

# Status of South Asian Non-volant Small Mammals

Sally Walker

Readers may remember the feature articles in ZOOS' PRINT, Vol.19(4): 1-5 and in Rat-a-Tattle Newsletter in the past year regarding the non-volant small mammal CAMP and GMA. This was held 9-13 February 2004 at the Karl Kubel Training Institute in Coimbatore, India. This workshop was years in planning and preparation. It was scheduled and cancelled two or three times. Finally, it could materialise and had the additional benefit of collaboration with the Conservation International/Species Survival Commission Global Mammal Assessment.

Such a complicated and difficult-to-organise workshop might be expected to have a complicated and difficult-to produce report and this was the case. Non-volant small mammals are one of the lesser studied groups of mammals, although their species numbers make them one of the largest groups. Their large number meant much more text, tables and taxon data sheets to correct and to standardise, more maps to produce, more checking to be done, etc. Finally, the 618 page Report has been published, on 1 September 2005, and is being circulated in different versions to persons who want and need to know about the status of non-volant mammals ...to study them, to help them, to legislate for them, to protect them.

## Editors and Authors

The Report was edited by Sanjay Molur, C. Srinivasulu, Bhargavi Srinivasulu, Sally Walker, P.O. Nameer and Latha Ravikumar but dozens more people worked many, many long and hard hours to check and recheck all parts of it to make it suitable for publication. That is nothing compared to the hours of field work the non-volant small mammal biologists put into the field studies which gave the workshop information to make IUCN Red List assessments and assign species to Red List categories. Eighteen non-volant small mammal biologists input directly into the workshop in February 2004 and another group of the same size sent current information on Biological Information sheets. These persons are the Authors of the Report.

## Organisers, Collaborators and Sponsors

The workshop was organised by the Rodent Insectivore Lagomorph Scandent Conservation & Information Network of South Asia (RILSCINSA), the Conservation Breeding Specialist Group, South Asia (CBSG, SA), Zoo Outreach Organisation (ZOO), and Wildlife Information & Liaison Development (WILD) along with collaborators IUCN SSC Conservation Breeding Specialist Group (CBSG), IUCN SSC Reintroduction Specialist Group, and the IUCN SSC Rodent Specialist Group. All of the IUCN SSC small mammal specialist groups were represented at the workshop, e.g., the IUCN SSC Rodent, Insectivore and Lagomorph Specialist Groups with members from South Asia, UK, and USA, including the Rodent Specialist Group Chair, Giovanni Amori from Italy. A high powered team of mammalogists from the Global Mammal Assessment (GMA) assisted with recording information. The workshop was endorsed by the IUCN SSC Rodent Specialist Group, the IUCN SSC Conservation Breeding Specialist Group, the IUCN Regional Biodiversity Programme (RBP), Asia and the Reintroduction Specialist Group, South & East Asia.

The workshop would not have been possible without Knowsley Safari Park, who sponsors the whole non-volant small mammals network, RILSCINSA, and has sponsored training workshops in three countries of South Asia, aided by Chester Zoo and Universities Federation for Animal Welfare, who sponsored travel for resource persons for the training in reintroduction, welfare and captive breeding immediately following the CAMP.

An interesting feature of the book is the art work. We collected as many photographs of non-volant small mammals as possible and contracted our favourite artist, Arnab Roy, from Calcutta to make

line drawings from them. Some examples illustrate this article and are found throughout the book.

## The C.A.M.P. Process

For those who are reading about the C.A.M.P. Process for the first time, it was developed by the IUCN SSC Conservation Breeding Specialist Group (CBSG). It includes assembling experts such as wildlife managers, SSC Specialist Group members, representatives of the academic community or private sector, researchers, captive managers and other stakeholders who provide the most current information in order to a) assign species and subspecies to IUCN Categories of Threat; b) formulate broad-based management recommendations, and c) develop more comprehensive management and recovery programs *in situ* and/or *ex situ*. Extensive review is carried out by participants who desire to do so before the final Report is compiled and finalised.

C.A.M.P. workshops use the most recent version of the IUCN Red List Criteria and Categories and, where appropriate, the IUCN SSC Guidelines for Application of IUCN Red List Criteria at Regional Levels (version 3.0), as tools in assessing the status of a group of taxa. In the last decade IUCN has improved the method of assessing taxa by incorporating numerical values attached to the different criteria for threat categories. The 2001 version (version 3.1) of the Red List Criteria and Categories use a set of five criteria (population reduction; restricted distribution, continuing decline and fluctuation; restricted population and continuing decline; very small population; and probability of extinction) to determine the threatened categories, which are Critically Endangered (CR), Endangered (EN) and Vulnerable (VU). Other categories are Extinct (EX), Extinct in the Wild (EW), Near Threatened (NT), Least Concern (LC), Data Deficient (DD) and Not Evaluated (NE).

## The Workshop

Four South Asian countries were represented at the workshop: India, Nepal, Sri Lanka and Bangladesh with participants present throughout the exercise. C.A.M.P. workshops use working group sessions alternating with review in several plenary sessions. In this workshop the groups were organised by family/orders: two groups on Muridae (including all other families of rodents, and including lagomorphs and pholidots), Sciuridae and Insectivora.

With the added advantage of having many working field biologists from the range of these taxa, there was a significant improvement in data quality compared to the exercise conducted in 1997 under the auspices of the Biodiversity Conservation Prioritisation Project BCPP. In the current C.A.M.P. workshop, 55 of the 185 non-volant small mammal species were categorized as threatened. Thirtyeight of the 62 species endemic to South Asia are threatened, which is over 60% of all NVSMs in the region! However, of the 123 non endemics, only 17 are threatened. Restricted distribution is therefore a major criteria for threat assessments in the case of NVSMs in South Asia, barring six species that were categorised as threatened due to population decline and four species due to being found in only a few locations albeit with no threats on either the population or habitat.

Species not endemic to a country were assigned national status in every country of occurrence according to the IUCN Regional Red List Criteria (IUCN, 2003). India having the largest land area has the most endemic NVSM species - 26, followed by Sri Lanka with 10, and Nepal and Pakistan with one each. The remaining 24 species are endemic to South Asia but distributed in more than one country.

A Draft Report containing Taxon Data Sheets for all 185 NVSM species was given to participants at the end of the workshop thanks to the C.A.M.P. Data Entry Programme and hard work by recorders. The published report reflects the corrections and

comments that were returned on the draft Taxon Data Sheets. The output from the workshop has been submitted to the appropriate specialist group chairs and IUCN Red List committee for inclusion in 2005 IUCN Red List of Threatened Species. This is an appropriate utilisation of information from local field biologists and NVSM students from South Asia, and a credit to their work.

The Workshop was greatly aided by four members of the Global Mammal Assessment who participated in the working groups and in assessments. The GMA team filled in data into the GMA database as well as mapped the distribution on the computer. The information on nonendemic species from the region will be used to assess the global status of widely distributed species of NVSMs by GMA.

### Recommendations

A series of recommendations for research and management of South Asian Non-volant Small Mammals was derived from Taxon Data Sheets filled out by participants in the workshop. Key recommendations for research were taxonomic studies, surveys and life history studies; and for management included habitat management, public education and monitoring. Special issue working groups were formed on the following subjects: Research and field studies, Taxonomy, and Networking, training and education. There were also recommendations on captive breeding which have been published in Section 3 of the Report, Additional Information.

### Captive Breeding recommendations

The following recommendations are made with regard to the information presented at the C.A.M.P. and contained within the data sheets, combined with existing captive husbandry knowledge and experience. Recommendations generally are made on a 'South Asia wide' basis rather than making separate recommendations for each of the countries. Clearly there may be additional national priorities if they were assessed on a 'country by country' basis leading to additional conservation breeding recommendations.

Species are recommended primarily for two different strategies; firstly as an insurance population in cases where the distribution is extremely limited or fragmented and threatened. Under these circumstances, these insurance populations are required to safeguard the species from potential extinction, but are not recommended at this stage for conservation breeding and release. The second strategy is for recovery purposes involving conservation breeding and release. At this stage, while species may be recommended for a recovery programme, this is only to highlight the potential. Any release should only be as part of an integrated and coordinated programme fully discussed and approved with the appropriate authorities and IUCN. Conservation breeding of small mammals is not widely practiced in South Asia and so it is generally recommended that model species are used to gain experience in the husbandry and management of small mammal conservation breeding programmes, which can be equally if not even more complex than programmes for large mammals. General experience should be improved by working with wild trapped stock of fairly common species such as *Rattus rattus*, *Tatera indica*, *Suncus murinus*, *Funambulus pennanti* / *F. palmarum*. In the early stages, it also may be necessary for assistance from outside the region to secure insurance populations of some of the high priority species.

### Lagomorpha

**Caprolagus hispidus [EN B2ab(ii,iii,iv)].** Recommended for an *ex situ* programme for recovery purposes due to being a habitat specialist of highly fragmented habitat patches (Terai grassland) to which natural recolonisation may be unlikely. Captive husbandry is likely to be very difficult.

### Rodentia

**Alticola albicauda [DD].** Known from a single specimen only but likely to be highly threatened and recommended for an *ex situ* programme for insurance purposes should the opportunity arise to

obtain stock of this species. *Alticola* spp. can be difficult to keep and breed in captivity although several species have been successfully kept.

**Biswamoyopterus biswasi [CR B1ab(iii); D].** Highly recommended for an *ex situ* programme for insurance purposes due to its very small population and highly restricted threatened habitat. Whilst some techniques for the husbandry of other large flying squirrels (*Petaurista*, *Trogopterus*) are known, they are generally very difficult species to maintain in captivity requiring a high level of skill and complex husbandry.

**Calomyscus hotsoni [CR B1ab(ii,iii)].** Highly recommended for an urgent *ex situ* programme for insurance purposes and also potentially for a recovery programme following field work. This species is highly restricted and under habitat threat. Other members of the genus *Calomyscus* have been kept and bred successfully within captivity.

**Cremonomys elvira [CR B1ab(ii,iii)+2ab(ii,iii)].** Highly recommended for an urgent *ex situ* programme for insurance purposes due to its very restricted distribution and threat to habitat. The captive husbandry of *Cremonomys* is unknown but may be similar to small *Rattus* for which techniques are well known.

**Funambulus layardi [VU A3c+4c;B1ab(ii,iii)].** If the species is rediscovered from India then this population would be highly recommended for an *ex situ* programme for recovery purposes due to its taxonomic uniqueness from the Sri Lankan populations and highly restricted distribution. Captive husbandry of *Funambulus palmarum* and *F. pennanti* is known although can be difficult.

**Funambulus sublineatus [VU B2ab(ii,iii,iv)].** Recommended for an *ex situ* programme for recovery purposes due to being a habitat specialist of highly fragmented habitat patches to which natural recolonisation may be unlikely. Captive husbandry of *Funambulus palmarum* and *F. pennanti* is known although can be difficult.

**Millardia kondana [CR B1ab(iii)+2ab(iii)].** Highly recommended for an urgent *ex situ* programme for insurance purposes due to its very restricted distribution and threat to habitat. The captive husbandry of *Millardia* is unknown but may be similar to small *Rattus* for which techniques are well known.

**Mus famulus [EN B1ab(ii,iii)+2ab(ii,iii)].** Recommended for an *ex situ* programme for recovery purposes due to being a habitat specialist of highly fragmented habitat patches (Shola grassland) to which natural recolonisation may be unlikely. Captive husbandry of other *Mus* spp. is well known.

**Mus fernandoni [EN B1ab(ii,iii)+2ab(ii,iii)].** Recommended for an *ex situ* programme for insurance purposes due to the high fragmentation of populations and continuing habitat loss. Captive husbandry of other *Mus* is well known.

**Mus mayori [EN B1ab(ii,iii)].** Recommended for an *ex situ* programme for insurance purposes due to the high fragmentation of populations and continuing habitat loss. Captive husbandry of other *Mus* spp. is well known.

**Rattus burrus [EN B1ab(ii,iii)+2ab(ii,iii)].** Recommended for an *ex situ* programme for insurance purposes due to the highly restricted and fragmented distribution of this species. If circumstances on the Andaman and Nicobar Islands allow, this species may also be the subject of a recovery programme. Captive husbandry of other medium sized *Rattus* spp. is well known.

**Rattus palmarum [CR B1ab(iii)].** Highly recommended for an urgent *ex situ* programme for insurance purposes due to the highly restricted distribution of the species and habitat threats. If circumstances on the Andaman and Nicobar Islands allowed this

species may also be the subject of a recovery programme. Captive husbandry of other medium sized *Rattus* spp. is well known.

***Rattus ranjiniae* [EN B1ab(ii,iii)+2ab(ii,iii)].** Highly recommended for an *ex situ* programme for insurance purposes due to the highly restricted distribution of this species and threats to habitat. Captive husbandry of some other *Rattus* spp. is well known.

***Rattus stoicus* [VU D2].** Highly recommended for an urgent *ex situ* programme for insurance purposes due to the highly restricted and fragmented distribution of populations of this species. Captive husbandry of other medium sized *Rattus* spp. is well known.

#### **Soricomorpha**

***Crocidura andamanensis* [CR B1ab(iii)].** Highly recommended for an *ex situ* programme for insurance purposes due to the highly restricted distribution of the species and habitat threats. If circumstances on the Andaman and Nicobar Islands allowed, this species may also be the subject of a recovery programme. Captive husbandry of shrews can be difficult although techniques are known for the successful long-term maintenance of several small *Crocidura* spp. in captivity.

***Crocidura hispida* [VU D2].** Highly recommended for an urgent *ex situ* programme for insurance purposes due to the highly restricted distribution of this species. Captive husbandry of shrews can be difficult although techniques are known for the successful long-term maintenance of several small *Crocidura* spp. in captivity.

***Crocidura jenkinsi* [CR B1ab(iii)].** Highly recommended for an *ex situ* programme for insurance purposes due to the highly restricted distribution of the species and habitat threats. If circumstances on the Andaman and Nicobar Islands allowed, this species may also be the subject of a recovery programme. Captive husbandry of shrews can be difficult although techniques are known for the successful long-term maintenance of several small *Crocidura* spp. in captivity.

***Crocidura nicobarica* [EN B1ab(iii)+2ab(iii)].** Recommended for an *ex situ* programme for insurance purposes due to its highly restricted and fragmented distribution and threats to habitats. Captive husbandry of shrews can be difficult although techniques are known for the successful long-term maintenance of several small *Crocidura* spp. in captivity.

***Suncus dayi* [EN B1ab(ii,iii)+2ab(ii,iii)].** Recommended for an *ex situ* programme for recovery purposes due to being a habitat specialist of highly fragmented habitat patches (Shola grassland) to which natural recolonisation may be unlikely. Captive husbandry of *Suncus murinus* is well known although other *Suncus* can be very difficult to maintain in captivity.

#### **Captive Management of Small Mammals in South Asia**

Both the types of what we term as “small mammals”, volant or flying mammals and non-volant or non flying in the world are kept in zoological gardens of the world. All play an immense role in ecosystems making them excellent animals for display. They are small and non-threatening to human beings, and they breed easily and quickly, all of which makes them good candidates for conservation breeding programmes.

Small mammals make up by far the greater number of all the mammals on earth with Rodentia as the largest Order. Rodents and shrews disperse seeds and pollen and control invertebrate populations. They also consume vegetation which clogs waterways and cause other problems and, most importantly, they are prey for a host of small and even large carnivores. Small mammals are highly speciose.

Mammalian species of the world total about 4629. Of these, mammals which are not “small” are Cetacea (2%), Lagomorph (2%), Diprotodont (3%), Artiodactyla (5%), Primates (5%), Carnivora (6%), Others (6%). The rest are “small mammals” (bats (19%), rodents (43%) and insectivores (9%)) which equal 71% of total mammal diversity. Leaving small mammals out of zoo collections is almost as misleading as leaving out invertebrates!

Contrary to what people often think, small mammals are very much prone to extinction. According to the 2000 IUCN Red List, 74% of mammal species categorised as Extinct by IUCN excluding Extinct in the Wild consisted of Chiroptera (14%), Rodentia (53%) and Insectivora (7%). The other mammals categorised as Extinct are Diprotodont (7%), Artiodactyla (6%), Paramelemorph (4%), Carnivora (4%), Others (5%). An inordinate percentage of small mammal species are from a restricted range, which is a factor for the very high percentage of threatened species of Rodentia (29%), Insectivora (14%), Chiroptera (21%). The other threatened mammal orders are Didelphimorph (2%), Dasyuomorph (2%), Diprotodont (3%), Artiodactyla (6%), Primates (10%), Carnivora (6%). The above figures are global but in tropical countries and regions there is a similar or even more dramatic disproportion of small mammals to other mammals. In South Asia, the proportion of small mammals to other mammals is well over 60%. These are dramatic figures, yet, small mammals are neglected compared to other mammals both by zoological gardens and by conservation scientists.

#### **Zoos and scientists**

The proportion of small mammals kept in zoos is highly disproportionate to their number, threat status and ecological importance according to ISIS, IZY, and other zoo records. As a result, zoo exhibits do not tell the true story of ecosystems or of biodiversity. What people see and the subliminal impression it imparts is far from reality. Small mammals represent a big gap in zoos’ commitment to conservation. Zoos interested in biodiversity education perhaps should be aware of the subliminal message conveyed by a preponderance of large mammals and other charismatic species to the more numerous species. Even scientists — field biologists — neglect small mammals as the comparatively small number of field studies and published papers indicate when compared to studies of charismatic large animals. This has been quantified in a scientific paper by Giovanni Amori, Chair of the IUCN SSC Rodent Specialist Group. His research revealed a very small number of field studies and a very small number of conservation-oriented published papers on small mammals, compared to charismatic large animals. This was particularly true in countries of high biodiversity and very particularly in Asia (Amori, 2000).

As has been described in Status of South Asian Non-volant Small Mammals (2005), in addition to many species having a limited range, the threats to small mammals are numerous, e.g., habitat loss, habitat destruction, alien invasive species (competition, predation), disease. Other threats are that forest rodents are mistaken for pest species, harassment by human beings, trapping for food and medical use and — more than any — ignorance of their immense value.

Therefore, zoos do not have a true picture of the conservation status of many species of small mammals in South Asia, because even scientists don’t. In high biodiversity countries, scientific conservation studies on behalf of small mammals are considerably less than in other parts of the world. It is found that the number of academics working on conservation of small mammals is far fewer and they are isolated from one another individually and institutionally. The small amount of work which has been done often is not published.

Therefore, wildlife protective legislation in many tropical countries does not include most small mammals; government needs published scientific evidence to protect these controversial animals which are always considered pests and as threats themselves by the agriculture lobby. Governmental funding for conservation studies

or threat assessments is not easily available for these groups.

In fact, interest is so low that it takes a focused non-traditional initiative to network, train and nurture sufficient small mammal biologists so that a community of scientific workers for small mammals will emerge and work together effectively. Two such initiatives are the Rodent Network and Bat Network of the Zoo Outreach Organisation and CBSG/South Asia, more specifically the Chiroptera Conservation and Information Network of South Asia CCINSA and the Rodent, Insectivore, Lagomorph, Scandent Conservation and Information Network of South Asia (RILSCINSA).

#### **Zoo conservation partnerships**

Zoo and other conservation partnerships can help these network make a difference for the two largest orders of mammals in South Asia, Chiroptera and Rodentia. Zoos can fulfill their commitment to conservation of small mammals first by educating the public, then by assisting the field community and finally when information is organized, by taking up breeding programmes for threatened species. Already, zoos, conservation organisations and animal welfare organizations from temperate countries have adopted some of these projects and assist in many ways, to wit :

**1. Providing technical support:** Dr. Paul Racey, Regius Professor of Natural History, Aberdeen University, Chair, IUCN SSC Chiroptera SG; Giovanni Amori, Chair, IUCN SSC Rodent SG, Mike Jordan, Curator of Mammals, Chester Zoo and Chair, IUCN SSC Reintroduction SG Europe, W Asia & Member, Rodent SG, Insectivore SG; Werner Haberl, Chair, IUCN SSC Insectivore SG; Andrew Smith, Chair, IUCN SSC Lagomorpha SG, Conservation Breeding SG, and Reintroduction SG.

**2. Contributing funds:** For networks, training, public awareness, lobbying, conservation workshops such as C.A.M.P./GMAs, and for field techniques, taxonomy and other conservation training: Chester Zoo, Knowsley Safari Park, Columbus Zoo, Riverbanks Zoo, Bat Conservation International, Marwell Zoological Park, Miami Metro Zoo, Cleveland Zoological Society.

**3. Hosting South Asian professionals** to participate as trainees in their projects (ex. The Chester Zoo Harvest Mouse programme)

**4. Contributing time of staff:** Chester Zoo and Aberdeen University. Some of the major projects which relate to zoos have been

**i. Conservation Workshops:** C.A.M.P. Workshop for South Asian Chiroptera – 2002; C.A.M.P. Workshop for South Asian Non-volant Mammals – 2004; Field Techniques Training 2002, 2003, 2004, 2005, Reintroduction and Conservation Welfare Training. Zoos can use the C.A.M.P. output for prioritising species for conservation breeding and the Reintroduction and Conservation Welfare training for exhibiting small mammals and later possibly reintroducing them.

**ii. Education, communication, lobbying:**

— Teaching scientists to teach kids  
— Forest officers education project  
— Preparation and distribution of educational materials for zoos, schools, conservation NGO's  
— Lobbying to have Rodents (mice and rats) removed from negative list of Wildlife Protection Act

**iii. Checklists on the zoo premises:** Some zoos have a wide variety of rodents and insectivores due to their highly vegetated zoo campus and food attraction from the spilled and stored foodstuffs for other animals.

**iv. Networking:** Some zoo personnel are members of our taxon networks and all are welcome. Thus, it is possible to make a big change in neglected faunal groups with zoo conservation partnerships as demonstrated by the projects

involving small mammals in South Asia. The Knowsley Safari Park, Liverpool has supported such activities on behalf of Rodentia since 2001 and the Chester Zoo has supported Rodentia and Insectivora by contributing staff time to training workshops. Both have contributed generously to the support of the Conservation Breeding Specialist Group, South Asia Network which coordinates these taxon conservation networks. The commitment of these zoos has made it possible to conduct C.A.M.P.s/Red Listing exercises, field training, lobbying and public education. It is a model of zoo cooperation for *in situ* conservation at a very basic level.

#### **Small Mammal Zoo Conservation and Management**

Currently, captive management of Small Mammals is not particularly well-organised. Currently in India, where there are some 164 zoos, mini-zoos, and deer parks, there are only 9.14.1.24 reported squirrels of three subspecies; an unnecessary 68.54.72.194 porcupines of three subspecies, and a possibly hopeful population of 9.4.6.19 Himalayan Marmots, *Marmota bobak*, at Calcutta Zoo. There are even fewer in the other South Asian countries (Tables on following page.)

The only significant populations in numbers are the common Porcupine, *Hystrix indica*, which exists in good numbers and a reasonable sex ratio in 24 institutions. Another species, Bengal Porcupine, *Atherurus macrourus assamensis*, may be also feasible for a conservation breeding with a relatively small number (10.9.24.43), reasonable sex ratio but no studbook. There are single or single sexed animals in some situations as with the Mysore Zoo's single female Giant Grizzled Squirrel, *Ratufa macroura* and others.

#### **Editorial comment (not in Status of South Asian Non-volant Mammals)**

**The "policy" of zoos of South Asia is to focus their attention on the more charismatic species. This policy is unwritten in most countries but in India, the Central Zoo Authority has made a decision to highlight the larger, threatened mammals which is reported in their meeting minutes and attested by the recent selection of certain animals for intensive attention.**

**It is because of these policies that we have not included captive management recommendations in the combined Report.**

**We hope that in future, the zoos of this region will evolve to a point where they can "afford" to spend time, energy and funds on small, threatened animals as well as large ones. All are part of biodiversity which is the point of it all.**



# Non-volant Small Mammals in Indian and other South Asian Zoological Gardens

## Non-volant Small Mammals in Indian Zoological Gardens, 2002-2003 (CZA database)

Country	Species	Zoo	M	F	U	T
<b>India</b>						
<b>GIANT SQUIRREL</b>						
<b>Squirrel Giant Grizzled, <i>Ratufa macroura</i></b>						
		Sri Chamarajendra Zoological Gardens	0	1	0	1
<b>Squirrel Giant Malabar / Indian, <i>Ratufa indica</i></b>						
		Alipore Zoological Garden	0	1	0	1
		Arignar Anna Zoological Park	1	1	0	2
		Bannerghatta Natl Pk & Zoological Garden	0	3	0	3
		Jaipur Zoo	1	0	0	1
		Lucknow Zoological Park	1	3	0	4
		Marble Palace Zoo	2	2	0	4
		NBC Pranisangahalaya	1	0	0	1
		Sanjay Gandhi Biological Park	1	1	0	2
		Thiruvananthapuram Zoo	0	1	0	1
		Tiger & Lion Safari, Thyayarekoppa	1	1	0	2
<b>Squirrel Malayan, <i>Ratufa bicolor</i></b>						
		Kanpur Zoological Park	1	0	1	2
<b>PORCUPINE</b>						
<b>Porcupine Bengal, <i>Atherurus macrourus assamensis</i></b>						
		Arignar Anna Zoological Park	3	3	2	8
		Indroda Nature Park	0	0	2	2
		Kamla Nehru Zoological Garden	0	0	9	9
		Kanpur Zoological Park	1	2	0	3
		Marble Palace Zoo	1	1	0	2
		Nandankanan Biological Park	0	1	0	1
		National Zoological Park	2	0	0	2
		Sakkarbaug Zoo	1	1	0	2
		State Museum & Zoo	1	0	0	1
		Tata Steel Zoological Park	1	1	0	2
		Udaipur Zoo	0	0	11	11
<b>Porcupine Brush-tailed/Bengal, <i>Atherurus macrourus</i></b>						
		Alipore Zoological Garden	0	0	2	2
		Assam State Zoo Cum Botanical Garden	2	1	0	3
		Kamla Nehru Zoological Garden	1	0	0	1
<b>Porcupine Himalayan Crestless, <i>Hystrix hodgsoni</i></b>						
		Assam State Zoo Cum Botanical Garden	1	0	0	1
<b>Porcupine Indian, <i>Hystrix indica</i></b>						
		Assam State Zoo Cum Botanical Garden	1	0	0	1
		Aurangabad Municipal Zoo	3	3	0	6
		Bhagwan Birsa Biological Park	0	0	2	2
		Bondla Zoo	2	2	0	4
		Gandhi Zoological Park	1	1	0	2
		Indira Gandhi Zoological Park	3	3	0	6
		Itanagar Biological Park	1	1	2	4
		Jaipur Zoo	1	1	4	6
		Kamla Nehru Prani Sanghralay Zoo	5	4	1	10
		Lucknow Zoological Park	0	0	1	1
		Mahendra Chaudhury Zoological Park	0	0	10	10
		Nandankanan Biological Park	1	1	0	2
<b>Porcupine (Albino), <i>Hystrix indica</i></b>						
		Bannerghatta Natl Pk & Zoological Garden	5	3	2	10
		Jawaharlal Nehru Biological Park	1	1	0	2
		Manipur Zoological Garden	0	0	6	6
		Tiger & Lion Safari, Thyayarekoppa	0	0	2	2
		Veeramata Jijabai Bhosale Udyan & Zoo	1	0	0	1

## Forest Rat

### *Rattus rattus wroughtoni*

Nehru Zoological Park	3	1	0	4
Piliikula Wildlife Safari	4	3	0	7
Rajiv Gandhi Zoological Park	0	0	5	5
Rajkot Municipal Corporation Zoo	1	0	0	1
Sakkarbaug Zoo	2	1	0	3
Sanjay Gandhi Biological Park	4	6	0	10
Sayaji Baug Zoo	3	4	3	10
Sepahijala Zoological Park	1	2	0	3
Sri Chamarajendra Zoological Gardens	0	0	1	1
Sri Venkateswara Zoological Park	0	0	6	6
Sundervan Nature Discovery Centre	1	1	1	3
Thiruvananthapuram Zoo	4	3	0	7
V.O.C. Park Mini Zoo	1	0	0	1
Veeramata Jijabai Bhosale Udyan & Zoo	5	3	0	8

## MARMOT

### *Marmot Himalayan, *Marmota himalayana**

Alipore Zoological Garden	9	4	6	19
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## PANGOLIN

### *Indian Pangolin, *Manis Crassicaudata**

Sepahijala Zoological Park	1	0	0	1
Nandankanan Biological Park	1	4	0	5
Sri Chamarajendra Zoological Gardens	0	0	1	1

## Non-volant Small Mammals in South Asian Zoos

### Pakistan

#### *Indian Porcupine, *Hystrix indica**

Bahawalpur Zoo	3	4	0	7
Karachi Zoo	7	8	2	17
Lahore Zoo	0	0	4	4
Landhi Korangi Zoo	2	2	0	4

### Nepal

#### *Flying Squirrel, *Petaurista petaurista**

Central Zoo	1	0	0	1
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#### *Common Squirrel, *Funambulus palmarum**

Central Zoo	0	1	0	1
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#### *Indian Giant Squirrel, *Ratufa indica**

Central Zoo	0	1	0	1
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#### *Indian Porcupine, *Hystrix indica**

Central Zoo	2	0	0	2
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### Bangladesh

#### *Five Striped palm Squirrel, *Funambulus pennanti**

Dhaka Zoo	0	0	4	4
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#### *Himalayan Squirrel, *Callosciurus pygerythrus**

Dhaka Zoo	0	0	2	2
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#### *Indian Porcupine, *Hystrix indica**

Chittagong Zoo	2	2	0	4
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Comilla Zoo	0	0	1	1
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Dhaka Zoo	1	2	3	6
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Rajshahi Zoo	0	0	4	4
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Rangpur Zoo	0	0	3	3
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#### *Malayan Giant Squirrel, *Ratufa bicolor**

Dhaka Zoo	2	0	0	2
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### Sri Lanka

#### *Flying Squirrel, *Petaurista petaurista**

Dehiwala Zoo	1	0	0	1
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#### *Giant Squirrel, *Ratufa indica**

Dehiwala Zoo	3	4	0	7
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