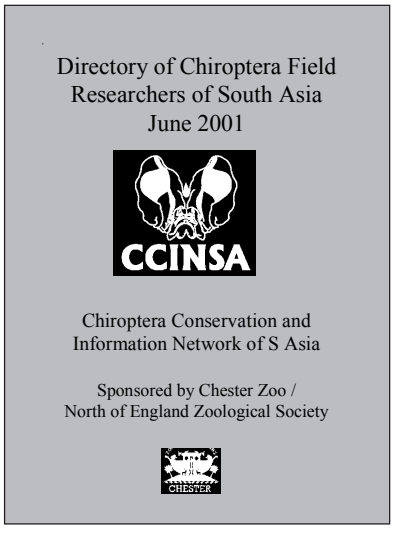
In India, on 30 September 2002, the Central Government listed two species of bats (*Otomops wroughtonii*, Wroughton's Free-tailed Bat, and *Latidens salimalii,* Salim Ali's Fruit Bat) on Schedule I of the Wildlife (Protection) Act, 1972, according the highest degree of protection to these threatened species. No other of the 112 species of Indian bats are protected; in fact, the remaining twelve fruit bats are listed still under Schedule V where they are defined as "Vermin" and can be captured or killed with impunity.

Bats play a crucial role in the ecosystem, a very simplistic example being fruit bats' task as flower pollinators and in seed dispersal, and that of insectivorous bats in controlling much of the insect pest population. Although fruit bats damage a small percentage of agricultural crops, their role in forest regeneration more than compensates this loss in the long term from the perspective of the greater good.

Research on insect consumption by bats in other parts of the world has shown that *Tadarida brasiliensis* of Mexico can consume more than half its weight in insects nightly with colonies estimated to consume 10 tonnes per million bats on a nightly basis. Similar estimates for other insectivorous species are known from Borneo where one cave population consumes 7500 kg per night. *Myotis lucifugus*, the little brown bat, which can eat up to its own body weight in insects per night, much of which is likely to be mosquitos (S. Mistry, *in litt*.). Some insectivorous bats also eat small mammals. Y.P. Sinha has described the Indian False Vampire (*Megaderma lyra*) as a "good friend of farmers" in the state of Bihar. Colonies of this species, ranging from 25 to 240 individuals, consume rats and mice, which destroy different grains stored in bags (Sinha, 1986, 1994) and are rewarded with protection by farmers, who call it the "goddess Laxmi" (Y.P. Sinha, *in litt*., 1 Nov 2002).

Bats are not recognised for the many useful and essential things they do for ecosystems and human survival. Fruit bats are major pollinators of plants and also dispersers of seeds which have been noted to have a very high rate of germination. Insect bats consume literally millions of insects which would otherwise destroy valuable crops or spread diseases. Yet bats are commonly thought to destroy fruit crops and spread rabies, which is not correct.





Status surveys of bats

The World Conservation Union (IUCN) Species Survival Commission (SSC) Chiroptera Specialist Group (CSG) has been active in promoting research, conservation and conservation management of bats around the world. One of CSG's important contributions in conservation of bats is the publication of Action Plans -- the Old World Fruit Bats Action Plan (Mickleburgh *et al*., 1992) and the Microchiroptera Action Plan (Hutson *et al*., 2001). These compilations highlight the conservation status of bats globally and focus on the need for conservation action plans at the national and local levels. National and International Red Data Books have included some threatened bat species. A number of publications including reports, newsletters and peer-reviewed articles have indicated the status of bats in the wild, a recent one being that published in *Oryx* (Mickleburgh *et al*., 2002).

In India the first list of threatened bats was compiled after assessing the status of 102 Indian bats at the 1997 Conservation Assessment and Management Plan (C.A.M.P.) workshop for Indian mammals (Molur *et al*., 1998). Bates and Harrison's (1997) book entitled *"Bats of the Indian Subcontinent"* was published the same year as the mammal C.A.M.P. in India, but unfortunately was not available in time for the workshop. An initial assessment based on 1994 IUCN Red List Criteria was attempted for all Indian bats. A total of 102 species of endemic and non-endemic bats were assessed, of which 16 were categorized as threatened in India, and 52 species were categorized as Data Deficient. One of the recommendations at the Indian C.A.M.P. was to assess the status of all species after five years, based on new information.

Chiroptera Conservation and Information Network of South Asia (CCINSA)

As a result of the 1997 Mammal C.A.M.P. workshop recommendation for a five-year review and particularly in view of the distressing number of Data Deficient species of bats, a network of Chiroptera specialists and enthusiasts was initiated. The objectives of the network were: to locate bat specialists of the South Asian region and encourage them to compile information on bats for a comprehensive assessment; to promote the ecological importance of bats and to provide training, information and education on bats. The Chiroptera Conservation and Information Network of South Asia (CCINSA) has recorded nearly 100 known bat biologists in the region and could bring 43 of them together for the Chiroptera C.A.M.P., 2002 as opposed to the six which participated in the Mammal C.A.M.P. CCINSA was recognized by the IUCN SSC Chiroptera Specialist Group in 1999 and asked to represent CSG in the region of South Asia. Since its inception CCINSA has actively pursued networking of bat researchers and compiled new information.

As part of the objectives and goals of the network as well as of the IUCN SSC Chiroptera Specialist Group, a C.A.M.P. workshop for Chiroptera was held in early 2002 to assess the status of bats of South Asia. At the end of the 5-day workshop a total of 123 species of bats had been assessed according to the 2001 IUCN Red List Criteria. Conservation research and management recommendations were also made species-wise after the assessments were completed. The workshop was facilitated and coordinated by the Conservation Breeding Specialist Group regional network for South Asia (CBSG, South Asia). Anthony Hutson, Co-chair of the IUCN/SSC Chiroptera Specialist Group represented CSG and lent support to the South Asian regional network of CSG formed in association with CCINSA.

1997 Recommendation carried out with CAMP for South Asian Bats

The Chiroptera Conservation and Information Network of South Asia (CCINSA), the Zoo Outreach Organisation (ZOO), CBSG - South Asia, Wildlife Information Liaison Development Society (WILD) and the Chiroptera Specialist Group of South Asia (CSG-SA) organized the workshop in collaboration with the IUCN/SSC Chiroptera Specialist Group and the IUCN/SSC Conservation Breeding Specialist Group. Madurai Kamaraj University, School of Biological Sciences, Department of Animal Behaviour & Physiology was the host and co-organizer. Chester Zoo/North of England Zoological Society, Bat Conservation International, Columbus Zoo Conservation Fund and Metro-Toronto Zoo sponsored the exercise.

The Workshop method
Initial discussions with some potential participants and literature survey indicated the near impossibility of assessing all bat taxa of South Asia, since they numbered upwards of 250. It was decided at the workshop, after much deliberation, that assessments would be made only at the species level. In all, 120 of the 123 species were assessed. Assessments were derived for the political region of South Asia only and, as such, did not include Myanmar or Afghanistan for widely distributed species, although Afghanistan and northern Myanmar are part of the biogeographical region.

South Asian bat species constitute about one third of the mammalian diversity of the (political) region. They belong to a total of eight (8) families, of which one is a megachiropteran (Old World fruit bat) and seven are microchiropteran (insectivorous bat) families. India constitutes a major landmass of South Asia (ca.70%) and for that reason has the most bats - 114 species (92.7%), while Bangladesh has 34 species (27.6%), Bhutan 9 species (7.3%), Maldives 2 species (1.6%), Nepal 50 species (40.6%), Pakistan 45 species (36.6%) and Sri Lanka 32 species (26%). The two species of bats in Maldives are Megachiroptera. Although subspecies were not considered, it is important to note the number of island populations of bats in the region, which is 45.5% (56 species): Andaman and Nicobar Islands (part of India) have 22 bat taxa, Maldives has 2 taxa and Sri Lanka has 32 taxa. For the purposes of assessing the status at the species level, insular populations were considered under the higher taxonomic level.

The Table on the following pages is a summary of the status of South Asian bats in different countries. After the initial assessment of the status in South Asia, national status for every country was derived based on the IUCN Red List Criteria Regional Guidelines (Gärdenfors *et al*., 2001). This process of national assessments has its advantage for national conservation action and management planning. For most non-endemic species in India, the national status is the same as the status of the species in South Asia. This is because of the vastness of the area, which in most cases encompasses a majority of the species distribution in the region. In other countries like Bhutan, Nepal and Bangladesh, which have a relatively smaller area, the status is different based on the threats and the area occupied, along with the status of the species in neighbouring India. Since information on bat distribution in Bhutan and Pakistan were not available at the workshop, national status for some species in these two countries are Data Deficient.

Regional assessments
Regional assessments have their own importance compared to global assessments due to the following advantages:
a. Smaller area of assessment resulting in greater accuracy
b. More participation by local field biologists in the assessment process
c. Assessments based on more recent field information
d. Implications for regional action plans and management plans
e. Bottom-up approach to assessments, i.e. regional/national information feeding into global assessments.
f. Post assessment follow-up actions such as surveys, monitoring and education
g. Information is likely to be used in regional or national Red Data books and national biodiversity strategies
h. Lobbying for conservation efforts with local governments can be done more effectively
i. Sustained effort in gathering field information and networking

Regional assessments have their own importance compared to global assessments

National Status of Bats in South Asia

Scientific name	SA	Ban	Bhu	India	Mald	Nep	Pak	SL
Endemic bats of South Asia								
Eptesicus tatei Ellerman and Morrison-Scott, 1951	DD	-	-	DD	-	-	-	-
Hipposideros durgadasi Khajuria, 1970	EN	-	-	EN	-	-	-	-
Hipposideros hypophyllus Kock & Bhat, 1994	EN	-	-	EN	-	-	-	-
Hipposideros lankadiva Kelaart, 1850	LC	LC	-	LC	-	-	-	LC
Hipposideros speoris (Schneider, 1800)	LC	-	-	LC	-	-	-	LC
Latidens salimalii Thonglongya, 1972	EN	-	-	EN	-	-	-	-
Murina grisea Peters, 1872	CR	-	-	CR	-	-	-	-
Myotis csorbai Topal, 1997	DD	-	-		-	DD	-	-
Myotis sicarius Thomas, 1915	VU	-	-	EN	-	VU	-	-
Pipistrellus dormeri (Dobson, 1875)	LC	LC	DD	LC	-	-	NT	-
Pteropus faunulus Miller, 1902	EN	-	-	EN	-	-	-	-
Rhinolophus beddomei Andersen, 1905	NT	-	-	NT	-	-	-	NT
Rhinolophus cognatus Andersen, 1906	VU	-	-	VU	-	-	-	-
Rhinolophus ferrumequinum Schreber, 1774	VU	-	-	VU	-	-	-	-
Rhinolophus mitratus Blyth, 1844	VU	-	-	VU	-	-	-	-
Scotoecus pallidus (Dobson, 1876)	NT	-	-	NT	-	-	NT	-
Taphozous perforatus E. Goeffroy, 1818	LC	-	-	LC	-	-	LC	-
Non-endemic bats of South Asia								
Areilulus circumdatus (Temminck, 1840)	LC	-	-	LC	-	NT	-	-
Asellia tridens (Geoffroy, E., 1813)	NE	-	-	-	-	-	NE	-
Barbastella leucomelas (Cretzschmar, 1830/31)	NT	-	-	NT	-	NT	DD	
Coelops frithii Blyth, 1848	NT	NT	-	NT	-	-	-	-
Cynopterus brachyotis (Muller, 1838)	LC	-	-	LC	-	-	-	LC
Cynopterus sphinx (Vahl, 1797)	LC	LC	DD	LC	-	LC	DD	LC
Eonycteris spelaea (Dobson, 1871)	LC	-	-	LC	-	-	-	-
Eptesicus bottae (Peters, 1869)	DD	-	-	-	-	-	DD	-
Eptesicus gobiensis Bobrinskii, 1926	DD	-	-	-	-	DD	DD	-
Eptesicus nasutus (Dobson, 1877)	DD	-	-		-	-	DD	-
Eptesicus pachyotis (Dobson, 1871)	DD	LC	-	DD	-	-	-	-
Eptesicus serotinus (Schreber, 1774)	NT	-	-	NT	-	NT	DD	-
Harpiocephalus harpia (Temminck, 1840)	NT	-	DD	NT	-	-	-	-
Harpiocephalus mordax Temminck, 1840	DD	-	-	DD	-	-	-	-
Hesperoptenus tickelli (Blyth, 1851)	LC	-	DD	LC	-	DD	-	NT
Hipposideros armiger Hodgson, 1835	LC	-	-	LC	-	LC	-	-
Hipposideros ater Templeton, 1848	LC	-	-	LC	-	-	-	LC
Hipposideros cineraceus Blyth, 1853	NT	-	-	NT	-	NT	DD	-
Hipposideros diadema (E. Geoffroy, 1813)	VU	-	-	VU	-	-	-	-
Hipposideros fulvus Gray, 1838	LC	-	-	LC	-	LC	LC	LC
Hipposideros galeritus Cantor, 1846	NT	NT	-	NT	-	-	-	VU
Hipposideros larvatus (Horsfield, 1823)	NT	NT	-	NT	-	-	-	-
Hipposideros pomona Andersen, 1918	LC	DD	-	LC	-	NT	-	-
Ia io Thomas, 1902	EN	-	-	EN	-	CR	-	-
Kerivoula hardwickii (Horsfield, 1824)	LC	-	-	LC	-	-	DD	LC
Kerivoula papillosa Temminck, 1840	NT	NT	-	NT	-	-	-	-
Kerivoula picta (Pallas, 1767)	LC	LC	LC	LC	-	LC	-	LC
Macroglossus sobrinus (K. Andersen, 1911)	NT	-	-	NT	-	-	-	-
Megaderma lyra E. Geoffroy, 1810	LC	LC	-	LC	-	LC	LC	LC
Megaderma spasma Linnaeus, 1758	LC	LC	-	LC	-	-	-	LC
Megaerops niphanae Yenbutra & Felten, 1983	NT	-	-	NT	-	-	-	-
Miniopterus pusillus Dobson, 1876	VU	-	-	VU	-	CR	-	-
Miniopterus schreibersi (Kuhl, 1819)	LC	-	-	LC	-	LC	-	LC
Murina aurata Milne-Edwards, 1872	NT	-	-	NT	-	NT	-	-
Murina cyclotis Dobson, 1872	LC	-	-	LC	-	-	-	LC
Murina huttonii (Peters, 1872)	LC	-	-	LC	-	DD	DD	-
Murina leucogaster Milne-Edwards, 1872	NT	-	-	NT	-	VU	-	-
Murina tubinaris (Scully, 1881)	NT	-	-	NT	-	-	NT	-
Myotis annectans (Dobson, 1871)	VU	-	-	VU	-	-	-	-
Myotis blythii (Tomes, 1857)	VU	-	-	VU	-	VU	DD	-
Myotis daubentonii (Kuhl, 1819)	EN	-	-	EN	-	-	-	-
Myotis formosus (Hodgson, 1835)	LC	LC	-	LC	-	NT	-	-
Myotis hasseltii (Temminck, 1840)	NT	-	-	NT	-	-	-	VU
Myotis horsfeldii (Temminck, 1840)	LC	-	-	LC	-	-	-	-

Scientific name	SA	Ban	Bhu	India	Mal	Nep	Pak	SL
*Myotis lonfipwa (*Dobson, 1873)	NT	-	-	NT	-	NT	-	-
Myotis montivagus (Dobson, 1874)	VU	-	-	VU	-	-	-	-
Myotis muricola (Gray, 1846)	LC	-	-	LC	-	LC	LC	DD
Myotis mystacinus (Kuhl, 1819)	VU	-	-	VU	-	VU	VU	-
Myotis siligorensis (Horsfield, 1855)	NT	-	-	NT	-	NT	-	-
Nyctalus leisleri (Kuhl, 1819)	EN	-	-	EN	-	-	EN	-
Nyctalus montanus (Barrett-Hamilton, 1906)	NT	-	-	NT	-	NT	-	-
Nyctalus noctula (Schreber, 1774)	LC	-	-	LC	-	LC	LC	-
Otomops wroughtoni (Thomas, 1913)	CR	-	-	CR	-	-	-	-
Otonycteris hemprichi Peters, 1859	NT	-	-	NT	-	-	NT	-
Philetor brachypterus (Temminck, 1840)	VU	-	-	EN	-	VU	-	-
Pipistrellus abramus (Temminck, 1840)	DD	-	-	DD	-	-	-	-
Pipistrellus affinis Dobson, 1871	NT	-	-	NT	-	?	-	NT
Pipistrellus cadornae Thomas, 1916	NT	-	-	NT	-	-	-	-
Pipistrellus ceylonicus (Kelaart, 1852)	LC	LC	-	LC	-	-	LC	LC
Pipistrellus coromandra (Gray, 1838)	LC	LC	-	LC	-	LC	-	LC
*Pipistrellus javanicus (*Gray, 1838)	LC	LC	-	LC	-	LC	LC	-
Pipistrellus kuhlii (Kuhl, 1819)	LC	-	-	LC	-	-	LC	-
Pipistrellus paterculus Thomas, 1915	LC	-	-	LC	-	-	-	-
Pipistrellus pipistrellus (Schreber, 1774)	LC	-	-	LC	-	-	LC	-
Pipistrellus savii (Bonaparte, 1837)	VU	EN	-	VU	-	-	-	-
Pipistrellus tenuis (Temminck, 1840)	LC	LC	-	LC	-	LC	LC	LC
Plecotus auritus Linnaeus, 1758	NT	-	-	NT	-	NT	NT	-
Plecotus austriacus (Fischer, 1829)	NT	-	-	NT	-	NT	NT	-
Pteropus giganteus Brunnich, 1782	LC	EN	-	LC	LC	LC	LC	LC
Pteropus hypomelanus Temminck, 1853	EN	-	-	EN	CR	-	-	-
Pteropus melanotus Blyth, 1863	VU	-	-	VU	-	-	-	-
Pteropus vampyrus (Linnaeus, 1758)	EN	-	-	EN	-	-	-	-
Rhinolophus affinis Horsfield, 1823	LC	-	LC	LC	-	LC	-	DD
Rhinolophus blasii Peters, 1866	NT	-	-	-	-	-	NT	-
Rhinolophus hipposideros (Bechstein, 1800)	VU	-	-	VU	-	-	VU	-
Rhinolophus lepidus Blyth, 1844	LC	LC	-	LC	-	NT	NT	-
Rhinolophus luctus Temminck, 1835	NT	NT	-	NT	-	NT	-	-
Rhinolophus macrotis Blyth, 1844	NT	-	-	NT	-	NT	NT	-
Rhinolophus pearsonii Horsfield, 1851	LC	NT	NT	LC	-	LC	-	-
Rhinolophus pusillus Temminck, 1834	LC	-	-	LC	-	LC	-	-
Rhinolophus rouxii Temminck, 1835	NT	-	-	NT	-	NT	-	NT
Rhinolophus sinicus (Andersen, 1905)	LC	-	-	LC	-	LC	-	-
Rhinolophus subbadius Blyth, 1844	VU	VU	-	VU	-	EN	-	-
Rhinolophus trifoliatus Temminck, 1834	VU	-	-	VU	-	-	-	-
Rhinolophus yunanensis Dobson, 1872	VU	-	-	VU	-	-	-	-
Rhinopoma hardwickii Gray, 1831	LC	LC	-	LC	-	-	LC	-
Rhinopoma microphyllum (Brunnich, 1782)	LC	LC	-	LC	-	-	LC	-
Rhinopoma muscatellum Thomas, 1903	NT	-	-	NT	-	-	NT	-
Rousettus aegyptiacus (E. Geoffroy, 1810)	VU	-	-	-	-	-	VU	-
Rousettus leschenaulti (Desmarest, 1820)	LC	LC	NT	LC	-	NT	LC	LC
Scotomanes ornatus (Blyth, 1851)	LC	NT	-	LC	-	NT	-	-
Scotophilus heathii Horsfield, 1831	LC	NT	-	LC	-	LC	LC	LC
Scotophilus kuhlii Leach, 1821	LC	LC	-	LC	-	NT	LC	LC
Sphaerias blanfordi (Thomas, 1891)	NT	-	NT	NT	-	NT	-	-
Tadarida aegyptiaca (E. Geoffroy, 1818)	LC	NT	-	LC	-	-	LC	LC
Tadarida plicata (Buchanan, 1800)	LC	-	-	LC	-	-	-	LC
Tadarida teniotis (Rafinesque, 1814)	NE	-	-	NE	-	-	-	-
Taphozous longimanus Hardwicke, 1825	LC	LC	-	LC	-	DD	-	LC
Taphozous melanopogon Temminck, 1841	LC	LC	-	LC	-	-	-	LC
Taphozous nudiventris Cretzschmer, 1830	LC	-	-	LC	-	-	LC	-
Taphozous saccolaimus Temminck, 1838	LC	LC	-	LC	-	-	-	LC
Taphozous theobaldi Dobson, 1872	VU	-	-	VU	-	-	-	-
Triaenops persicus Dobson, 1871	VU	-	-	-	-	-	VU	-
Tylonycteris pachypus Temminck, 1840	NT	NT	-	NT	-	-	-	
Tylonycteris robustula Thomas, 1915	NE	-	-	NE	-	-	-	-
Vespertilio murinus Linnaeus, 1758	NT	-	-	-	-	-	NT	-
Total	**123**	**34**	**9**	**114**	**2**	**50**	**45**	**32**

Ground Rules for Group Interaction

Everyone participates in discussions and no one dominates

Set aside all special agendas except conserving the taxa under assessment

Assume good intent of all participants. Treat other participants with respect

Stick to the schedule... begin and end promptly

The primary work will be conducted in sub-groups

Facilitators of plenary sessions or working groups can call 'time out' when discussions reach an impasse or stray too far off the topic at hand

Agreements or recommendations are reached by consensus

Plan to complete and review of draft report by the end of the meeting

Flexibility is the key. We adjust our process and schedule as needed to achieve goals.

Keywords and their application in the Bat C.A.M.P. 2002

Endemic species

Seventeen species of bats are endemic to South Asia. One species of microchiroptera, *Otomops wroughtoni* (Wroughton's Free-tailed Bat), which was until recently known to occur in only one cave in Karnataka, has been reported from Cambodia (Walston & Bates, 2002) and from Siju cave in Meghalaya (Thabah & Bates, in prep.). Therefore, the species is no longer endemic to India.

Restricted distribution

Endemic bats in South Asia, as seen above, are all highly restricted in distribution. Although endemics do pose some interest to wildlife biologists, a few (e.g. *Hipposideros durgadasi*) have not been studied systematically after first description. Other endemics from southern India have been better studied, but systematic surveys and monitoring have not been undertaken. There are some changes in categories compared to previous attempts as a result of new information available at the workshop.

Threatened species have been categorized as such due to the restricted distribution within the region. Irrespective of their wide distribution in the world some of the species are threatened within the South Asian region because of limited area of occupancy or extent of occurrence within South Asia. Some of the typical examples of bats with restricted distribution within South Asia are those that occur in northeastern India, Bhutan, Bangladesh, eastern parts of Nepal and Andaman & Nicobar Islands. They are restricted within South Asia because of political boundaries, but their range extends into Myanmar and other countries of Southeast Asia. Twenty-three species of bats that have a restricted distribution in the region with a wider global distribution are threatened in the region, while 11 species of these are threatened at the global level (Hilton-Taylor, 2000).

Range

Restricted distribution was estimated, inferred or calculated based on available information at the workshop. For species with reliable information from recent observations, range (extent of occurrence) and area (of occupancy) were calculated using maps. While it was easier to calculate range for widely distributed species, the area of restricted species was estimated based on the minimum foraging distance a bat flies from its roost site. Although no information on minimum foraging distance is available for any bat species in the South Asian region, some studies have been conducted abroad which suggest the foraging radius for certain species of bats (Tony Hutson at the workshop). This was applied to bats with fragmented populations, and the area of occupancy for each locality was calculated using the formula Area = πr^2. In case of widely distributed species this was not applied since it was assumed that the colonies were close enough to migrate or shift roosts if disturbed. This was also not applied to species with known capability to adapt to changing habitats.

Area of occupancy / extent of occurrence

IUCN defines area of occupancy as critical area needed for a taxon to survive. In the case of bats, in earlier exercises this has been interpreted as the actual area in which a bat roosts. For example, in the case of *Otomops wroughtoni*, area as per IUCN definition and interpretation would mean the area of the cave(s) in which the bat roosts. It was argued at the workshop that the roosting area alone is not enough to sustain a bat colony if its foraging area was destroyed. In the case of *O. wroughtoni*, the cave may be protected but if the proposed dam submerges the surrounding habitat, it is not known whether the bat would be able to find sufficient food under the resulting environmental changes. The area of occupancy in this case was therefore calculated based on a minimum foraging radius.

In case of species with information only from literature or known only from type localities, depending on the information available of its original habitat, area of occupancy was inferred. To be more specific, if a species was known from only one locality and if the type locality was known, area was calculated on the present availability of habitat. If the type locality was at a broad level with no specific habitat

mentioned (e.g. Malabar or Mussoorie), then the area of occupancy and/or extent of occurrence were not estimated.

Locations and Subpopulations
Number of locations and subpopulations were inferred or estimated based on the number of localities. Although IUCN definitions for the two terms are dependent on genetic flow and threats respectively, for want of detailed information on bats, the workshop participants could make a generalization only. The number of localities indicated includes all known, published and unpublished records, irrespective of whether the localities currently have any viable population or not. It was assumed that in every case (unless otherwise known), old published localities were potential habitats for bats and whatever form of degradation to the habitat has occurred in the recent past would be reflected in change in quality of habitat. Decline in number of locations or subpopulations were indicated only if sampling efforts indicated absence of the species in the area.

Habitat loss
Habitat loss was considered one of the major threats to bats. Many commensal species with good adaptation to changing environment and wide distribution were not categorized as threatened. Those species categorized as threatened or near threatened with restricted distribution were assessed as such because of some significant change to their habitat, either in decrease in area or decrease in quality of habitat. Sixty-five species in all were assessed as having a decline in habitat, some more pronounced than others.

Number of mature individuals
Number of mature individuals was indicated for some well-studied species with restricted distribution or inferred from literature. For many widely distributed species, numbers were indicated as being more than 10,000 which falls outside the threshold for restricted populations.

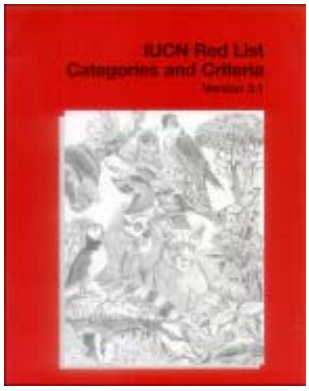
Extreme fluctuation
For want of adequate information the workshop participants did not want to speculate on factors of extreme fluctuation in area, extent, locations and number of mature individuals.

Population fluctuation
Only one species (*Taphozous theobaldi)* was assessed as threatened due to population reduction. Although there was a general consensus about decline in bat numbers for many species, actual rates or range of decline was not mentioned. In most cases habitat loss was correlated to population decline, which however did not meet the threshold values of the decline criterion. In comparison, six species of bats occurring in the region have been assessed as threatened based on population decline at the global level (Hilton-Taylor, 2000).

Small population
Since population data was available for a few species, small numbers criterion (D) was applied occassionally. However, since population trends were not known or subpopulation and location information was not known, restricted criterion (C) was not applied. Similarly, probability of extinction criterion was not applied due to lack of information.

Species not assessed as threatened, but suffering some declines in populations or being impacted by other threats were assigned to the Near Threatened category. Documentation for all categories is included in the Taxon Data Sheets which are available in the full Report, Status of Chiroptera of South Asia.

The 2001 IUCN Red List Criteria (Version 3.1)



The C.A.M.P. workshop process employs the IUCN Red List Criteria as a tool in assessing species status in a group of taxa. The structure of the categories includes extinct, threatened, non-threatened, data deficient and not evaluated divisions.

In the last decade IUCN has improved the method of assessment of species by incorporating numerical values attached to the different criteria for threat categories. The 2001version of the Red List threatened categories are derived through a set of 5 criteria

1. population reduction,
2. restricted distribution,
3. continuing decline and fluctuation;
4. restricted population
5. probability of extinction

based on which the threatened category is assigned.

The term "threatened" according to the 2001 IUCN categories means Critically Endangered, Endangered or Vulnerable.

The "non-threatened" categories are Near Threatened and Least Concern

Other categories are Extinct, Extinct in the Wild, Data Deficient and Not Evaluated

Threatened and why ....

The IUCN Red List Criteria is a set of conditions or situations of populations, habitats, and areas by which the probability of extinction can be assessed if sufficient information or even high quality estimates and inferences are available. These conditions are used to rank species and assign them to categories which describe their level of threat. The threatened species of bats from the CAMP workshop have been listed below according to their level of threat, or category (Critically Endangered, Endangered, Vulnerable - the "threatened" categories. Since the criteria to rank the species in both symbols and text is too big to be included here, sample assessments of different threat category vis-a-vis criteria are included as case studies

***Taphozous theobaldi* Dobson, 1872**
Vulnerable in South Asia (A2a)
This bat is Vulnerable in South Asia because of population reduction. Although the bat is distributed in India and extends to South East Asia, its population in India is threatened due to disturbance to its roost sites, which is mainly in caves, due to human interference. Field observations indicate that there is more than 30% decline in population over the last 3 generations, which is over 12 to 18 years. The bat is recorded from six caves in India with an estimated 7000 individuals. One of the six caves was burnt completely which resulted in the death of an estimated 3000 bats recently.

***Hipposideros hypophyllus* Kock and Bhat, 1994**
Endangered (B1ab(ii,iii) + 2ab(ii,iii))
This Indian endemic species is restricted to only two caves in two localities in Karnataka. The area of occupancy and extent of occurrence are restricted to less than 500 sq km and 5000 sq km respectively. The caves are

List of Threatened South Asian Chiroptera -- Endemic and non-endemic

CRITICALLY ENDANGERED (CR)
A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered and therefore considered to be facing an extremely high risk of extinction in wild.

***Murina grisea* Peters, 1872** — **Peter's Tube-nosed Bat**
B1ab(iii) (Restricted extent and continuing decline in quality of habitat)
Endemic to South Asia

***Otomops wroughtoni* (Thomas, 1913)** — **Wroughton's Free-tailed Bat**
B2ab(iii) (Restricted area and continuing decline in quality of habitat)
Endemic to South Asia

ENDANGERED (EN)
A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered and it is therefore considered to be facing a very high risk of extinction in the wild.

***Hipposideros durgadasi* (Khajuria, 1970)** — **Khajuria's Leaf-nosed Bat**
D (Very small population) ***Endemic to South Asia***

***Hipposideros hypophyllus* Kock & Bhat, 1994** — **Kolar Leaf-nosed Bat**
B1ab(ii,iii) + 2ab(ii,iii) (Restricted extent & area and continuing decline in area & quality of habitat) ***Endemic to South Asia***

***Latidens salimalii* Thonglongya, 1972** — **Salim Ali's Fruit Bat**
B1ab(iii) + 2ab(iii) (Restricted extent & area and continuing decline in quality of habitat)
Endemic to South Asia

***Pteropus faunulus* Miller, 1902** — **Nicobar Flying Fox**
B1ab(iii) + 2ab(iii) (Restricted extent & area and continuing decline in quality of habitat)
Endemic to South Asia

***Pteropus vampyrus* Linnaeus, 1758** — **Large Flying Fox**
B1ab(iii) + 2ab(iii) (Restricted extent & area and continuing decline in quality of habitat)

***Pteropus hypomelanus* Temminck, 1853** — **Island Flying Fox**
B1ab(iii) + 2ab(iii) (Restricted extent & area and continuing decline in quality of habitat)

Ia io Thomas, 1902 — **Great Evening Bat**
B1ab(iii) + 2ab(iii) (Restricted extent & area and continuing decline in quality of habitat)

***Nyctalus leisleri* (Kuhl, 1819)** — **Leisler's Bat**
D (Very small population)

***Myotis daubentonii* (Kuhl, 1819)** — **Water Bat**
B1ab(iii) + 2ab(iii) (Restricted extent & area and continuing decline in quality of habitat); D (Very small population)

VULNERABLE (VU)
A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable and it is therefore considered to be facing a high risk of extinction in the wild.

***Myotis sicarius* Thomas, 1915** — **Mandelli's Mouse-eared Bat**
B2ab(iii) (Restricted area and continuing decline in quality of habitat)

***Rhinolophus cognatus* Andersen, 1906** **Andaman Horseshoe Bat**
D2 (Very small population in restricted area and locations) ***Endemic to South Asia***

***Rhinolophus ferrumequinum* (Schreber, 1774)** **Greater Horseshoe bat**
B2ab(iii) (Restricted area and continuing decline in quality of habitat)
Endemic to South Asia

***Rhinolophus mitratus* Blyth, 1844** **Mitred Horseshoe Bat**
D2 (Very small population in restricted area and locations) ***Endemic to South Asia***

***Hipposideros diadema* (E. Geoffroy, 1813)** **Diadem Leaf-nosed Bat**
D2 (Very small population in restricted area and locations)

***Miniopterus pusillus* Dobson, 1876** **Nicobar Long-fingered Bat**
B2ab(iii,iv) (Restricted area and continuing decline in quality of habitat & locations)

***Myotis annectans* (Dobson, 1871)** **Intermediate Bat**
D2 (Very small population in restricted area and locations)

***Myotis blythii* (Tomes, 1857)** **Lesser Mouse-eared Bat**
D1 (Very small population)

***Myotis montivagus* (Dobson, 1874)** **Burmese Whiskered Bat**
B2ab(iii) (Restricted area and continuing decline in quality of habitat); D2 (Very small population in restricted area and locations)

***Myotis mystacinus* (Kuhl, 1819)** **Whiskered Bat**
D1 (Very small population)

***Philetor brachypterus* (Temminck, 1840)** **Rohu's Bat**
B1ab(iii) + 2ab(iii) (Restricted extent & area and continuing decline in quality of habitat)

***Pipistrellus savii* (Bonaparte, 1837)** **Savi's Pipistrelle**
B1ab (iii) (Restricted extent and continuing decline in quality of habitat)

***Pteropus melanotus* Blyth, 1863** **Blyth's Flying Fox**
B1ab(iii) + 2ab(iii) (Restricted extent & area and continuing decline in quality of habitat)

***Rhinolophus hipposideros* (Bechstein, 1800)** **Lesser Horseshoe bat**
B1ab(iii) + 2ab(iii) (Restricted extent & area and continuing decline in quality of habitat)

***Rhinolophus subbadius* Blyth, 1844** **Chestnut Horseshoe Bat**
B2ab(iii) (Restricted area and continuing decline in quality of habitat)

***Rhinolophus trifoliatus* Temminck, 1834** **Trefoil Horseshoe Bat**
B1ab(iii)+2ab(iii) (Restricted extent & area and continuing decline in quality of habitat)

***Rhinolophus yunanensis* Dobson, 1872** **Asian Horseshoe Bat**
B1ab(iii)+2ab(iii) (Restricted extent & area and continuing decline in quality of habitat)

***Rousettus aegyptiacus* (E. Geoffroy, 1810)** **Egyptian Fruit Bat**
B1ab(iii) (Restricted extent and continuing decline in quality of habitat)); D1 (Very small population)

***Taphozous theobaldi* Dobson, 1872** **Theobald's Bat**
A2a (Observed population reduction in the last 10 years)

***Triaenops persicus* Dobson, 1871** **Persian Trident Bat**
D2 (Very small population in restricted area and locations)

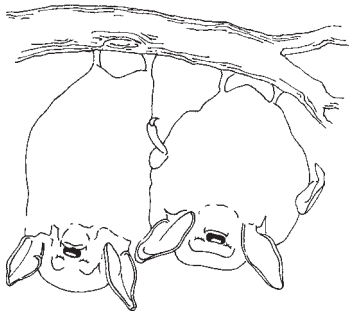
under pressure from human interference for mining and the surrounding habitat on which the bats depend for food is threatened by deforestation, habitat loss and modification. Because the bats are found in a very confined area and are under threat, this species is Endangered.

***Hipposideros durgadasi* (Khajuria, 1970)**
Endangered (D)

This bat is endemic to a small area in Madhya Pradesh. The last time the bat was studied, it was found restricted in distribution but the habitat was still safe. Hence it was not threatened due to restricted distribution. However, its numbers were estimated to be less than 200 mature individuals in the two localities, which therefore made it susceptible to threats. The species is categorized as Endangered because of very few numbers in the wild.

***Rhinolophus cognatus* Andersen, 1906**
Vulnerable (D2)

This Andaman endemic species is restricted in its destribution to less than 500 sq km area and 5000 sq km extent, but the habitat is undisturbed, hence it is not threatened due to restricted distribution. Since not enough studies are conducted, ia population estimation is not possible, hence the bat is not categorized as threatened due to small numbers (D). However, since the bat is found only in three localities, and the habitat is susceptible to future developmental activities, the species is categorized as Vulnerable under restricted distribution and few locations (D2) using the precautionary approach. Because the species is found in very few localities, any disturbance in the localities could affect the population status badly.



Hunting and other threats for bats

Cynopterus sphinx ***(Vahl, 1797) -- Habitat loss, development, dams, deforestation, exploitation, hunting, hunting for medicine***

Eptesicus serotinus ***(Schreber, 1774) Exploitation, hunting for medicine in Assam, habitat destruction***

Hesperoptenus tickelli ***(Blyth, 1851) Habitat loss, deforestation, exploitation, hunting, hunting for medicine, human interference***

Hipposideros diadema ***(E. Geoffroy, 1813) -- Habitat loss, hunting for food***

Hipposideros galeritus ***Cantor, 1846 -- Exploitation, hunting for medicine in Sri Lanka, human interference, habitat loss***

Hipposideros lankadiva Kelaart, 1850 *-- Habitat loss, deforestation, hunting, human interference

Hipposideros pomona Andersen, 1918 -- Habitat loss, development, exploitation, hunting for food, human interference

Hipposideros speoris (Schneider, 1800) * -- Habitat loss, stone quarrying, chemical spraying, renovation of temples, hunting

Latidens salimalii Thonglongya, 1972 * -- Habitat loss, agriculture, farming, horticulture, extraction, harvesting non-woody vegetation, exploitation, hunting for medicine and food, trade

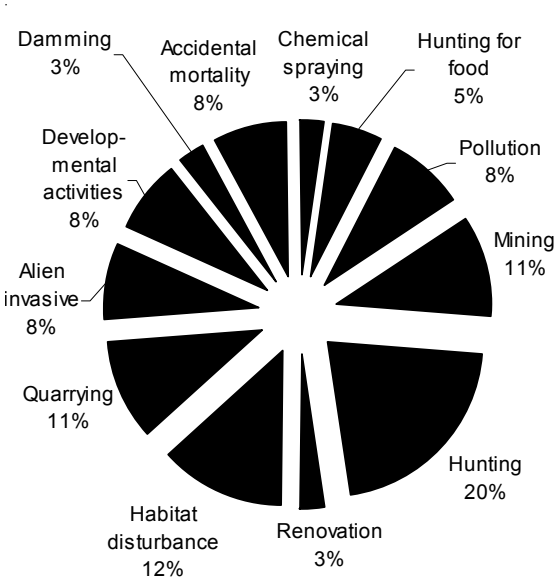
Megaderma lyra E. Geoffroy, 1810-- Exploitation, illegal trade for food,

Threats

Human interference leading to habitat loss is a major threat to almost all species of bats.

Felling of roost trees for widening of roads is also a common threat to fruit bats. Deforestation for different reasons such as development, timber, local needs, forest policies, etc. destroys many roost and fruit trees for fruit bats.

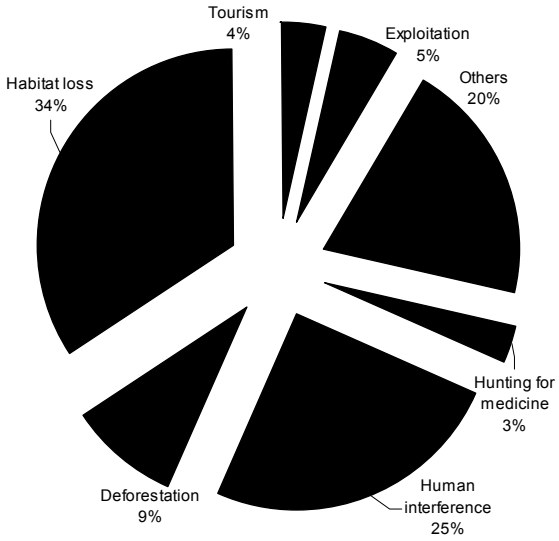
The resulting loss of habitat due to felling of trees reduces the quality of habitat for microchiropterans through reduction in canopy insect populations. Human interference such as lopping, fires, roost disturbance, anti-fruit bat measures, etc. results in a highly negative effect on bat colonies in both wild and semi-wild habitats.



Bats that live in caves that are a tourist attraction such as Ajantha and Ellora are prone to roost disturbance. Bats that have colonised old or abandoned buildings, temples, disused wells and timber yeards are under threat from changes in policies of the concerned authorities.

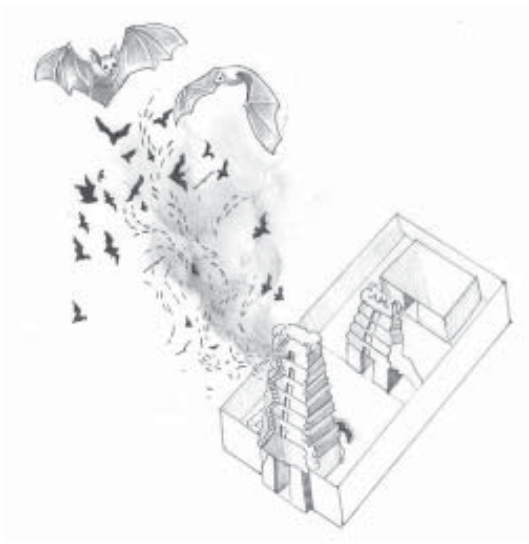
In addition, hunting accounts for threats to about 15% of bat species. There are different types of hunting. Locals hunt most species of bats for meat and medicine. Some species of bats such as the fruit bats are considered pests and therefore persecuted. Of the 19 species that are hunted, eight are fruit bats. Four hunted species are endemic to South Asia. (Please refer sidebars).

Although it may seem that many South Asian bats, having been



assessed Least Concern, are still relatively safe, it is very important to understand that the assessments have been done only at the species level and not at subspecies or population level. There are at least 139 known and valid subspecies of bats in the region (Appendix III), some of them highly restricted to small areas such as Andaman & Nicobar Islands, Maldives and Sri Lanka.

Even though the status of many species is safe for now, individual populations or subspecies may be under tremendous pressure. If appropriate measures are not taken to conserve such subspecies and populations, genetic diversity could be lost forever. Of course, no country wants to lose an endemic species due to the disgrace it would bring to their government. However, the loss of even non-endemic species population and subspecies is actually a danger to the country due to the loss of myraid benefits to ecosystems and human needs.

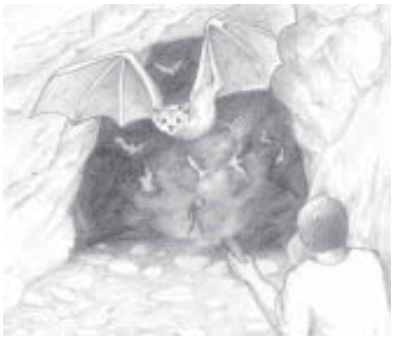


human interference, renovation of old temples, quarrying, human habitation, habitat disturbance

Nyctalus montanus ***(Barrett-Hamilton, 1906)-- Hunting for medicine, habitat loss, deforestation, quarrying and mining***

Pipistrellus ceylonicus ***(Kelaart, 1852) -- Exploitation, hunting, hunting for medicine***

Pteropus faunulus ***Miller, 1902 * Habitat loss, possibly hunted***



Pteropus giganteus ***Brunnich, 1782 Exploitation, hunting, habitat loss***

Pteropus hypomelanus ***Temminck, 1853 -- Habitat loss, persecution***

Pteropus melanotus ***Blyth, 1863 Habitat loss, possibly hunted***

Pteropus vampyrus ***Linnaeus, 1758 Habitat loss, persecution, possibly hunted***

Rousettus leschenaulti ***(Desmarest, 1820) -- Exploitation, hunting, tourism***

Taphozous melanopogon ***Temminck, 1841 -- Hunting, human interference***

**** Endemic to South Asia***

Data Deficiency -- with special reference to Research and Management

Data Deficient species
Only 8 of the 123 species of South Asian Chiroptera assessed in the C.A.M.P. workshop have been categorized as Data Deficient

People doing red listing often believe that there is not enough information to determine the status of certain species in the wild. It is a common mistake to leap to the conclusion that a species is Data Deficient when information is sparse. In fact, the level of information desired for "absolute certainty" is never available!

Thus, the IUCN Red List Criteria guidelines are very clear in stating that if no observations are available, inference, estimates, and predictions are permitted within reason.

Consistency in applying the boundaries of the limits to inference is crucial however. If the various individuals and institutions conducting Red List exercises are not consistent in application of criteria, then the whole rationale for having a Red List methodology has no meaning. The Red List Criteria and Categories were developed in the first instant so that scientists working in all biological disciplines and taxon groups could understand what the other meant when they said a taxon was Endangered or Least Concern.

At the beginning of the 2002 Chiroptera C.A.M.P., there was unanimity in declaring many bats as being Data Deficient, however, when the confidence level in the process of logical deduction in compiling and analyzing information increased, many species were found to have sufficient data to assign a status. Further, for those with limited data, inference within reason and justification was adopted.

Thus, "Data Deficient" ranking is a very interesting category. If a species

Recommendations

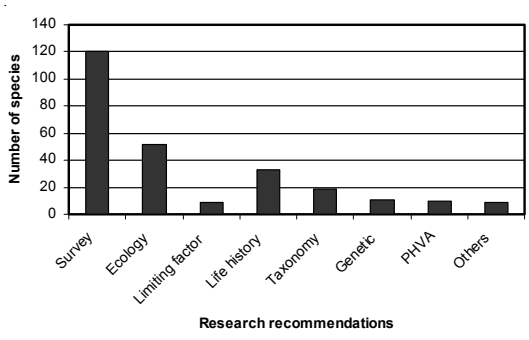
Research

Bats are one of the least studied mammalian groups in the region. Apart from status assessments, the objective of a C.A.M.P. workshop is also to make research and management recommendations for every species considered for assessment.

There is an obvious dirth of information on bats in the wild. Information for many species is based only on museum or literature references, with no recent distribution information in the wild. The absence of this crucial information prompted the working groups to recommend survey as the primary research recommendation for nearly all bats (120 species). Surveys are needed to understand the distribution and status all over the region.

Paucity of information is so dramatic that there could be a few species that may be locally extinct already, but these possible extinctions cannot be ascertained for want of systematic surveys.

Most bat studies in the past have been on occasional and opportunistic collections for taxonomic works and in a few cases, distribution and status in certain areas. Systematic surveys have been conducted for one or two well known bats of importance, such as *Otomops wroughtonii* and *Latidens salimalii* among others, but even so, surveys in regions other than the known localities failed to locate the species. In point of fact is the recent discovery of *Otomops wroughtonii* in Cambodia (Walston & Bates, 2001) and in Meghalaya (Thabah & Bates, in prep). This indicates not only the range extension of the species, but also the fact that the species could be distributed more widely than is known today. Similarly, there is no current information on the distribution or even the presence of *Hipposideros durgadasi*, another endemic bat of India.



Ecological studies are critical for better understanding of the status of the species as well as the very much-needed documentation of the ecological value of bats. The assessments carried out at this stage lack much of ecological data, the availability of which could help in the actual understanding of the status. For example, foraging distance from the roost site is an important aspect that can determine the distribution of a bat given various influences on the habitat.

Other research recommendations include life history studies, limiting factor research, taxonomic studies, genetic studies, population and habitat viability analysis, among others.

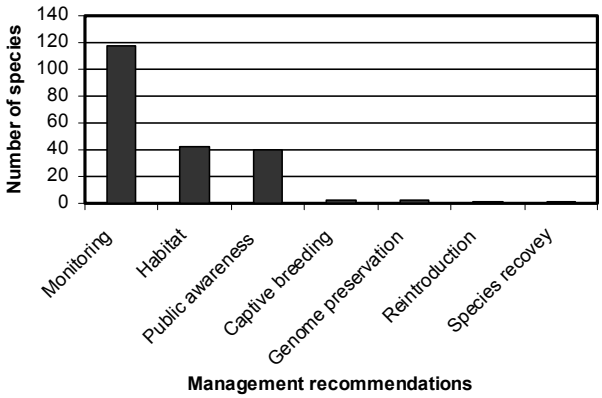
Management

For a thorough understanding of the species status in the wild, it is imperative that surveys are followed by periodic monitoring. Lack of monitoring has hindered our understanding of population structure and dynamics of bats of the region. Very little is known of the better-known bats like the endemics mentioned before through occasional field visits and trapping, but no systematic studies involving monitoring of population has been conducted for either *O. wroughtonii* or *L. salimalii.*

For the rest of the bats, monitoring is recommended as a priority in management followed by habitat management and public awareness. In some cases roosts of certain species are known, but foraging areas are not well understood or assessed. It is imperative that habitat studies be done initially to determine the potential of a given area to support bats in the roost. Habitat management is crucial from not only conserving roost areas such as caves, trees, old buildings, temples and well, but also in conserving the source of food, be it fruits or insects. Bat organisations in western countries have been successful in convincing thousands of people to erect bat houses, which is a great help to displaced bats.

Even bat biologists admit that they know very little about South Asian bats but their knowledge is staggering when compared to that of the common man in South Asia and even of many professional foresters.

Public awareness is a crucial component of the actions that must be taken to implement a holistic conservation action plan for bats of this region. Other management recommendations include captive breeding, genome preservation, reintroduction and species recovery.



has to be categorised "DD" what with all the estimation and extrapolation permitted by the Red List Guidelines, it means it is so very poorly known indeed. If such a species actually occurs in very low numbers or few locations, or is subject to very severe threats, it could become extinct before we even realise it is in trouble. The classification "Data Deficient" is a very loud warning bell - it tells governments, institutions, scientists to get out and survey the species before it is too late. Research and management are absolutely crucial.

A species from the South Asian CAMP workshop,* Myotis csorbai *Topal, 1997 which occurs only in Nepal and* Eptesicus tatei *Ellerman and Morrison-Scott, 1951 which occurs only in India are each endemic to only one country and Data Deficient. Therefore, the onus for insuring the survival of these species falls on the Government of Nepal in the case of* Myotis *csorbai and on the Government of India in the case of* Eptesicus tatei. *These countries could suffer the indignity and shame of having a species found only in their country disappear from the Earth without knowing it was threatened !

Eight of the 123 species of South Asian Chiroptera assessed in the C.A.M.P. workshop have been categorized as Data Deficient. Although any DD species is regreted, this number is a great improvement over the 52 out of 102 Indian species assessed as DD in 1997.

List of Data Deficient species

Eptesicus bottae ***(Peters, 1869)***
Eptesicus gobiensis ***Bobrinskii, 1926***
Eptesicus nasutus ***(Dobson, 1877)***
Eptesicus pachyotis ***(Dobson, 1871)***
Eptesicus tatei Ellerman and ***Morrison-Scott, 1951 ****
Harpiocephalus mordax ***Thomas, 1923***
Myotis csorbai T*opal, 1997 **
Pipistrellus abramus ***(Temminck, 1840)***

**** Endemic to South Asia***

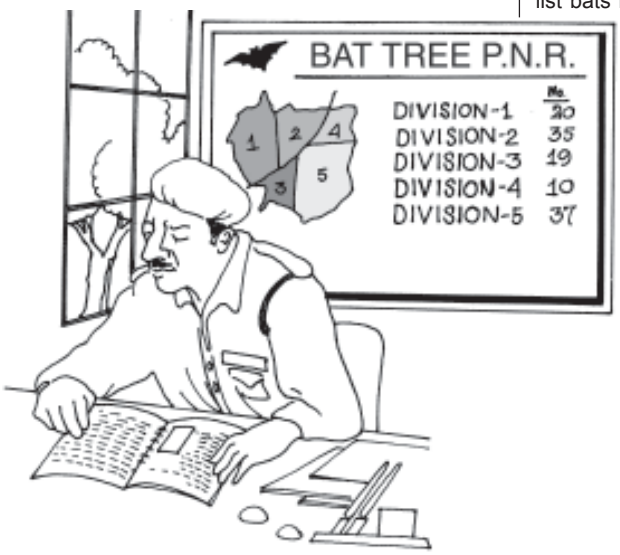
Bats in protected areas

Bats in protected areas

From a quick addition of the information gathered at the workshop for bats in protected areas, only 49 species have any record of occurring in protected areas of the region. Only seven of the 17 endemic bats of South Asia are found in protected areas. Information from protected areas for this group of mammals is very meager as evidenced in the list overleaf.

Mammal surveys in protected areas have a very strong bias towards larger, more conspicuous forms and many protected area management plans do not even list bats in the inventories. The list on the next page is not complete, but is a fair representation of what is understood of bats in protected areas in South Asia.

The Chiroptera Conservation and Information Network of South Asia CCINSA can, in fact, put foresters and PA managers in touch with bat biologists from their area. Many CCINSA researchers have agreed to visit these areas when called during annual census to help spot and identify different species of bats. Most all foresters, even those trained in the wildlife speciality cannot identify bat species, and are not expected to be able to do so. Even bat biologists themselves often cannot easily identify many species. An identification key is currently being worked out for this purpose. However, the first step is for foresters, particularly in Protected Areas, to make a special effort to observe, report the presence of, and list bats in their inventories.



South Asian Bats recorded in Protected Areas

Endemic to South Asia		
Hipposideros lankadiva	LC	India: Nagarjunsagar-Srisailam TR, AH, Kanha NP, MP
Hipposideros speoris	LC	India: Nagarjunsagar-Srisailam TR, AH
Latidens salimalii	EN	India: Kalakkad-Mundanthurai TR, TN; Periyar TR, KE
Myotis sicarius	VU	Nepal: Annapurna Conservation area
Pipistrellus dormeri	LC	India: Satpura NP, MP
Rhinolophus beddomei	NT	India: Chinnar WLS, KE; Nagarjunasagar-Srisailam TR, Gundla Brahmeshwaram WLS, AH
Rhinolophus cognatus	VU	India: Narcondam Island WLS
Not endemic to South Asia		
Barbastella leucomelas	NT	Nepal: Annapurna Conservation Area, Makala Barun NP and Rara NP
Cynopterus brachyotis	LC	India: Nagarahole NP, KA; Kalakkad-Mundanthurai TR, TN, Sri Lanka: Hakgalla NP
Cynopterus sphinx	LC	India: Point Calimere WLS, TN; Coringa WLS, Kawal WLS, Nagarjunasagar-Srisailam TR, AH; Kanha NP, MP
Eonycteris spelaea	LC	India: Kalakkad-Mundanthurai TR, TN
Eptesicus serotinus	NT	Nepal: Makalu Barun NP
Hipposideros fulvus	LC	India: Bhimashankar WLS, MH.
Hipposideros galeritus	NT	India: Melghat TR, MH; Borivili NP, MH; Kanha NP, MP
Hipposideros larvatus	NT	India: Orang NP, AS
Kerivoula hardwickii	LC	India: Siju WLS, MG
Kerivoula papillosa	NT	India: Sunderbans NP, WB
Kerivoula picta	LC	India: Borivili NP, MH; Kawal WLS, AP; Orang NP, AS, Nepal: Chitwan NP
Macroglossus sobrinus	NT	India: Namdapha WLS, AR
Megaderma lyra	LC	India: Tadoba-Andhari TR, Radhanagari WLS, MH; Kawal WLS, AH; Orang NP, AS; Nagarjunsagar-Srisailam TR, AH
Megaderma spasma	LC	India: Tadoba TR, Melghat TR, Pench NP, MH; Sunderbans NP, WB
Megaerops niphanae	NT	India: Namdapha WLS, AR
Miniopterus pusillus	VU	India: Kalakkad-Mundanthurai TR, TN
Miniopterus schreibersi	LC	India: Siju WLS, MG
Murina cyclotis	LC	Nepal: Royal Chitwan NP
Myotis horsfeldii	LC	India: Silent Valley NP, KL; Kanha NP, MP
Myotis longipes	NT	India: Balpakram NP, MG
Myotis muricola	LC	Pakistan: Murree NP; Nepal: Langtung NP
Otomops wroughtoni	CR	India: Siju WLS, MG
Pipistrellus coromandra	LC	India: Kanha NP, MP
Pipistrellus javanicus	LC	India: Kanha NP, MP
Pipistrellus tenuis	LC	India: Satpura NP, MP
Plecotus auritus	NT	Nepal: Makalu Barun NP, Rara NP
Pteropus giganteus	LC	India: Pt Calimere WLS, TN; Palamau TR, Hazaribagh WLS, JH; Kawal WLS, AP; Molem NP, GO; Kanha NP, MP; Chilka, Nalaban WLS, OR; Indravati NP, CH
Pteropus hypomelanus	EN	India: Barren Island WLS, AN
Rhinolophus lepidus	LC	India: Ranthambore NP, RJ; Karnala Bird Sanctuary, MH; Satpura NP, MP
Rhinolophus luctus	NT	India: Satpora NP, MP
Rhinolophus pusillus	LC	India: Phamong Lho WLS, SK
Rhinolophus rouxii	NT	India: Dandeli WLS, KN; Karnala WLS, MH; Kanha NP, MP; Indravati NP, CH.
Rhinopoma hardwickii	LC	India: Kanha NP, MP
Rousettus leschenaulti	LC	India: Namdapha Biosphere Reserve, AR; Nagarhole WLS, KA; Sambalpur WLS, OR; Kanha NP, MP; Indravati NP, CH
Scotophilus kuhlii	LC	India: Satpura NP, MP
Sphaerias blanfordi	NT	India: Phambong Lho WLS, SK; Namdapha NP, AR
Taphozous longimanus	LC	India: Hazaribagh WLS, JH; Kanha NP, MP
Taphozous melanopogon	LC	India: Kanha NP, Satpura NP, MP
Taphozous nudiventris	LC	India: Kanha NP, MP
Taphozous saccolaimus	LC	India: Campbell Bay NP, AN; Kanha NP, MP
Taphozous theobaldi	VU	India: Silent Valley NP, KE; Bhimshankar WLS, MH

Bats *NOT* recorded in P.A.s

Endemic to South Asia

Eptesicus tatei, DD
Hipposideros durgadasi EN
Hipposideros hypophyllus EN
Murina grisea CR
Myotis csorbai DD
Pteropus faunulus EN
Rhinolophus ferrumequinum VU
Rhinolophus mitratus VU
Scotoecus pallidus NT
Taphozous perforatus LC

Not endemic to South Asia

Areilulus circumdatus LC
Asellia tridens NE
Coelops frithii NT
Eptesicus bottae DD
Eptesicus gobiensis DD
Eptesicus nasutus DD
Eptesicus pachyotis DD
Harpiocephalus harpia NT
Harpiocephalus mordax DD
Hesperoptenus tickelli LC
Hipposideros armiger LC
Hipposideros ater LC
Hipposideros cineraceus NT
Hipposideros diadema VU
Hipposideros pomona LC
Ia io EN
Murina aurata NT
Murina huttonii LC
Murina leucogaster NT
Murina tubinaris NT
Myotis annectans VU
Myotis blythii VU
Myotis daubentonii EN
Myotis formosus LC
Myotis hasseltii NT
Myotis montivagus VU
Myotis mystacinus VU
Myotis siligorensis NT
Nyctalus leisleri EN
Nyctalus montanus NT
Nyctalus noctula LC
Otonycteris hemprichi NT
Philetor brachypterus VU
Pipistrellus abramus DD
Pipistrellus affinis NT
Pipistrellus cadornae NT
Pipistrellus ceylonicus LC
Pipistrellus javanicus LC
Pipistrellus kuhlii LC
Pipistrellus paterculus LC
Pipistrellus pipistrellus LC
Pipistrellus savii VU
Pteropus melanotus VU
Pteropus vampyrus EN
Rhinolophus affinis LC
Rhinolophus blasii NT
Rhinolophus hipposideros VU
Rhinolophus macrotis NT
Rhinolophus pearsonii LC
Rhinolophus sinicus LC
Rhinolophus subbadius VU
Rhinolophus trifoliatus VU
Rhinolophus yunanensis VU
Plecotus austriacus NT
Rhinopoma microphyllum LC
Rhinopoma muscatellum NT
Rousettus aegyptiacus VU
Scotomanes ornatus LC
Scotophilus heathii LC
Tadarida aegyptiaca LC
Tadarida plicata LC
Tadarida teniotis NE
Triaenops persicus VU
Tylonycteris pachypus NT
Tylonycteris robustula NE
Vespertilio murinus NT

Insectivorous bats

Areilulus circumdatus (Temminck, 1840) - LC
Asellia tridens (Geoffroy, E., 1813) - NE
Barbastella leucomelas (Cretzschmar, 1830/31) - NT
Coelops frithii Blyth, 1848 - NT
Eptesicus bottae (Peters, 1869) - DD
Eptesicus gobiensis Bobrinskii, 1926 - DD
Eptesicus nasutus (Dobson, 1877) - DD
Eptesicus pachyotis (Dobson, 1871) - DD
Eptesicus serotinus (Schreber, 1774) - NT
Eptesicus tatei Ellerman and Morrison-Scott, 1951 - DD
Harpiocephalus harpia (Temminck, 1840) - NT
Harpiocephalus mordax Thomas, 1923 - DD
Hesperoptenus tickelli (Blyth, 1851) - LC
Hipposideros armiger (Hodgson, 1835) - LC
Hipposideros ater Templeton, 1848 - LC
Hipposideros cineraceus Blyth, 1853 - NT
Hipposideros diadema (E. Geoffroy, 1813) - VU
Hipposideros durgadasi (Khajuria, 1970) – EN
Hipposideros fulvus Gray, 1838 - LC
Hipposideros galeritus Cantor, 1846 - NT
Hipposideros hypophyllus Kock & Bhat, 1994 - EN
Hipposideros lankadiva Kelaart, 1850 - LC
Hipposideros larvatus (Horsfield, 1823) - NT
Hipposideros pomona Andersen, 1918 - LC
Hipposideros speoris (Schneider, 1800) - LC
Ia io Thomas, 1902 - EN
Kerivoula hardwickii (Horsfield, 1824) - LC
Kerivoula papillosa Temminck, 1840 - NT
Kerivoula picta (Pallas, 1767) - LC
Megaderma lyra E. Geoffroy, 1810 - LC
Megaderma spasma (Linnaeus, 1758) - LC
Miniopterus pusillus Dobson, 1876 - VU
Miniopterus schreibersii (Kuhl, 1819) - LC
Murina aurata (Milne-Edwards, 1872) - NT
Murina cyclotis Dobson, 1872 - LC
Murina grisea Peters, 1872 - CR
Murina huttonii (Peters, 1872) - LC
Murina leucogaster (Milne-Edwards, 1872) - NT
Murina tubinaris (Scully, 1881) - NT
Myotis annectans (Dobson, 1871) - VU
Myotis blythii (Tomes, 1857) - VU
Myotis csorbai Topal, 1997 - DD
Myotis daubentonii (Kuhl, 1819) - EN
Myotis formosus (Hodgson, 1835) - LC
Myotis hasseltii (Temminck, 1840) - NT
Myotis horsfieldii (Temminck, 1840) - LC
Myotis longipes (Dobson, 1873) - NT
Myotis montivagus (Dobson, 1874) - VU
Myotis muricola (Gray, 1846) - LC
Myotis mystacinus (Kuhl, 1819) - VU
Myotis sicarius Thomas, 1915 - VU
Myotis siligorensis (Horsfield, 1855) - NT
Nyctalus leisleri (Kuhl, 1819) - EN
Nyctalus montanus (Barrett-Hamilton, 1906) - NT
Nyctalus noctula (Schreber, 1774) - LC
Otomops wroughtoni (Thomas, 1913) - CR
Otonycteris hemprichii Peters, 1859 - NT
Philetor brachypterus (Temminck, 1840) - VU
Pipistrellus abramus (Temminck, 1840) - DD
Pipistrellus affinis (Dobson, 1871) - NT
Pipistrellus cadornae Thomas, 1916 - NT
Pipistrellus ceylonicus (Kelaart, 1852) - LC
Pipistrellus coromandra (Gray, 1838) - LC
Pipistrellus dormeri (Dobson, 1875) - LC

Economic value of insectivorous bats

Of the 1000+ species of bats in the world, almost three-fourths are insectivorous. These bats consume many types of insects including common crop pests such as moths, beetles, corn borers, june bugs, cucumber bugs and even mosquitoes. The majority of bats in South Asia feed upon insects, yet we know very little about the beneficial economic impacts they might have on agricultural systems. If studies in other countries are any indication, insectivorous bats in the subcontinent may provide enormous services by reducing crop pests and keeping a check on mosquito populations.

Research on insect consumption by bats has shown that in the case of *Tadarida brasiliensis*, the Mexican free-tailed bat, each bat can consume more than half its weight in insects every night. Colonies of these bats, which often number in the millions, are estimated to consume 10 tonnes per million bats on a nightly basis. This amounts to 6-13 thousand tonnes of insects per summer. Similar estimates for other insectivorous species are known from Borneo where one cave population consumes 7500 kg per night.

Rates of insect consumption are also known from studies on *Myotis lucifugus*, the little brown bat, which can eat up to its own body weight in insects per night. Coupled with a very fast digestion rate (as fast as 20 minutes) and numerous foraging bouts per night, these bats can eat a considerable number of insects. *Myotis* bats are also known to have remnants of mosquitoes in most of their feces, suggesting that mosquitoes play an important role in their diet.

Similar estimates for bat species in South Asia are difficult because we have very little knowledge about the types of insects consumed or the rates of consumption. However, given the diversity of insectivorous species across the subcontinent, and the importance of agriculture to the economy, the study of insectivorous bats and their feeding habits should be considered a major priority.

Moreover, it has been observed by Sinha (1986; 1994) that one species, *Megaderma lyra*, consumes the flesh of rats and mice found in farmers' godowns, crops, fields and houses. Rats and mice destroy different types of grains, which are stored in bags in the house as well as crops in the field. The size of its colony varies from 25 to 340 individuals. Farmers in the state of Bihar call the bat as the "goddess Laxmi", goddess of wealth, and protect its colonies. According to Sinha, this species selects mostly small vertebrates like fishes, amphibians, lizards, small mammals and birds and large insects like locusts, grass hoppers and beetles etc. The bat may thus play a more complex role in agricultural economics and ecosystems than previously thought.

Economic value of fruit bats

The economic value of Chiroptera has been well documented for Megachiroptera also, but as in the case of Microchiroptera, no long range, systematic ecological studies have been carried out in South Asia. In brief, Megachiroptera contribute via their ecological significance as seed dispersers and pollinators with a wealth of additional assets, which come along with these activities. Fruit bats play an important role in the regeneration of forests, a known fact noted by Goyal and Sale (1992) of the Wildlife Institute of India who conducted a four-year study of fruit bats around Dehra Dun, India. Goyal and Sale also made a strong recommendation that fruit bats be removed from the Vermin category (Schedule V) of the WL(P)Act, 1972. Although there are a few other studies from this region, they were not sufficiently long-term or appropriately formulated to understand the holistic ecological and economic value of fruit bats.

Studies from other parts of the world can give some indication of the immense value fruit bats contribute to tropical and other forest types. Many people think fruit bats are found primarily in fruit orchards and contribute nothing but a hard time to struggling farmers. In fact there are numerous species of forest bats which feed on fruits or husks which are not agricultural produce but are associated with a variety of economically important trees and their products, e.g. dyes, tannin, medicine, fiber, fuel, lumber, etc. which depend on fruit bats for their propagation. It is a pity that more South Asia bat biologists are not doing such studies. Foresters, in particular, should give them every encouragement to do so.

Fleming (1997) studying fruit bats in Costa Rica cites Seba's Short-tailed Fruit Bat, to illustrate the impact of one species of small, common bat on the dynamics of a tropical forest. One bat may eat up to 60,000 seeds of fruits in a night, averaging in the tens of thousands. If each bat consumed an average of only 1000 seeds, one bat colony would disperse 146 million seeds a year. If only one tenth of these germinated, the resulting 146,000 seedlings from one bat colony compares very favourably to the cost of such numbers of plantings by human beings !

Fleming also comments on the importance of frugivorous bats in regeneration of forests in disturbed habitats: "bat-dispersed plants are among the first and most abundant plants to invade natural and man-made clearings…quick to grow and mature, these plants attract hungry bats which also may bring later successional plant species into the clearing…". Shahroukh Mistry, one of the few Chiroptera specialists to conduct ecological studies of forest bats in India, points out the difference in India where the tropical forests are dry and deciduous and fruit bats more often disperse old growth and canopy species. Each behaviour has its own value but must be known and understood in order to be used for best management of forests.

Thomas (1991) studying fruit bat interactions with trees and shrubs in forest-savannah in West Africa noted that in the tropics seed-eating insect populations under trees and shrubs are so numerous that few fallen seeds germinate. The reproductive strategy evolved by 80-95% trees and shrubs in tropical forests to combat this problem is to hide their seeds in edible fruits which are carried away by frugivouous mammals and birds, of which many are bats. Using a series of simple but very clever experiments over years, Thomas could conclude that i) 75% of ripe fruits on an important tree species were removed by bats, ii) that bats accounted for 95% of seed-bearing faeces at any of his research sites, iii) that bats (as compared to birds) moved more ingested seeds away from sites where insect seed predation is typically high, iv) that certain bats which consume from 1-2 times their body weight per night stuff their mouths with fruit and after digesting easy matter spit out a bolus which contains some seeds. Thomas evaluated the efficacy of the seeds eaten by bats and found that fecal seeds and bolus seeds germinated with far greater efficiency than seeds germinated from ripe fruits. Finally, Thomas was able to demonstrate that in terms of insect predation, such as from ants, seeds containing remnants of fruit (such as you would get from fallen seeds) were located and consumed first by ants as compared with faecal seeds. In a day ants removed 92% of seeds associated with fruit and only 72% of fecal seeds, suggesting that more fecal seeds might survive to germinate and

List of Fruit bats and their status

Latidens salimalii ***Thonglongya, 1972, Endemic to India ; Endangered***

Pteropus faunulus ***Miller, 1902, Endemic to India; Endangered***

Pteropus hypomelanus ***Temminck, 1853, Endangered***

Pteropus vampyrus ***(Linnaeus, 1758), Endangered***

Pteropus melanotus ***Blyth, 1863, Vulnerable***

Rousettus aegyptiacus ***(E. Geoffroy, 1810), Vulnerable***

Megaerops niphanae ***Yenbutra & Felten, 1983, Near Threatened***

Cynopterus sphinx ***(Vahl, 1797) Least Concern***

Eonycteris spelaea ***(Dobson, 1871) Least Concern***

Macroglossus sobrinus ***(K. Andersen, 1911), Least Concern***

Pteropus giganteus ***Brunnich, 1782, Least Concern***

Rousettus leschenaulti ***(Desmarest, 1820), Endemic to India, Least Concern***

Sphaerias blanfordi ***(Thomas, 1891), Least Concern***

Cynopterus brachyotis ***(Muller, 1838), Least Concern***

Pteropus intermedius ***Andersen, 1908, Least Concern***

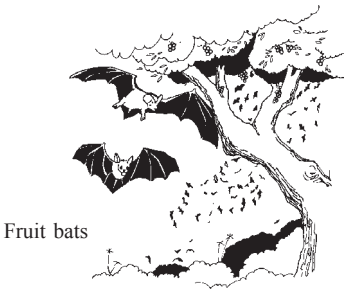
produce the next generation of plants.
It was noted by Estrada in Mexico that agricultural lands in between forest patches act as a sort of way station to bats, providing perches, food, and shelter. It was suggested that in a disturbed landscape the bats use what fragmented forest areas are left along with the human created islands of vegetation as "stepping stones." While such scenarios may not be ideal, it may be useful for forest management in today's world where human beings are winning in so many temporary and potentially fatal ways.

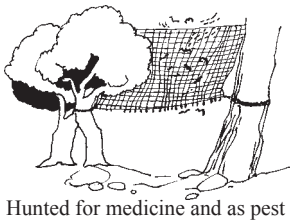
These few studies have been cited only to illustrate the power of well-planned, systematic ecological studies in determining the value of bats. The fact that few such studies have been carried out in South Asia may be indicative of the fact that protective legislation is almost non-existant, while negative Acts defining bats as vermin are very clear and also seemingly difficult to change. Since the agricultural lobby presumably provides much of the clout behind the presence of bats (as well as rats and mice) on Schedule V, Goyal and Sale, (1992) spent much of their study on damage done by fruit bats to fruit trees and the lack of efficacy of any method in protecting farm crops while also protecting fruit bats. Their conclusion "there is no cheap or simple answer to the problem of fruit bat damage to crops" provides its own solution. If there is no viable way to stop crop damage by fruit bats, then the alternative is to prove categorically that fruit bats' contribution to the greater ecological and economic good outweighs the individual and collective damage done to trees of fruit growers. Convincing farmers, whose perspective is understandably short term, of the long-range value of fruit bats may be impractical in time to save species, but the government which creates legislation should not take such a view.

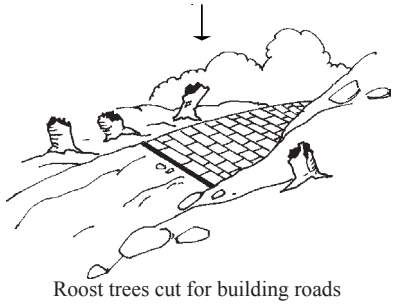
It should be noted that the absence of studies of fruit bats includes those which determine the cause of decline in fruit bat populations to ascertain whether extermination by farmers actually has an appreciable effect when compared to the widespread destruction of habitat and the total absence of forest management practices which focus on bats. Fujita (1988) who studied the economic importance of bats in South East Asia noted the difficulty of assessing the impact of commerical hunting of bats due to the lack of historical data on bat populations. The same holds true for any hunting and in South Asia as well as South East Asia. Fujita and others have noted that very large numbers of bats are necessary for reproduction and propagation of some rain forest plants. Mistry (1997) found dramatic declines in half the studied roosts in one of his recent surveys on Indian Flying Foxes. In this regard he comments that flying fox colonies, which contained thousands of bats historically now average 500 or fewer.

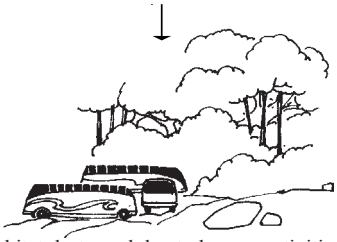
List of bats hunted for food or medicine

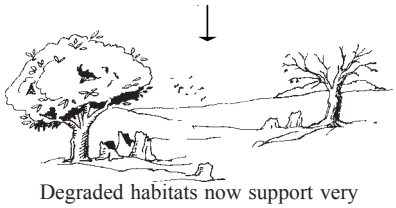
Cynopterus sphinx **(Vahl, 1797) -- hunting for medicine**
Eptesicus serotinus **(Schreber, 1774) -- hunting for medicine in Assam, habitat destruction**
Hesperoptenus tickelli **(Blyth, 1851) -- hunting, hunting for medicine**
Hipposideros diadema **(E. Geoffroy, 1813) -- hunting for food**
Hipposideros galeritus **Cantor, 1846 -- hunting for medicine in Sri Lanka**
Hipposideros lankadiva **Kelaart, 1850 * -- Hunting**
Hipposideros pomona **Andersen, 1918 -- hunting for food**
Hipposideros speoris **(Schneider, 1800) * -- hunting**
Latidens salimalii **Thonglongya, 1972 * -- hunting for medicine and food**
Megaderma lyra **E. Geoffroy, 1810 -- illegal trade for food**
Nyctalus montanus **(Barrett-Hamilton, 1906) -- Hunting for medicine**
Pipistrellus ceylonicus **(Kelaart, 1852) -- hunting for medicine**
Pteropus faunulus **Miller, 1902 * -- possibly hunted**
Pteropus giganteus **Brunnich, 1782 -- Hunting**
Pteropus hypomelanus **Temminck, 1853 -- persecution**
Pteropus melanotus **Blyth, 1863 -- possibly hunted**
Pteropus vampyrus **Linnaeus, 1758 -- persecution, possibly hunted**
Rousettus leschenaulti **(Desmarest, 1820) -- Hunting**
Taphozous melanopogon **Temminck, 1841 -- Hunting**


Fruit bats

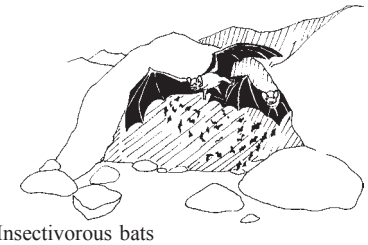

Hunted for medicine and as pest


Roost trees cut for building roads

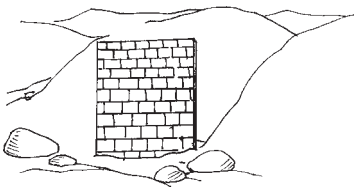

Habitat destroyed due to human activities


Degraded habitats now support very few bats.

Fruit bats face innumerable threats. Although they play a key ecological role that keeps the ecosystem in balance and are needed for agricultural and horticultural success, they are categorised as Vermin in the Indian Wildlife (Protection) Act. Is this justified?

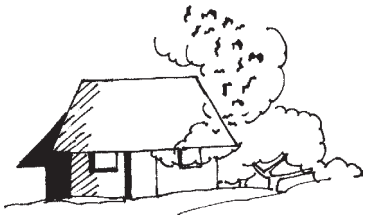


Insectivorous bats



Cave entrances blocked or caves modified for human use

Habitats under threat from mining and quarrying



Habitats smoked to rid of insect bats

Mostly degraded habitats now support insectivorous bats

Many insectivorous bat species are threatened. They also play a key ecological role in keeping insect pests under control. Because people do not differentiate them from fruit bats, insectivorous bats are also persecuted. Worse, they are not even recognised as protected species in the Indian Wildlife (Protection) Act!

Legislation

Bats are protected in many parts of the world due to their demonstrated ecological value. Ironically, temperate countries of the western world (Europe, U.K., and USA) are far more organized in this aspect than the tropics, where the diversity of Chiroptera is enormous. In the tropics, Australia, Mexico and some states in Malaysia have strong protective legislation for bats while most other tropical countries and continents have no or actually negative legislation. Mexico's legislation includes full protection of caves partly because of their role as bat habitats (Hutson, *in litt*.).

Many countries are currently updating wildlife legislation as a result of the Rio Convention. In this regard, it is not really sensible to sign the Convention on Biological Diversity and continue to treat pollinating and seed dispersing animals as "noxious". CITES regulations regarding *Pteropus* and *Acerodon* also have influenced some states to introduce protective legislation for bats (Hutson, in litt).

In South East Asia the Malaysia Parliament in Borneo has protected all bats under a Wild Life Protection Ordinance (1998), which requires a license for domestic possession of bats or any part or derivative. A more recent Malaysian law requires a license for the sale and use of all mist nets with severe penalties for their sale and use (Gumal & Racey, 1999). In fact, peninsular Malaysia has included fruit bats in legislation for control of hunting since 1972 and there is similar legislation for some other states in Malaysia. Other South East Asian states legislations are not so specific.

Protective legislation for Chiroptera is a vexed subject in the region of South Asia, particularly in India where fruit bats are caught and eaten as food by some local people, and used for medicines to cure headache and female ailments by others. They can be trapped for zoos or laboratory work in any numbers with impunity. Fruit bats are killed in great numbers from time to time due to what is considered their nuisance value to farmers when they damage orchards. Participants in the C.A.M.P. workshop recorded 11 species of Microchiroptera and 8 species of Megachiroptera that were hunted for food or medicinal use in India, Nepal, Sri Lanka and Myanmar

No South Asian country protects bats in principle. Sri Lankan legislation gives full protection to one subspecies, *Rousettus leschenaulti seminudus*. Other countries, such as Pakistan go to the other extreme of exempting bats from wildlife legislation. Bats are exempted from the regulation of international trade in Pakistan and the Punjab excludes *Pteropus giganteus* from protection (Mickleburgh *et al*., 1992).

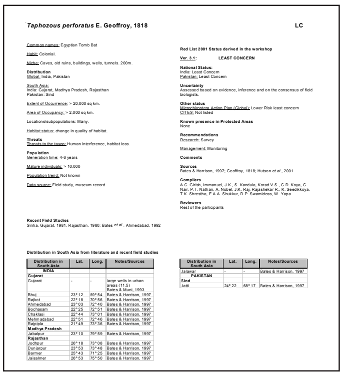
In India fruit bats are listed as a group on Schedule V of the Indian Wildlife (Protection) Act, 1972 which is the only Schedule that carries no penalty or restriction at all for the killing or capture of bats, crows, mice, and rats. At one time wild boar and jackal were also listed on Schedule V but have since been de-listed.This year for the first time the Ministry for Environment amended the Wildlife (Protection) Act to include two threatened bats on Schedule I. This will, perhaps, create a precedent for delisting of fruit bats from Schedule V and upgrading to a Schedule that will provide some protection. Without more hard information about the status and value of fruit bats and thorough documentation of their ecological significance, it has been impossible to persuade the government to do so.

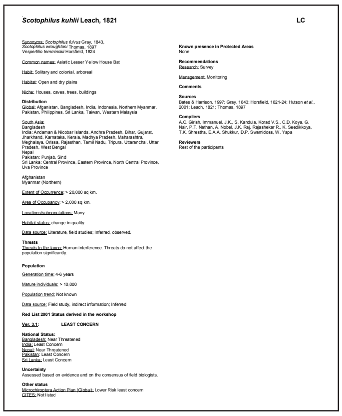
Insectivorous bats are not listed in any schedule and can be similarly persecuted with impunity if they prove to be a nuisance to human beings. They settle in temples, in the eaves of houses and in deserted structures where they are driven out by various means without regard for their value in nature. As insectivorous bats are not listed anywhere in the Wildlife (Protection) Act, 1972, the only circumstance under which anyone can be charged and prosecuted for harming them is within a Protected Area, where every living creature comes under the protection of the Chief Wildlife Warden of the state.

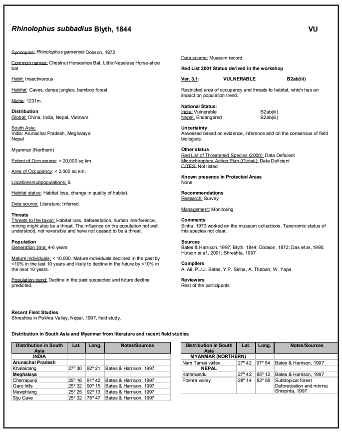
Legislation cannot be implemented if officials whose duty is to uphold the law are not aware of its implications. Foresters can do much to rectify this situation.

Taxon Data Sheets

Eight-page Taxon Data Sheets are used in gathering information at the workshop. The samples posted below are the Taxon Data Sheets as seen in the final report of the CAMP workshop.


Taphozous perforatus E. Geoffroy, 1818 LC


Scotophilus kuhlii Leach, 1821 LC


Rhinolophus subbadius Blyth, 1844 VU

Conclusion

The South Asian Chiroptera C.A.M.P. (2002) was an improvement over the previous assessment of Indian bats in 1997. The Mammal C.A.M.P. of 1997, in which 102 bats were assessed was a milestone itself compared to the nearly total inattention to status of bats which preceded it. Improvements notwithstanding, the recent workshop merely has brought into full focus how much still is unknown about the world's second largest and most ecologically and economically valuable mammal groups

Although most of the bats could be assessed, with far fewer Data Deficient species, the information used to derive the categories was dependent to a greater extent on inference and indirect sources and begs for systematic field studies.

By and large the field biologists, foresters, and taxonomists of South Asia have yet to consider the overall threats impacting the population dynamics of bats, as evidenced by the example of *Pteropus giganteus* and other widespread species. It was evident that a widespread species is considered "safe" irrespective of various threats identified, especially loss of roost trees, hunting, pesticide use, change in habitat quality and even negative legislation.

It is also clear from the workshop that ecological studies need special focus both for better status assessments and for understanding the ecological and economic role of bats. It is also clear that that there is a crying need for more active, full-time field biologists working on bats in South Asia to deal with the 123 species of this large, neglected and complex group of mammals.

The fate of man's quality of life depends to a great extent on his capacity to reverse some current trends in management, legislation and even science, which are based on subjective impressions and unpractical policies. It may well be the case with South Asian bats.

In science, systematic reviews of literature reveal that even scientists focus far more attention on species which are large in size and whose importance to ecosystems may be more symbolic than actual. Amori *et al*. (2000) showed that published articles on highly speciose but small-bodied groups such as bats and rodents were dramatically less numerous than those on large mammals, and very much less in tropical countries where species richness is far greater. Barnett (2002), quoted a recent review by Alan Clarke of University of Washington of 32,000 articles on conservation research which revealed a tremendous bias towards more attractive animals with the most speciose group -- invertebrates -- at the low end of the list. Further in the 1990's the U.S. state and federal endangered species agencies spent far more on threatened birds and mammals than invertebrates. Clark goes on to say that there has been no improvement in this regard for the last 15 years, although scientists are aware of the discrepancy.

In management, species such as small mammals, invertebrates, amphibians, etc. do not get the concentrated attention they need even though landscape approaches might preserve larger swatches of habitat. Many habitats are already lost that niches or islands of forest require intensive and intelligent maintenance to preserve the valuable and unique biodiversity they represent.

Legislation is still based on false economic principles and political salvation without sufficient attention to genuine scientific information from active field biologists.

The lack of scientific objectivity in general wildlife practices in the world is what makes the IUCN Red List Criteria so valuable. Focusing on biological values, using the most current information from active field workers from the range of the species, recommendations based on hard data, and objective application of the IUCN Red List Criteria to this information - provides a compass by which the direction of a viable conservation action plan can be understood and put into practice.