

THE RED DATA BOOK ON INDIAN ANIMALS

PART 1 : VERTEBRATA

(Mammalia, Aves, Reptilia and Amphibia)



A Contribution to Biodiversity in India

ZOOLOGICAL SURVEY OF INDIA

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PART 1 : VERTEBRATA

(Mammalia, Aves, Reptilia and Amphibia)



Edited by the Director,
ZOOLOGICAL SURVEY OF INDIA, CALCUTTA
1994

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Mammalia

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Amphibia

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Cover drawing of a Golden Langur (*Presbytis geei*) by Subrata Biswas.

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PREAMBLE

The Zoological Survey of India, as the premier national organisation has been engaged in field survey and laboratory investigation on faunal resources of India for the last 78 years.

The living resources, fauna, flora and micro-organisms provide the lifeline for human survival. The status of such resources is considered vital for any developmental strategy. This has been realised both at global and national levels. ZSI has already published an account of *Threatened Animals of India* in 1983 and has initiated a series on *Status Survey of Endangered Species* - the first being published in 1994 on Golden langur, Phayre's leaf monkey and Hispid hare.

The present volume, the first of a two volume document gives an updated data on all vertebrate animal species (except fishes) under threat, as per the Schedules of Indian Wildlife (Protection) Act. The second volume will comprise information on invertebrates.

The present work is the result of sustained efforts of a number of scientists and naturalists. For such a task we rely heavily on the assistance and support of not only our own experts in the field but also on a number of outside associates to ensure that the data presented here is of the highest quality. I, therefore, appeal to all who read this book to pass on additional information/suggestions, if any, to the Director, Zoological Survey of India, Calcutta.

I take this opportunity to express my grateful thanks to all those who have contributed towards this work particularly to Dr. V.C. Agrawal who has compiled the data sheets, to Dr. J.R.B. Alfred who has assisted in editing and processing it and to Shri G. Sivagurunathan who has brought it out in the present form.

Calcutta
July, 1994

A. K. Ghosh
Director
Zoological Survey of India

ZSI

ZSI (Zoological Survey of India) is a national centre exploring the biodiversity of India. It was established to undertake surveys in all the biogeographic zones of the country and to collect, identify and inventorise its faunal biodiversity. Its Headquarters is located at Calcutta, with 16 Regional and Field Stations placed in different parts of the country.

Founded in 1916, the Zoological Survey of India is one of the largest repository of type specimens from which a very large number of species of animals from Protozoa to Mammalia have been described, and its collections are recognised as the **National Zoological Collection**. This comprises of more than one million specimens of nearly sixty thousand species including fifteen thousand **type specimens** from India and abroad. More than three hundred specialists are working on different groups of animals.

ZSI

- explores and surveys the faunal resources of the country;
- carries out taxonomic and ecological studies;
- undertakes status survey of endangered species;
- publishes the results in Fauna of India and State Fauna series and in Records of the Zoological Survey of India;
- maintains the National Zoological Collection;
- renders advisory, information, referral and library services;
- acts as a centre for ENVIS on Animal Ecology;
- undertakes Environmental Impact Assessment studies.

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INTRODUCTION

This is the first Red Data Book on Indian Animals containing data in synoptic form on vertebrate species (except fishes) threatened with extinction in India.

This Red Data Book has primarily been compiled on the pattern of the IUCN Red Data Book. As already decided by the IUCN, instead of the loose leaf system, this publication has been brought out as a bound volume.

The categorisation in the Red Data Book has been made according to the latest criteria of the IUCN (1993) as Extinct, Critical, Endangered, Vulnerable, Rare, and Insufficiently Known. The categorisation has been done on the basis of the population-size or the degree of threat within the Indian Union and not on the basis of its status throughout its range outside the country. Although for many species there is no factual information on the exact population size, the status has been retained on the basis of the experience of Zoologists and Naturalists in the country. The species-account follow the standard IUCN Red Data Book format, with a few modifications. A brief description of each of the species has been included as 'diagnostic characters', since many species may not be familiar to all readers.

Background

Zoogeographically, India belongs to the Oriental realm, but the Ethiopian and Palaearctic elements are also found here, partly because of the invasion of the fauna and flora from other areas and partly by man who has also contributed to this diversity. The geographical area of India is about 329 million hectares and its coastline stretches to nearly 7000 km. The climate ranges from temperate to arctic in the Himalaya, to tropical and subtropical in the Indo-Gangetic plains and the peninsular region. The vegetative cover is rich and of varied type, consisting of all types of forests and a vast expanse of grasslands, each with its teeming millions of fauna characteristic of these habitats. The Thar Desert in western Rajasthan is the hottest and most hostile. The annual rainfall varies from about 100 mm in the desert (Rajasthan) to as high as 5000 mm, in Meghalaya. The ecology of major regions of India is, however, largely dependant on the rainfall. Based on the habitats, India has been divided into the following biogeographical regions (Rodgers & Pawar, 1988) : Trans-Himalayan, Himalayan, Indian Desert, Semi-arid, Western Ghats, Deccan Peninsula, Gangetic Plains, North-East India, Islands and Coasts.

Though the area of the country is only about 2% of world's total land mass, India harbours as much as 6.67% of all known species of animals.

Based on the information available, the Indian fauna comprises a little over 81000 species including the kingdom Protista. Of these, the insects constitute about 53430 species, molluscs a little over 5000 species, mammals 372, birds 1228, reptiles 446, amphibians 204 and fishes 2546. These include 77 species of mammals, 55 species of birds, 20 species of reptiles, one species of amphibia and a large number of insects and other invertebrates which are threatened with extinction, to varying degrees.

Scope

This Red Data Book primarily deals with the animal species (mammals, birds, reptiles and amphibians) included in Schedule I of the Indian Wild Life (Protection) Act, 1972 and its subsequent amendments till date. However there are a few exceptions. Due to the vast experience of the scientists of the Zoological Survey of India in the field a few more species other than those which are mentioned in Schedule I have also been included. Similarly, a few taxa which were originally placed in Schedule I, but subsequently transferred to Schedule II without sufficient justification, get a place in this book.

In this volume, 75 species of mammals, 44 species of birds and 19 species of reptiles belonging to Schedule I, two species of mammals and one species of amphibian belonging to Schedule II, and eleven species of birds and one species of reptile not included in any schedule but whose status is endangered or rare, have been included.

Method

The species (and subspecies) account, forming the main text of this volume are based on compilation, selection and editing of published and unpublished written information, sometimes verbal from a variety of sources and the observations of the scientists of the Zoological Survey of India in the field. A variety of people including field and museum scientists, wildlife & forest personnel and naturalists have also provided the information.

As far as possible, each data sheet is self-explanatory. However, since each is designed to be self-sufficient, there is some repetition of information on many of the sheets. The data sheets themselves are arranged phylogenetically by Order, Family, Genus, Species and in some cases Subspecies.

Recommendations

Each account in this Red Data Book includes a section on "Conservation Measures suggested" which comprises recommendations on the action required to improve the taxon's prospects of survival. The proposals are primarily concerned with the protection of the animal and its habitat, and elimination of threats to its survival.

The following is a general checklist of conservation measures for threatened species :

A. Fact Finding

1. To conduct surveys to determine
 - (a) the status of the taxon,
 - (b) the current threats to its survival,
 - (c) the remaining habitat for its survival, and
 - (d) the legal and enforcement situation.
2. To launch research projects to ascertain its ecology, the factors limiting its population-growth and the relationship between it, its habitat and the local human interaction.

B. Action Proposed

1. Legal
 - (a) to promote new legislation or make better use of powers under existing legislation,
 - (b) to promote a special international convention,
 - (c) to improve law enforcement in regard to conservation areas and CITES, and
 - (d) to add/transfer/delete a species in CITES.
2. To declare new conservation areas.
3. To establish a continuing scientific action plan
 - (a) through scientific research programme, and
 - (b) by establishing research stations.
4. To undertake educational/public awareness programmes.
5. To encourage existing conservation efforts.
6. To re-establish a taxon by translocation/release of captive bred stock or by increasing the food supply or living space by habitat management.
7. To control feral/hybrid animals.

RED DATA BOOK CATEGORIES

EXTINCT (Ex)

A taxon is Extinct when there is no reasonable doubt that the last individual has died.

CRITICAL (CR)

A taxon is Critical when it is facing an extremely high probability of extinction in the wild in the immediate future. A taxon is defined as Critical by any of the following criteria (A to E)

- A. Population estimated to number less than 50 mature individuals.
- B. Population estimated to number less than 250 mature individuals and to have both of the following characteristics.
 - 1. Population structure in the form of either of the following :
 - (a) severely fragmented i.e. no sub-population is known or estimated to contain more than 50 mature individuals,
 - (b) found only at a single location.
 - 2. Continuing decline, observed, inferred or projected in either of the following (a) number of mature individuals (b) area, extent, and /or quality of habitat.
- C. Geographic extent estimated to be less than 100 km² or range area estimated to be less than 10 km² and estimates indicating any two of the following :
 - 1. Severely fragmented or found only at a single location.
 - 2. Continuing decline, observed, inferred or projected, in any of the following :
 - (a) geographic extent; (b) range area; (c) area, extent and/or quality of habitat; (d) number of locations; (e) number of mature individuals.
 - 3. Extreme fluctuations in any of the following :
 - (a) geographic extent (b) range area; (c) number of locations.
- D. Decline in population in the form of either of the following :
 - 1. An observed precipitous and continuing decline in the number of mature individuals (typically more than 25% per year over 5 years)
 - 2. A continuing decline as specified in D1 inferred or projected from any of the following (a) a decline in area, extent and/or quality of

habitat, (b) levels of exploitation; (c) the effects of introduced species, pathogens, competitors, or parasites.

- E. Quantitative analysis showing the probability of extinction in the wild is at least 50% within 5 years or 2 generations, whichever is longer.

ENDANGERED (EN)

A taxon is Endangered when it is not Critical but is facing a very high probability of extinction in the wild in the near future. A taxon is defined as Endangered by any of the following criteria (A to E)

- A. Population estimated to number less than 250 mature individuals.
- B. Population estimated to number less than 2,500 mature individuals and to have both of the following characteristics.
1. Population structure in the form of either of the following :
 - (a) severely fragmented i.e. no sub-population is known or estimated to contain more than 250 mature individuals; (b) found only at a single location.
 2. Continuing decline, observed, inferred or projected, in either of the following :
 - (a) number of mature individuals; (b) area, extent, and/or quality of habitat.
- C. Geographic extent estimated to be less than 5,000 km² or range area estimated to be less than 500 km² and estimates indicating any two of the following :
1. Severely fragmented or found only at no more than two locations.
 2. continuing decline, inferred, observed or projected, in any of the following :
 - (a) geographic extent; (b) range area; (c) area, extent, and /or quality of habitat; (d) number of locations; (e) number of mature individuals.
 3. Extreme fluctuations in any of the following :
 - (a) geographic extent; (b) range area; (c) number of location.
- D. Decline in population in the form of either of the following :
1. An observed marked and continuing decline in the number of mature individuals (typically more than 50% in total within 5 years or 2 generations, whichever is longer).

2. A continuing decline as specified in D1 inferred or projected from any of the following :
 - (a) a decline in area, extent and/or quality of habitat; (b) levels of exploitation; (c) the effects of introduced species, pathogens, competitors or parasites.
- E. Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or 5 generations whichever is longer.

VULNERABLE (VU)

A taxon is Vulnerable when it is not Critical or Endangered but is facing a high probability of extinction in the wild in the medium-term future. The taxon is defined as Vulnerable by any of the following criteria (A to E).

- A. Population estimated to number less than 1,000 mature individuals.
- B. Population estimated to number less than 10,000 mature individuals and to have both of the following characteristics.
 1. Population structure in the form of either of the following : (a) severely fragmented i.e. no sub-population is known or estimated to contain more than 1000 mature individuals (b) found only at a single location.
 2. Continuing decline, observed, inferred or projected, in either of the following (a) number of mature individuals (b) area, extent and/or quality of habitat.
- C. Geographic extent estimated to be less than 20,000 km² or range area estimated to be less than 2,000 km² and estimates indicating any two of the following :
 1. Severely fragmented or found at no more than five locations.
 2. Continuing decline, inferred, observed or projected, in any of the following :
 - (a) geographic extent; (b) range area; (c) area, extent, and/or quality of habitat; (d) number of locations; (e) number of mature individuals.
 3. Extreme fluctuations in any of the following (a) geographic extent (b) range area; (c) number of locations.
- D. Decline in population in the form of either of the following :
 1. An observed continuing decline in the number of mature individuals (typically more than 50% in total within 10 years or 3 generations, whichever is longer).

2. A continuing decline as specified in D1 inferred or projected from any of the following :

(a) a decline in area, extent and/or quality of habitat; (b) levels of exploitation; (c) the effects of introduced species, pathogens, competitors, or parasites.

E. Quantitative analysis showing the probability of extinction in the wild is at least 10% within 50 years or 10 generations whichever is longer.

RARE (R)

The taxa with small populations in the world that are not at present endangered or vulnerable but are at risk. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range.

INSUFFICIENTLY KNOWN (IK)

A taxon is Insufficiently Known when an evaluation of its Red List category has been attempted, but available data are inadequate to assign a category.

TAXONOMIC LIST OF THREATENED SPECIES OF VERTEBRATES DESCRIBED IN THIS VOLUME

Mammalia

Order Primates Family Lorisidae

VU	<i>Loris tardigradus</i> Linnaeus	Slender Loris
IK	<i>Nycticebus caucang</i> (Boddaert)	Slow Loris

Family Cercopithecidae

VU	<i>Macaca arctoides</i> l. Geoffroy	Stump-tailed Macaque
VU	<i>Macaca fascicularis</i> (Raffles)	Crab-eating Macaque
VU	<i>Macaca nemestrina</i> (Linnaeus)	Pig-tailed Macaque
EN	<i>Macaca silenus</i> (Linnaeus)	Lion-tailed Macaque
VU	<i>Presbytis geei</i> Khajuria	Golden Langur
VU	<i>Presbytis johnii</i> (Fischer)	Nilgiri Langur
VU	<i>Presbytis phayrei</i> Blyth	Phayre's Leaf Monkey
VU	<i>Presbytis pileatus</i> (Blyth)	Capped Langur

Family Hylobatidae

EN	<i>Hylobates hoolock</i> (Harlan)	Hoolock Gibbon

Order Carnivora Family Canidae

VU	<i>Canis lupus pallipes</i> Sykes	Indian Wolf
IK	<i>Canis lupus chanco</i> Gray	Tibetan Wolf
IK	<i>Vulpes ferrilata</i> Hodgson	Tibetan Sand Fox
VU	<i>Vulpes vulpes pusilla</i> Blyth	Desert Fox

Family Ursidae

EN	<i>Helarctos malayanus</i> (Raffles)	Malayan Sun Bear
EN	<i>Ursus arctos isabellinus</i> Horsfield	Himalayan Brown Bear

Family Procyonidae

EN	<i>Ailurus fulgens</i> Cuvier	Red Panda

Family Mustelidae

VU	<i>Aonyx cinerea</i> (Illiger)	Oriental Small-clawed Otter
IK	<i>Arctonyx collaris</i> Cuvier	Hog Badger
IK	<i>Mellivora capensis</i> (Schreber)	Honey Badger or Ratel
IK	<i>Mustela erminea ferghanae</i> Thmas	Ermine or Stoat

Family Viverridae

EN	<i>Arctictis binturong</i> (Raffles)	Binturong
EN	<i>Viverra megaspila</i> Blyth	Malabar Civet
EN	<i>Prionodon pardicolor</i> Hodgson	Spotted Linsang

Family Felidae

EX	<i>Acinonyx jubatus venaticus</i> (Griffith)	Asiatic Cheetah or Hunting Leopard
VU	<i>Felis bengalensis</i> (Kerr)	Leopard Cat
IK	<i>Felis manul</i> Pallas	Pallas's Cat
EN	<i>Felis marmorata</i> (Martin)	Marbled Cat
IK	<i>Felis rubiginosa</i> Geoffroy	Rusty-spotted Cat
EN	<i>Felis silvestris</i> Schreber	Desert Cat
EN	<i>Felis temmincki</i> (Vigors & Horsfield)	Golden Cat
VU	<i>Felis viverrina</i> Bennett	Fishing Cat
EN	<i>Felis caracal schmitzi</i> Matschie	Caracal
EN	<i>Lynx lynx isabellinus</i> Blyth	Himalayan Lynx
EN	<i>Neofelis nebulosa</i> (Griffith)	Clouded Leopard
EN	<i>Panthera leo persica</i> (Meyer)	Asiatic Lion
VU	<i>Panthera pardus</i> (Linnaeus)	Leopard
VU	<i>Panthera tigris tigris</i> (Linnaeus)	Tiger
EN	<i>Panthera uncia</i> (Schreber)	Snow Leopard

Order Cetacea

Family Platanistidae

VU	<i>Platanista gangetica</i> (Roxburgh)	Gangetic Dolphin

Family Delphinidae

IK	<i>Orcaella brevirostris</i> (Gray)	Irrawaddy Dolphin or Snub-nosed Dolphin

Family Phocoenidae

IK *Neophocaena phocaenoides* (G. Cuvier) Little Indian Porpoise

Order Sirenia

Family Dugongidae

VU *Dugong dugon* (Muller) Dugong

Order Proboscidea

Family Elephantidae

VU *Elephas maximus* Linnaeus Asian Elephant

Order Perissodactyla

Family Equidae

EN *Equus kiang* Moorcroft Tibetan Wild Ass or Kiang

EN *Equus onager khur* Lesson Indian Wild Ass

Family Rhinocerotidae

EN *Rhinoceros unicornis* Linnaeus Great One-horned Rhinoceros

Order Artiodactyla

Family Suidae

IK *Sus scrofa andamanensis* Blyth Andaman Wild Pig

EN *Sus salvanius* Hodgson Pigmy Hog

Family Tragulidae

VU *Tragulus meminna* (Erxleben) Mouse Deer

Family Cervidae

VU *Cervus duvauceli* G. Cuvier Swamp Deer

EN *Cervus elaphus hanglu* Wagner Kashmir Stag or Hangul

CR *Cervus eldi eldi* McClelland Manipur Brow-antlered Deer or Sangai

EN *Moschus chrysogaster* (Hodgson) Himalayan Musk Deer

Family Bovidae

VU *Antilope cervicapra* (Linnaeus) Blackbuck or Indian Antelope

VU *Gazella dorcas bennetti* (Sykes) Chinkara or Indian Gazelle

IK *Procapra picticaudata* Hodgson Tibetan Gazelle

VU *Tetracerus quadricornis* Blainville Four-horned Antelope

IK	<i>Pantholops hodgsoni</i> (Abel)	Tibetan Antelope
CR	<i>Bos mutus</i> Przewalski	Yak
VU	<i>Bos gaurus</i> H. Smith	Gaur or Indian Bison
EN	<i>Bubalus bubalis</i> (Linnaeus)	Wild Buffalo
IK	<i>Budorcas taxicolor</i> Hodgson	Takin
EN	<i>Capra falconeri</i> Wagner	Markhor
EN	<i>Capra ibex</i> Linnaeus	Himalayan Ibex
VU	<i>Capricornis sumatraensis</i> (Bechstein)	Serow
VU	<i>Hemitragus hylocrius</i> (Ogilby)	Nilgiri Tahr
EN	<i>Hemitragus jemlahicus</i> (H. Smith)	Himalayan Tahr
IK	<i>Ovis ammon hodgsoni</i> Blyth	Great Tibetan Sheep or Nayan
EN	<i>Ovis vignei</i> Blyth	Urial or Shapu
VU	<i>Pseudois nayaur</i> (Hodgson)	Blue Sheep or Bharal

Order Pholidota

Family Manidae

VU	<i>Manis crassicaudata</i> Gray	Indian Pangolin
IK	<i>Manis pentadactyla</i> Linnaeus	Chinese Pangolin

Order Rodentia

Family Sciuridae

EN	<i>Petinomys fuscicapillus</i> (Jerdon)	Small Travancore Flying Squirrel
EN	<i>Ratufa macroura</i> (Pennant)	Grizzled Giant Squirrel

Order Lagomorpha

Family Leporidae

CR	<i>Caprolagus hispidus</i> (Pearson)	Hispid Hare

Aves

Order Pelecaniformes

Family Pelecanidae

VU	<i>Pelecanus philippensis crispus</i> Bruch	Dalmatian Pelican

Family Fregatidae

CR	<i>Fregata andrewsi</i> Mathews	Christmas Island Frigate bird

Order Ciconiiformes

Family Ardeidae

R	<i>Ardea goliath</i> Cretzschman	Giant Heron
R	<i>Ardea insignis</i> Hume	Great Whitebellied Heron

Family Ciconiidae

EN	<i>Leptotilos dubius</i> (Gmelin)	Adjutant Stork
EN	<i>Leptotilos javanicus</i> (Horsfield)	Lesser or Haircrested Adjutant
EN	<i>Ciconia ciconia boyciana</i> (Swinhoe)	Eastern White Stork

Family Threskiornithidae

EN	<i>Platalea leucorodia major</i> Temminck & Schlegel	White Spoonbill

Order Anseriformes

Family Anatidae

VU	<i>Dendrocygna bicolor</i> (Vieillot)	Large Whistling Teal
EN	<i>Anas gibberifrons albogularis</i> (Hume)	Andaman Teal
EX	<i>Rhodonessa caryophyllacea</i> (Latham)	Pinkheaded Duck
VU	<i>Cairina scutulata</i> (Muller)	Whitewinged Wood Duck

Order Falconiformes

Family Accipitridae

VU	<i>Aviceda jerdoni</i> (Blyth)	Brown Baza or Lizard Hawk
VU	<i>Aviceda leuphotes</i> (Dumont)	Black-crested Baza
VU	<i>Haliaeetus leucogaster</i> (Gmelin)	Whitebellied Sea Eagle
EN	<i>Gypaetus barbatus aureus</i> (Hablizl)	Himalayan Bearded Vulture
VU	<i>Pandion haliaetus</i> (Linnaeus)	Osprey
EN	<i>Falco biarmicus</i> Temminck	Lagger Falcon
EN	<i>Falco peregrinus peregrinator</i> Sundevall	Shaheen Falcon

Order Galliformes

Family Megapodidae

VU	<i>Megapodius freycinet</i> Gaimard	Nicobar Megapode

Family Phasianidae

EN	<i>Tetraogallus tibetanus</i> Gould	Tibetan Snowcock

VU	<i>Bambusicola fytchii</i> Anderson	Bamboo Partridge
EX	<i>Ophrysia superciliosa</i> (J.E. Gray)	Mountain Quail
VU	<i>Ithaginis cruentus tibetanus</i> (Baker)	Tibetan Blood Pheasant
EN	<i>Tragopan melanocephalus</i> (J.E. Gray)	Western Tragopan
VU	<i>Tragopan satyra</i> (Linnaeus)	Satyr or Crimson Horned Tragopan
VU	<i>Tragopan blythii</i> (Jerdon)	Blyth's Tragopan
EN	<i>Tragopan temmincki</i> (J.E. Gray)	Temminck's Tragopan
EN	<i>Crossoptilon crossoptilon harmani</i> Elwes	Elwes's Eared Pheasant
EN	<i>Lophophorus impejanus</i> (Latham)	Impeyan or Himalayan Monal Pheasant
EN	<i>Lophophorus sclateri</i> Jerdon	Sclater's or Mishmi Monal Pheasant
VU	<i>Pucrasia macrolopha</i> (Lesson)	Koklass Pheasant
EN	<i>Catrius wallichii</i> (Hardwicke)	Cheer Pheasant
CR	<i>Syrnaticus humei</i> (Hume)	Mrs Hume's Bartailed Pheasant
VU	<i>Polyplectron bicalcaratum bakeri</i> Lowe	Peacock Pheasant
VU	<i>Pavo cristatus</i> Linnaeus	Indian Peafowl
CR	<i>Pavo muticus spicifar</i> Shaw & Nodder	Burmese Peafowl

Order Gruiformes

Family Gruidae

CR	<i>Grus nigricollis</i> Przevalski	Blacknecked Crane
CR	<i>Grus monacha</i> Temminck	Hooded Crane
EN	<i>Grus leucogeranus</i> Pallas	Siberian or Great-white Crane

Family Heliornithidae

CR	<i>Heliopais personata</i> (Gray)	Masked Finfoot

Family Otididae

EN	<i>Ardeotis nigrieps</i> (Vigors)	Great Indian Bustard
EN	<i>Chlamydotis undulata macqueenii</i> (J. E. Gray)	Houbara Bustard
EN	<i>Eupodotis bengalensis</i> (Gmelin)	Bengal Florican

VU *Sypheotides indica* (J.F. Miller) **Lesser Florican**

Order Charadriiformes

Family Glareolidae

CR *Cursorius bitorquatus* (Blyth) **Jerdon's or Double-banded
Courser**

Family Laridae

EN	<i>Rynchops albigollis</i> Swainson	Indian Skimmer

Order Columbiformes

Family Columbidae

VU *Caloenas nicobarica* (Linnaeus) Nicobar Pigeon

Order Strigiformes

Family Strigidae

CR *Athene blewitti* (Hume) Forest Spotted Owlet

Order Coraciiformes

Family Bucerotidae

VU *Ptilolaemus tickelli austeni* (Jerdon) Brownbacked Hornbill

VU *Aceros nipalensis* (Hodgson) **Rufousnecked Hornbill**

VU *Rhyticeros undulatus ticehursti* Deignan Assam Wreathed Hornbill

VU *Rhyticeros narcondami* (Hume) **Narcondam Hornbill**

EN	<i>Buceros bicornis homrai</i> Hodgson	Great Pied Hornbill

VU *Anthracoceros malabaricus* (Gmelin) Malabar Pied Hornbill

Reptilia

Order Crocodylia

Family Gavialidae

EN	<i>Gavialis gangeticus</i> (Gmelin)	Gharial

Family Crocodylidae

EN	<i>Crocodylus porosus</i> Schneider	Estuarine or Saltwater Crocodile

EN	<i>Crocodylus palustris</i> Lesson	Marsh Crocodile or Mugger

Order Testudines

Family Cheloniidae

EN	<i>Caretta caretta</i> (Linnaeus)	Loggerhead Sea Turtle

EN	<i>Chelonia mydas</i> (Linnaeus)	Green Sea Turtle
EN	<i>Eretmochelys imbricata</i> (Linnaeus)	Hawksbill Turtle
EN	<i>Lepidochelys olivacea</i> (Eschscholtz)	Olive Ridley Turtle

Family Dermochelyidae

EN	<i>Dermochelys coriacea</i> (Linnaeus)	Leatherback Sea Turtle

Family Emydidae

EN	<i>Batagur baska</i> (Gray)	Batagur or Terrapin
VU	<i>Kachuga tecta</i> (Gray)	Indian Tent Turtle

Family Trionychidae

VU	<i>Lissemys punctata</i> (Lacepede)	Indian Flap-shelled Turtle
VU	<i>Trionyx gangeticus</i> (Cuvier)	Indian Soft-shelled Turtle
VU	<i>Trionyx hurum</i> Gray	Peacock-marked Soft-shelled Turtle

Order Squamata

Family Varanidae

EN	<i>Varanus bengalensis</i> (Daudin)	Common Indian Monitor
EN	<i>Varanus flavescens</i> (Hardwicke & Gray)	Yellow Monitor
EN	<i>Varanus salvator</i> (Laurenti)	Water Monitor
EN	<i>Varanus griseus</i> (Daudin)	Desert Monitor

Family Boidae

EN	<i>Python molurus</i> Linnaeus	Indian Rock Python
EN	<i>Python reticulatus</i> (Schneider)	Reticulated Python

Family Dasypeltidae

EN	<i>Elachistodon westermanni</i> Reinhardt	Indian Egg-eating Snake

Amphibia

Order Caudata

Family Salamandridae

EN	<i>Tylototriton verrucosus</i> Anderson	Himalayan Newt

Slender Loris

Order PRIMATES

Loris tardigradus (Linnaeus, 1758)

Family LORISIDAE

Diagnostic characters : A small, lanky animal of the size of a kitten, having an elongated snout, large rounded ears, close-set eyes encircled with brown, and long, slender limbs, but devoid of an external tail. Body well-furred, dark grey to reddish brown with an embellishment of silvery hairs on the back, and white or buff on the undersurface (Hill 1933, Pocock 1939, Roonwal & Mohnot 1977).

Measurements (mm) : Head and body : ♂ 186-264 ; ♀ 198-249.

Body weight (kg) : ♂ 0.35 ; ♀ 0.08-0.27

Intraspecific variations : Out of a total of six subspecies reported (Ellerman & Morrison-Scott 1951), the following two occur in India.

- i) ***lydekkerianus*** : Characterised by dark grey coat, mixed with silvery hairs, and cheeks white like that of interocular stripe.- Eastern Ghats extending westwards to Mangalore.
- ii) ***malabaricus*** : Coat brown, and cheeks darker than the interocular stripe. - Malabar coast from Goa to Trivandrum.

Distribution : India : Southern Andhra Pradesh, Karnataka, Tamil Nadu and Kerala. Also occurs in Sri Lanka.

Habitat and ecology : Slender Loris is found in tropical rain forests, open woodland and swampy coastal forests, from 200 m to 950 m altitudes. It is arboreal and nocturnal. It usually lives alone or with a mate. It is chiefly insectivorous but also feeds on young shoots, leaves, berries, bird-eggs, small birds, lizards, etc. It breeds twice a year, during April-May and October-November ; gestation lasts for 160-170 days ; a litter consists of one or two young (Kinnear 1919, Phillips 1931, Hill 1935, 1937, Ilse 1955, Manley 1967, Rao 1927, Subramoniam 1957, Seth 1963, Ramaswamy 1962 and Rahaman & Parthasarthy 1970).

Wild population : The exact population size is not known. Half a century ago, slender loris was quite common in southern India. Still it is not so rare as the slow loris but is now under great pressure.

Captive population : ISIS SDR abstract reports 40 lorises in six zoos and

animal centres, during the year 1988.

Threats to survival : The destruction of habitat is one of the major threats to this species. Moreover, it is also being used as an experimental animal by various research institutions. The eyes of slender loris are believed to be a potent love charm and of medicinal value in the treatment of eye diseases. Its status is vulnerable due to restricted distribution, habitat alteration and unauthorised killing.

Conservation measures taken : Protected in India by inclusion in Schedule I of the Wildlife (Protection) Act, 1972, as amended up to 1986, but open to restricted trade by inclusion in Appendix II of CITES.

Conservation methods suggested : The threat to this species is mainly within the country, hence, stringent measures should be taken to enforce the Wildlife (Protection) Act. In addition, the species should be included in Appendix I of CITES to check any kind of exploitation by trade.

Trade data : CITES parties registered 16 live specimens between 1979 and 1982. Often sold in local markets but seldom exported.

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Slow Loris

Order PRIMATES

Nycticebus coucang Boddaert, 1785

Family LORISIDAE

Diagnostic characters : Of the size of a small cat, having a rounded head, large round eyes encircled with brown, short ears, stout limbs and a stumpy tail (hidden in the fur) ; fur woolly, silvery white on the head and shoulders, grey on the flanks and rump ; a brown stripe present on the crown and back, which may or may not extend forward to join the eyes and ears (Groves 1971, Roonwal & Mohnot 1977).

Measurements (mm) : Head and body length : ♂ 265-380 ; ♀ 268-335.

Body weight (kg) : ♂ 0.85-1.67 ; ♀ 0.9-1.32 ; newborn 0.05.

Intraspecific variations : Out of four recognised subspecies, only one, namely *bengalensis* occurs in India. This subspecies is characterised by a pale head, and the median stripe ceasing on the middle of the crown (Pocock 1939).

Distribution : Northeastern India. Recently recorded from Tripura (Agrawal and Bhattacharya 1977, Mukherjee 1982), and Meghalaya (Pillai 1973). Also occurs in Bangladesh (Khan and Ashan 1986), Burma, Thailand, Laos, S. China, (Bangjie 1985), Malay peninsula, Indonesia, Vietnam and the Philippines (Groves 1971).

Habitat and ecology : The Slow Loris is found in the tropical rain forests. It is a very seclusive nocturnal animal, arboreal in habit and rarely comes to the ground. It feeds mainly on young shoots, leaves, fruits, insects, bird-eggs and small birds. It breeds all the year round. Gestation lasts for about 193 days. Usually single birth occurs, rarely twins. At birth, the body is covered with fur, and eyes open.

Population : Wild population : In India, the exact population-size is not known. However, it lives in small family groups. One solitary loris was recorded in Meghalaya (Pillai 1973) and three groups of two in sal and evergreen forests of Bangladesh (Green 1978, Khan and Ashan 1986). The population in Yunnan (China) is believed to be no more than a few hundred individuals (Bangjie 1985).

Captive population : ISIR SDR Abstract (1988) reports 90 lorises in 21

zoos and animal centres during the year 1988.

Threats to survival: Legal or illegal trade is one of the potential threats to this species. Natives in India have many superstitions about this animal. The whole animal or its bodyparts are said to have remarkable power of good or evil. Further, the present population is threatened by major habitat destruction. If the current destructive forces continue to operate, the population is likely to move to highly endangered category.

Conservation measures taken : Legally protected in India by inclusion in Schedule I of the Wildlife (Protection) Act, 1972 as amended up to 1986, but is open to selective trade due to its inclusion in Appendix II of CITES.

Conservation measures suggested : The species should be included in Appendix I of CITES so that international trade in this species is completely banned. Field studies should be undertaken to monitor its status.

Trade data : 358 live specimens were exported to USA alone between 1968-80. CITES parties registered 46 live specimens between 1979 and 1982.

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Compiled by V. C. Agrawal & J. R. B. Alfred

Stump-tailed Macaque

Order PRIMATES

Macaca arctoides I. Geoffroy, 1831 Family CERCOPITHECIDAE

Diagnostic characters : A large macaque, having a blotched red face, bald forehead, radiating crown hairs, thickset limbs, stumpy tail (about one-tenth of head and body length) and lanceolate glans, more than 40 mm in length. (Pocock 1939, Roonwal & Mohnot 1977).

Measurements (mm) : Head and body length : ♂ 482-700 ; ♀ 495-555.
Tail : ♂ 41-100 ; ♀ 10-61

Body weight (kg) : 6-18.

Intraspecific variations : Out of three recognised subspecies (Hill 1974), only the nominate subspecies occurs in India. The above description holds good for the Indian subspecies.

Distribution : Northeastern India. Recently recorded from Tripura (Mukherjee 1982). Also occurs in Bangladesh, extending eastwards to Vietnam, northeast to China (Fooden *et al.* 1985), and southeast to Malaysia (Hill 1974).

Habitat and ecology : Stump-tailed macaque occurs in India in thickly wooded areas up to an altitude of about 2400 m and near cultivated fields and villages. It lives in groups of 1-20 individuals, sometimes more. It is fairly terrestrial but spends a great deal of its time in trees. Feeds mainly on leaves, stems, tubers, fruits and seeds (Roonwal & Mohnot 1977).

Population : Wild population : The exact estimate of population is not known. Five troops consisting of 8-20 monkeys are reported from Tripura (Mukherjee 1982), and one troop from Meghalaya (Biswas and Diengdoh 1978). Larger troops up to 50 have been reported in Malaya (Medway 1969, 1970) and up to 100 in uninhabited forests of Thailand (Lekagul and Mc Neely 1977). About 5000 monkeys are estimated to be present in China (Bangjie 1985).

Captive population : The International Zoo Year Book reports 10 monkeys of this species bred in five collections during 1983. There are also

populations in medical research facilities.

Threats to survival : The destruction of habitat by cutting off the primary forests for jhoom cultivation, construction of bridges, railway line, petrochemical complex, etc., has considerably brought down the population of this monkey. In addition, it is also being hunted for food.

Conservation measures taken : Legally protected in India by inclusion in Schedule II of the Wildlife (Protection) Act, 1972, as amended up to 1986, and is open to selective trade due to its inclusion in Appendix II of CITES.

In the document of the Action Plan for Asian Primate Conservation, prepared by IUCN/SSC Primate Specialist Group, the Stump-tailed Macaque has been categorized as highly vulnerable with surviving population small, fragmented and threatened by habitat destruction. It is likely to move to endangered category by the year 2000 A.D., if proper conservation measures are not taken.

Conservation measures suggested : The species should be brought to Schedule I of the Wildlife (Protection) Act so as to ban its exploitation in any form. Further, studies on the ecology and behaviour of this species should be undertaken, and the population monitored at regular intervals.

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Crab-eating Macaque

Order PRIMATES

Macaca fascicularis (Raffles, 1821) Family CERCOPITHECIDAE

Diagnostic characters: A medium - sized macaque, with a rather heavy head, prominent eye-brows, backwardly directed crown-hairs and a long blackish tail, as long as or longer than the head and body ; body dusky grey above and drab below ; a white patch present above the upper eyelids in Nicobar-population (Blanford 1988-91, Pocock 1939, Roonwal & Mohnot 1977).

Measurements (mm) : Head and body length 485-510, tail 535-555, for Nicobar-population only.

Intraspecific variations: Out of 20 recognised subspecies (Napier and Napier 1967, Hill 1974) only one, namely, *umbrosa* occurs within the Indian limits.

Distribution : India : Great Nicobar, Little Nicobar and Katchal Islands (Miller 1902). Also occurs from Burma to Philippines, Malaysia, Indonesia, and coastal forests of Bangladesh (Khan and Ashan 1986).

Habitat and ecology : This monkey inhabits tropical rain forests, consisting of tall trees with profuse undergrowth of canes, bamboos, palms and ferns. It also visits mangrove forests near the sea shore. Some colonise near human settlements in the vicinity of forests to invade the crop-fields, vegetable gardens and orchards. It is omnivorous but mainly subsists on vegetable matter, and feeds on fruits, flowers and tender shoots. When available, it readily eats crustaceans and molluscs. It is usually encountered in small groups of 5-15 individuals, sometimes up to 100. Blanford (1988-91) and Furuya (1965) reported that there is no particular breeding season in this species. However, Fooden (1971) concludes that the period between March and May represents the birth peak in Thailand.

Population : Wild population : Devaraj (1983) visited nine islands of the Nicobar group in 1982 and encountered 136 monkeys in 8 troops. Saha (pers. comm.) counted 360 monkeys in 14 troops in Great Nicobar Island alone, and estimated a population of about 2000 individuals.

However, 48 monkeys in 4 troops have been reported from coastal forests of Bangladesh (Khan and Ashan 1986), and 480-600 from Anguar Island, Malaysia. In Malaya, the troop-size varied from 8 to 72, and in Thailand from 7 to 100 (Fooden, 1971).

Captive population : The International Zoo Year Book reports 184 monkeys in 31 zoos and animal breeding centres during the year 1983. There are a large number of monkeys of this species in different medical research facilities.

Threats to survival : The primary threat to its survival is from destruction of its habitat. Large tracts of tropical forests are being cleared for settlement of exogenous people, and also for monocultural forestry like rubber in Katchal Island. The secondary threat is due to man-macaque interaction. The farmers kill these monkeys to protect their standing crops. Although the authorities of the Forest Department have imposed a royalty of Rs. 10/- for each specimen killed, but the sum is too meagre to keep a check on poaching (Das & Ghosal 1977).

Conservation measures taken : Crab-eating Macaque is legally protected from poaching and trade by inclusion in Schedule I of the Indian Wildlife (Protection) Act, 1972 and Appendix II of CITES respectively.

Conservation measures suggested : i) The Indian subspecies *macaca fascicularis umbrosa* should be included in Appendix I of CITES. ii) Some stricter measures should be adopted by the concerned Forest Department to check poaching, rather than merely imposing a nominal royalty for killing this animal (Das & Ghosal 1977).

Trade data : 82135 specimens recorded by CITES Parties from 1982 to 1985 throughout its range of distribution.

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Pig-tailed Macaque

Order PRIMATES

Macaca nemestrina (Linnaeus, 1766) Family CERCOPITHECIDAE

Diagnostic characters : A large and stout monkey, having the dorsal surface of body golden brown to russet, grizzled, and with or without blackish patches ; ventral surface greyish white ; crown-hairs short, radiating from a central whorl ; a black patch present on forehead ; tail small, like that of a pig (one-third of head and body length), dark brown above and yellowish brown below (Hill 1974, Roonwal & Mohnot 1977, Tikader 1983).

Measurements (mm) : Head and body length : ♂ 508-775 ; ♀ 400-576.
Tail : ♂ 160-281 ; ♀ 137-200.

Body weight (kg) : ♂ 6.2-14.5 ; ♀ 4.4-10.9 (Pocock 1939, Roonwal & Mohnot 1977).

Distribution : Northeastern India. Elsewhere : Bangladesh, extending eastwards to Vietnam, northeast to S. China (Bangjie, 1985) and southeast to Malaysia and Indonesia (except Java).

Intraspecific variations : Out of three recognised subspecies (Fooden 1975), only one, namely, *leonina* occurs in India.

Population : Wild population : The exact estimate of population is not known. A troop of 9 monkeys was encountered in Tripura (Mukherjee, 1982), another of 26 individuals was seen in Jorhat, Assam, and three specimens were captured in Mawsynram, Khasi hills, Meghalaya (Biswas and Diongdoh 1978).

128 monkeys in three troops have been reported from evergreen forest of Bangladesh (Khan and Ashan 1986) and its population was estimated to be around 3800 individuals. About 39000 monkeys were estimated in Siberut Island (Tenaza and Mitchell 1985). In secondary forests of western Malaysia, the population density was 0.13 troops per sq mile and the troop-size varied from 3 to 20 (Southwick and Cadigan 1972).

Captive population : The International Zoo Yearbook reports 242 pig-tails bred in 23 collections and medical research facilities during 1983.

Habitat and ecology : It is among the more arboreal species of *Macaca*, in India. It keeps largely to dense evergreen forests at the base of hills. It passes the night on high trees but descends down during the day for

food and water.

It is omnivorous in diet but fruits and seeds constitute the main bulk of its food. It also takes leaves, tender twigs, insects, spiders, etc. Breeding has been recorded in April and May in Assam, and November and March in Malaysia (Bernstein 1967). Pregnant females have been found in February and April in Thailand (Fooden 1971).

Threats to survival : The destruction of habitat by cutting off the primary forests for Jhoom cultivation, construction of bridges, railway line, hydroelectric projects, petro-chemical complex, etc., has considerably brought down the population of this monkey. In addition, it is occasionally hunted for food and medicinal purposes. Some malaysians regard its meat as a delicacy that possesses special body building power. In many parts of its range, wild caught monkeys are domesticated to harvest coconuts and transported beyond their zoogeographical limits (Tenaza & Mitchell 1985).

In the document of the Action Plan for Asian Primate Conservation prepared by IUCN/SSC Primate Specialist Group, the Pig-tailed Macaque has been categorized as vulnerable to habitat alteration, and limited distribution. It is likely to move to highly vulnerable category, if proper conservation measures are not taken.

Conservation measures taken : Legally protected from hunting by inclusion in Schedule II of the Wildlife (Protection) Act, 1972 as amended up to 1986, and is open to selective trade due to its inclusion in Appendix II of CITES.

Conservation measures suggested : The species should be included in Schedule I of the Wildlife (Protection) Act and steps should be taken for the conservation of its habitat.

Trade data : 3418 live specimens were recorded by CITES Parties from 1982 to 1985.

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Lion-tailed Macaque

Order PRIMATES

Macaca silenus (Linnaeus, 1821)

Family CERCOPITHECIDAE

Common local names : Singalika (Kannad), Nella manthi (Malayalam), Korangu (Tamil), Kondamachu (Telegu).

Diagnostic characters : A medium-sized macaque, having a glossy black pelage, brownish grey mane around its face, and a tufted tail from one-half to two-thirds of the length of head and body (Pocock 1939, Fooden 1975, Roonwal & Mohnot 1977).

Measurements (mm) : Head and body length : ♂ 508-610 ; ♀ 415-481
Tail : ♂ 254-386 ; ♀ 254-318.

Body weight (kg) : ♂ 6.8.

Distribution : India ; southern India between latitudes 9°30'N and 15°N in the states of Karnataka, Kerala and Tamil Nadu (Kurup 1978 ; Karnath 1985). The maximum concentration of this monkey has been noticed at Kudremukh, Brahmagiri, Mukambika, Talakaveri, Pushpagiri, Someshwara and Sharavathi in Karnataka, and Nilgiri Hills, Anaimalai Hills, Cardamom Hills and periyar Lake, in Kerala and Tamil Nadu.

Intraspecific variations : No subspecies. However, the lion-tailed macaques found on the Wynaad Plateau and in the High Wavy Mountains are reported to be bigger than those found in the Anaimalai Hills (Hutton, 1949).

Habitat and ecology : The Lion-tailed Macaque inhabits dense evergreen or semi-evergreen rain forests of high trees in secluded and infrequented areas between 800 and 1300 m altitude. It also occurs in tea and cardamom plantations, interspersed with undisturbed forests, and selectively felled evergreen forests. It lives in groups of 4-30 individuals.

Its food consists mainly of fruits, seeds, flowers and insects. Although this species is said to be most arboreal among the macaques, about 30% of the plant-species eaten come from climbers and undergrowth, and rest of the 70% from lower storey trees (Karanth, 1984). There is no restricted

mating season and no sharp seasonality in births. Newborns have been seen in September and January.

Population : Wild population : Sugiyama (1968) estimated about 1000 monkeys in the Nilgiris, Anaimalais and Cardamom Hills and Periyar Lake areas of Kerala and Tamil Nadu. Green and Minkowsky (1977) counted 405 monkeys in 27 groups in Karnataka, Kerala and Tamil Nadu, with a group size of 6-34 individuals. Kurup (1978) estimated its total population at 825 monkeys in 55 groups, including 5 groups from Karnataka and North Wynaad area of Kerala, whereas Rauf Ali (1982) suggested a minimum population of 915 monkeys in 61 groups. Recently, Karanth (1985) has estimated about 3000 monkeys in 200 groups in Karnataka alone, with average group-size of 15-20 individuals.

Captive population : About 400 lion-tailed macaques are held in captivity throughout the world (Gledhill, 1985). The major captive populations are located in five North American Zoos (Baltimore, St. Louis, San Diego, Seattle and Winnipeg), one European Zoo (West Berlin) and one Indian Zoo (Delhi). However, the International Zoo Year Book reports 328 monkeys in 57 collections, in 1984. It lives up to 18 years of age.

Threats to survival : Shrinkage of habitat of this monkey has brought considerable decrease in its population. Diversion of forests for large irrigation, power and mining projects, extension of roads, etc., are not only responsible for the loss of habitat but have also opened up previously inaccessible areas to human beings. Low elevation habitats are steadily decreasing under pressure from local inhabitants for fuelwood, live-stock grazing, excessive collection of leaf-litter, etc., and the evergreen forests at higher elevations are subject to pressures from logging to produce plywood, matchwood and railway sleepers. In addition, steep increase in the market value of forest produce in recent years has resulted in excessive exploitation of forest resources. All these have contributed to the loss of habitat and eventual reduction in the number of this monkey.

This monkey is also being killed for fur trade and the supposed aphrodisiac and medicinal properties of its flesh by a section of the people. It is also suspected that the Lion-tailed macaques may be dying from Kyasanur Forest Disease (Bhat, 1982).

Conservation measures taken : i) This species gets protection from killing or trade by inclusion in Schedule I of the Wildlife (Protection) Act 1972 and Appendix I of CITES. ii) Nilgiris have been declared as the Biosphere Reserve. iii) Due to cultural tradition this monkey enjoys some protection from hunting by local people in about half of its range in Karnataka. The settlers from Kerala, however, hunt it. iv) After promulgation of Wildlife (Protection) Act, the cutting of forest trees for timber, fuelwood, plywood, matchwood, etc., in Karnataka, have reduced to about half from 3,21,9200 m³ in 1975-76 to 1,562,523 m³ in 1982-83 (Karanth 1985).

Scientific interest and potential value : It is a member of *silenus* group of macaques, which include in the Pig-tailed Macaque (*Macaca nemestrina*) of Southeast Asia. These macaques originated in the vast rainforests which covered peninsular India during Pliocene and spread through it evolving into several species (Fooden, 1975). The lion-tailed macaque is one of the surviving species of this group, now confined to drastically shrunk habitats on account of climatic and manmade changes. Though attempts are underway to conserve its habitat, it is often not recognised that conservation of the total biological diversity can only be achieved by conserving the ecosystem as a whole. Animal species which have through millenia evolved to fit in specialised ecological niches in these rainforests, like the lion-tailed macaque, is essentially an indicator which tells us about the ecological conditions of these forests.

Conservation measures suggested: Karanth (1984) has suggested that Kudremukh, Brahmagiri, Mukambika, Talkavere, Pushpagiri, Someshwara, and Sharavathi forest areas of Karnataka be declared as conservation areas, the first-three as biosphere reserves and the latter four as sanctuaries. It will cover 2280 km² of reserve forests, including 1427 km² or 33% of the total State's evergreen forests.

Trade data : 32 live specimens recorded by CITES Parties from 1982 to 1985.

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Golden Langur

Order PRIMATES

Presbytis geei Khajuria, 1955

Family CERCOPITHECIDAE

Common local names : Sugrib (Bhutanese), Sunahla Langur (Hindi).

Diagnostic characters : A rich golden to creamy buff langur, having the whiskers, neck, shoulders and hind quarters brighter than rest of the body; an ill-developed half whorl present on forehead, with hairs radiating backwards and sideways; whiskers long ; tail tassellated, specially in males (Gee 1955, Khajuria 1956, 1962).

Measurements (mm) : Head and body length : ♂ 640-720 ; ♀ 488-610.
Tail : ♂ 780-940 ; ♀ 710-805.

Body weight (kg) : ♂ 10-12 ; ♀ 9.5.

Intraspecific variations : No subspecies. However, Oboussier and Maydell (1959 a, b) regard *geei* as a subspecies of *Presbytis pileatus*.

Distribution : India : Goalpara district of Assam, bounded by the rivers Sankosh in the west and Manas in the east. Also occurs in Bhutan (Gee 1961, Roonwal & Mohnot 1977).

Habitat and ecology : Golden langur is a montane species. It lives in dense tropical deciduous forests with *Sal* as the dominant tree. In Bhutan, it also occurs in the evergreen forests up to an altitude of 2400 m. It is diurnal and feeds on leaves, buds, flowers and fruits. There is no specific breeding season. Newborn and infants have been reported in almost all seasons (Wayre 1968 a,b, Ghosh & Biswas 1975, Roonwal & Mohnot 1977).

Golden langur is sympatric with the Assamese macaque but the former occupies the upper storey of trees and the latter the lower storey. Hence, no hostile interactions are reported.

Population : *Wild population* : 78 langurs were visually counted in Bhutan in 1967, and 180 langurs in India during 1973-76 (Mukherjee & Saha 1974, Mukherjee 1978, 1981). However, Saha (1980), later counted about 1200 langurs in Bhutan only. It lives in small to medium-sized groups, ranging from 4 to 40 individuals.

Captive population : Fifteen langurs were kept in zoos in India during 1978 (*vide* International Zoo yearbook).

Threats to survival : Recent records indicate that the golden langur is not rare. But the limited range of its distribution makes it highly vulnerable and susceptible to biotic interference as a result of modified land use for human habitation, agriculture, hydro-electric projects and industry, that has already started coming up in the range of its distribution.

However, this langur commonly known as Sugrib, the mythological hero in the army of Lord Rama, is held in esteem by the local people. Secondly, it does not raid the standing crops, hence, is not molested.

Conservation measures taken : Legally protected from hunting and trade by inclusion in Schedule I of the Indian Wildlife (Protection) Act 1972 as amended up to 1986 and Appendix I of CITES. Further, the area in India where this langur occurs has been declared as a Biosphere Reserve.

Conservation measures suggested : Nil.

Trade data : Not known.

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Nilgiri Langur**Order PRIMATES*****Presbytis johnii* (Fischer, 1829)****Family CERCOPITHECIDAE**

Common local names : Vella manthi (Malayalam), Mandi or Manthi (Tamil).

Diagnostic characters : A glossy black langur, having the back of head yellowish brown, and rump and base of tail grizzled ; females possess a white patch on the inner side of thighs (Pocock 1939, Napier 1985).

Measurements (mm) : Head and body length : ♂ 508-700; ♀ 550-600. Tail : ♂ 680-965; ♀ 720-800.

Body weight (kg) : ♂ 9.1-13.2; ♀ 10.9-11.3; newborn 0.5.

Distribution : India : Western Ghats (Nilgiri, Anaimalai, Brahmagiri and Palani Hills), usually above 915 m altitude (Krishnan 1972, Kurup 1973).

Intraspecific variation : No subspecies.

Habitat and ecology : Nilgiri Langur is found in tropical moist evergreen and moist deciduous forests (altitude 900-1200 m), where it lives in groups of 3-25 individuals in the Sholas (strips of forest surrounded by grassland and transected by a narrow stream).

It is mainly a leaf-eater. Its food comprises of flowers, seeds, leaves and young shoots. Sometime it attacks orchards and cultivated fields. There do not appear to be a sharply defined birth season, but have a high degree of reproductive success (70%) (Roonwal & Mohnot 1977).

Population : Wild population : About 212 langurs in 33 groups were reported from the Nilgiris (Poirier, 1970), and 150-500 from Palni Hills (Oates, 1978, 1980).

Captive population : The International Zoo Yearbook, 1979, reports eleven langurs in different zoos and animal centres of the world.

Threats to survival : The species is vulnerable to destruction of its natural habitat (the sholas) for cultivation, human settlements, irrigation, power and mining projects. The evergreen forests at higher elevations are subject to pressures for logging to produce plywood, matchwood and

railway sleepers. In addition, this langur is persecuted for its fur, skin (for making drums) and flesh (for food and medicinal purposes).

Conservation measures taken : i) Legally protected from hunting and trade by inclusion in Schedule I of the Wildlife (Protection) Act, 1972 as amended up to 1986, and in Appendix II of CITES. ii) The Nilgiris where this species occurs has been declared as a Biosphere Reserve. iii) The status of this species has improved in recent years (Krishnan, 1972). For example, in Topslip, where in 1960 it was hard to find, is today almost common. In the Western Ghats, according to Kurup (1979) its distribution now seems to be progressing towards being continuous along the unbroken monsoon forest belt.

Conservation measures suggested: The species should be included in Appendix I of CITES. More areas where these langurs occur in good concentration should be declared as Wildlife Sanctuary.

Trade data : Not known.

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Phayre's Leaf Monkey

Order PRIMATES

Presbytis phayrei Blyth, 1847

Family CERCOPITHECIDAE

Diagnostic characters : A dark ashy brown langur, having the lips and area around eyes white, shoulders and upper arms with silvery lustre, extremities of limbs and proximal end of tail dark, and ventral surface white. Crown hairs elongated, may or may not form a crest. Females have a pale patch on the innerside of thighs. (Pocock 1939, Agrawal 1974 and Tikader 1983)

Measurements (mm) : Head and body length : ♂ 420-600; ♀ 442-570.
Tail : ♂ 648-858; ♀ 720-795.

Body weight (kg) : ♂ 7.9-8.7; ♀ 5.6-6.8.

Intraspecific variations : Four subspecies are recognised (Napier, 1985), of which only the nominate subspecies occurs in India.

Distribution : India : Tripura (Agrawal & Bhattacharya 1975, 1977) and parts of Assam (Cachar district). Also occurs in Bangladesh, Burma, Southwest China (Bangjie 1985), Laos, Thailand and N. Vietnam.

Habitat and ecology : Phayre's Leaf Monkey occurs in India in Sal forests. Its preferred habitat is bamboo and banana plantations along hillsides, in the vicinity of streams. However, it also occurs in evergreen forests of Bangladesh (Khan and Ashan 1986) and Thailand (Fooden 1971). Its food consists mainly of leaves ; also feeds on flowers, fruits and bamboo shoots. It never invades cultivated fields. Births are reported in September, October, November and February. A single young, sometimes twins, are born.

Population : Wild population : About 400 individuals in 36 troops have been encountered in Tripura (Mukherjee, 1982a,b). It occurs in small groups, 4-38 in Tripura, 20-30 in Burma and 3-30 in Thailand (Roonwal and Mahnot, 1977). About 205 langurs have been reported from Bangladesh (Green 1978, Khan and Ashan 1986). A recent survey (Mukherjee, Pers. Comm.) of primate species in Tripura revealed that the number of Phayre's Leaf monkey has further declined.

Captive population : No data is available.

Threats to survival : The population of this leaf-monkey, in India, is not only localised but also scanty. Hence, it is vulnerable and susceptible to modified land use resulting in the reduction of its preferred habitat. The factors are i) Felling of primary forests (bamboo, banana and wild plants) for sal plantation, ii) destruction of habitat due to Jhooming (shifting cultivation), iii) modified land use for agriculture, habitation, industry, railway track and roads. However, this langur is not killed and eaten by the local tribals.

Conservation measures taken : Protected in India by inclusion in Schedule I of the Wildlife (Protection) Act, 1972 as amended up to 1986 but is open to selective trade due to its inclusion in Appendix II of CITES.

Conservation measures suggested : The species should be included in Appendix I of CITES. Some of the areas where these monkeys occur in good numbers, in Tripura, should be declared as wildlife sanctuary.

Trade data : Not known.

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Capped Langur

Order PRIMATES

Presbytis pileatus (Blyth, 1843)

Family CERCOPITHECIDAE

Diagnostic characters : A grey to blackish grey langur, having the crown covered with a thick mat of backwardly directed dusky brown hairs, sharply contrasting in colour with the bright tint of the whiskers ; distal half of the tail blackish ; undersurface pale fulvous to golden red, sometimes grey (Pocock 1939, Roonwal & Mohnot 1977, Tikader 1983).

Measurements (mm) : Head and body length : ♂ 533-710; ♀ 490-610. Tail : ♂ 859-1040; ♀ 750-955.

Body weight (kg) : ♂ 11.5-14.0; ♀ 9.5-11.3

Intraspecific variations : Four subspecies are recognised (Pocock 1939). i) *brahma* : No sharp contrast in colour between dorsal and ventral surfaces. - N. Lakhimpur, Assam. ii) *durga* : Crown dusky grey ; cheeks, throat and ventral surface of body golden red. - Northeastern India (below 600 m. altitude) except in Lakhimpur and Kamrup districts of Assam. iii) *pileatus* : Crown dusky grey ; cheeks, throat and ventral surface of body pale buff. Northeastern India (above 600 m altitude). iv) *tenebricus* : Crown and back blackish - Kamrup district, Assam.

Distribution : Northeastern India. Also occurs in Bangladesh and northern Burma. (Agrawal & Bhattacharya 1977, Mukherjee 1982)

Habitat and ecology : Diurnal ; inhabits most deciduous and dense evergreen-hilly forests, intersected with streams, at 60-1525 m altitudes. Entirely arboreal, forest-dwelling animal. Food consists of fruits, flowers and leaves. Breeds during winter. It is polygamous and is found in groups of 8-10 individuals.

Population : Wild population : 58 langurs in group-size of 7-13 were encountered in Manas Sanctuary, Assam, in 1976 (Mukherjee 1978), and 138 langurs in group-size of 5-16 in Tripura during 1976-78 (Mukherjee 1982). Khajuria (1962) found multimale groups of 6-12 in Meghalaya. However, 165 (29 troops) and 295 (44 troops) langurs have been reported from deciduous & evergreen forests respectively of Bangladesh (Khan and

Ashan 1986).

Captive population : No data is available.

Threats to survival : Exact status of this langur is not known but the species is widely distributed and thriving well in the forests of northeastern India. However, it is vulnerable and susceptible to modified land use for habitation, agriculture, jhooming, industry, hydro-electric projects, etc. in the area of its occurrence.

Conservation measures taken : The species is protected from poaching and trade by inclusion in Schedule I of Wildlife (Protection) Act, and in Appendix I of CITES. Some of the areas, where this species occurs in good numbers, have been declared as conservation areas.

Conservation measures suggested : Studies on the ecology and behaviour of this species should be undertaken, and the population estimated and monitored at regular intervals.

Trade date : Not known.

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Hoolock Gibbon

Order PRIMATES

Hylobates hoolock (Harlan, 1834)

Family HYLOBATIDAE

Common local name : Uluk (Hindi).

Diagnostic characters : A relatively small ape, devoid of a tail ; arms long, double the length of legs. Males and young females black in colour, with a silvery white band above the eye brows; adult females buff or brownish grey (Pocock 1939, Roonwal & Mohnot 1977, Mc Cann 1933, Peart 1934).

Measurements (mm) : Head & body 450-630.*Body weight (kg)* : 6.1-7.9.

Intraspecific variations : Out of the two recognised subspecies of this gibbon (Groves, 1967), namely, *hoolock* and *leuconedys*, only the nominate subspecies occurs in India. It is characterised by the preputial tuft being black (instead of white in *leuconedys*), and the sprinkling of white hairs between the eyebrows, approximating closely in the midline (within 5 mm) (Groves 1970, 1971).

Distribution : Northeastern India, south of the river Brahmaputra and east of Dibang river in Arunachal Pradesh. (Agrawal & Bhattacharya 1977). Also occurs in Bangladesh (Khan and Ashan 1986), Burma. (Groves 1967) and China (Bangjie 1985).

Habitat and ecology : The Hoolock Gibbon lives in evergreen, semi-evergreen and moist deciduous forests, mainly along the hill slopes, in small family parties. A group consists of a male, a female and their offspring. A group is detected by its call which it makes during the early morning. One starts, the rest of the family takes it up. It feeds on wild fruits, leaves, buds, insects, spiders and birds' eggs. Gibbons sleep sitting erect in trees, huddling together in twos or threes. Sexual maturity is reached in about 7 years. Mating time is early in the rainy season. Gestation lasts for about 7 months and a single young is born during the winter (Alfred and Sati 1985, 1986, 1988, 1990 a, b Mukherjee 1986). The body temperature during menstrual cycle was reported by Carpenter (1941).

Population : Wild population : In 1971-72, the population of Hoolock Gibbon in Assam was estimated between 78,000 and 80,000 individuals (Chivers 1977, Tilson 1984, Gittings & Tilson 1979) which appears to be on a very high side. The population in Garo Hills, Meghalaya has recently been estimated to be about 9.03/km² (Alfred and Sati 1990 b) and in Tripura about 1000 - 1400 individuals (Mukherjee 1982). The population is better in Arunachal Pradesh. However, the population in Tripura is fast declining. About 92 gibbons in 34 groups were sighted in sal and evergreen forests of Bangladesh (Khan and Ashan 1986).

Captive population : ISIS SDR abstract (1988) reports one hoolock gibbon in one animal centre. However, some of the zoo gardens in India have one or two gibbons.

Threats to survival : Due to loss of pristine forests for modified land use, and jhooming or shifting cultivation, the population of this ape has considerably fragmented and declined in India. This ape is also being killed by local people for flesh.

Conservation measures taken : The Hoolock Gibbon is legally protected from hunting and trade by inclusion in Schedule I of the Wildlife Protection Act and Appendix I of CITES. Some of the areas where they occur in good numbers have been declared as conservation areas.

Conservation measures suggested : Deforestation resulting in the discontinuity of the forests is the main cause of decline in population of the Hoolock Gibbon in India. Hence, efforts should be made to have planned aforestation to bridge the gaps and to make a continuous corridor for the movement of these gibbons from one place to other in search of food.

Strict implementation of the Wildlife (Protection) Act to stop illegal poaching.

More and more areas where these animals occur in good numbers should be declared as conservation areas.

Trade data : Not known.

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Indian Wolf

***Canis lupus pallipes* Sykes, 1831**

Order CARNIVORA

Family CANIDAE

Common local names : Bheriya (Hindi) ; Bagyar (Sindhi) ; Tola (Kanarese); Toralu (Telugu).

Diagnostic characters : Of the size of an Alsation dog, with tail less than half of head and body and tipped black. Skull large, with long powerful jaws, arching brows and elevated forehead. Body above greyish fulvous, usually with a brownish or reddish tinge, sometimes mixed with black ; face greyer, having a mixture of black and white hairs ; undersurface dingy white (Blanford 1888-91, Roberts 1977, Prater 1980, Tikader 1983).

Measurements : Head and body length 90-105 cm ; tail 35-40 cm ; height at the shoulder 65-75 cm (Anon 1981; Tikader 1983).

Distribution : Occurs in India in the Himalayas, south through the desert zone to dry open country in the peninsular India. Extralimittally, found in Pakistan, Iran, Iraq and northern Arabia (Ellerman & Morrison-Scott 1966, Roberts 1977).

Other subspecies of *Canis lupus* occur in North america, Europe, Asia, including the Arabian Peninsula and Japan (Honacki *et al.* 1982).

Intraspecific variations : Out of 24 New World and 8 Old World recognised subspecies, two, namely, *Canis lupus pallipes* and *Canis lupus chanco* occur in India. The latter is larger in size and the coat more woolly than the former (Roberts 1977, Pocock 1941).

Population : Wild : The estimated population of the species is between 90,000 and 100,000 in the world (Anon 1981). Declining in several areas and reached to endangered level in several countries, for example Italy 200, Sweden 10, Norway 10, Spain and Portugal 200-300, Mexico 50, etc. Exact number unknown for most of the Asiatic countries.

Shahi (1982) estimated about 800 wolves in the Indian subcontinent but according to Ginsberg and MacDonald (1990) it is between 1,000-2,000 individuals.

In captivity : The International Zoo Year Book reports 227 specimens in 1980 in 53 collections (Anon 1985).

Habitat and ecology : The wolf occurs in almost all sorts of habitat where it finds a refuge like crevices in rocks, caves, burrows in sand, etc. It hunts during the night and animals such as antelope, fox, hare, rodent, etc., form its main prey items, but it does not spare a sheep or goat, when within easy reach. Incidence of its lifting children is also known. It breeds mostly at the end of the rains, and young-ones, three to eight, are born about December (Prater 1980, Anon 1981, Tikader 1983).

Threats to survival : The wolf has become extremely rare as a result of increased human settlement, and persecution by man for the commercial value of its fur. It is also being killed by farmers to protect their poultry, sheep and goats from its predation (Roberts 1977, Saharia 1981).

Conservation measures taken : The Indian Wolf is included in Schedule I and Appendix I of the Wildlife (Protection) Act and CITES respectively. These steps completely ban its killing or trade in its parts. The animal also finds protection in conservation areas which fall in the range of its distribution.

Conservation measures suggested : Strict enforcement of the existing wildlife protection laws is needed to preserve this species in the wild.

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Tibetan Wolf

Canis lupus chanco Gray, 1863

Order CARNIVORA

Family CANIDAE

Common local names : Chanco (Ladakhi and Tibetan); Ratnakin (Kashmiri).

Diagnostic characters : Of the size of an Alsatian dog, with large skull, long powerful jaws, arching brows and elevated forehead. Coat blackish; winter coat variegated with long, black and white hairs, and dense, grey or bright buff underwool. Tail short, bushy and black-tipped (Pocock 1941, Roberts 1977, Prater 1980).

Measurements : Head and body length 90-102 cm; tail 35-38 cm.

Distribution : In India, occurs in the upper Himalayan region (Pocock 1941, Roberts 1977, Anon 1981). Extralimittally, found in Russian Pamir, Chinese Turkestan, Tianshan, Tibet, Mongolia, northern China including Shensi (Pocock 1941, Ellerman & Morrison-Scott 1966).

Intraspecific variations : The subspecies *Canis lupus chanco* occurs in the Himalayas and is characterised by larger size and woolly coat (Pocock 1941, Roberts 1977).

Population : Wild : Not known.

In captivity : Not known.

Habitat and ecology : In mountainous areas it lives as a nomad, coming down to valleys during winter and migrating with the game and grazing flocks to the snow line, in summer. Lives in holes, caves, cavities in rocks, and thickets of reeds and scrub. It hunts by day or night. Rodents and small animals constitute its main diet in summer, and wild sheep and goats during winter. Mates from January to April and young ones are born during spring. Litter size ranges from 1 to 11, mean 6.

Threats to survival : Increased human settlement and persecution of the animal for the commercial value of its fur are responsible for the depletion in its numbers.

Conservation measures taken : The Tibetan Wolf is listed in Schedule

I and Appendix I of the Wildlife (Protection) Act and CITES respectively. This completely bans its killing, and commerce in its products.

Conservation measures suggested: Greater enforcement of the existing laws is desirable.

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Tibetan Sand Fox

Vulpes ferrilata Hodgson, 1842

Order CARNIVORA

Family CANIDAE

Common local name : Igur or De-dze (Tibetan) (Pocock 1941).

Diagnostic characters : Size smaller than a jackal, with ears short and its tuft well-developed. Body fur soft and thick, and tail tushy. Upper parts pale grey, agouti or sandy, with a tawny band along the dorsal surface ; underparts pale, fronts of legs tawny, and tip of tail white (Blanford 1888-91, Nowak & paradiso 1983).

Measurements : Head and body length 58-70 cm ; tail 40-48 cm (Blanford 1888-91, Nowak & Paradiso 1983).

Distribution : China (Tibet, Shanghai, Kansu and Yunnan) and Nepal (Ellerman & Morrison-Scott 1966, Honacki *et al.* 1982).

Intraspecific variation : No subspecies. However, this species has never been recorded from Indian territory (Ellerman and Morrison Scott 1966).

Population : Wild : Not known.

In captivity : Not known.

Habitat and ecology : Mitchell (1977) found this fox on barren slopes and in stream beds at an elevation of 3000 – 4000 m in Nepal. It lives in boulder piles or in burrows under large rocks. Food consists of rodents, lagomorphs and ground birds. Mating takes place in late February and from two to five young ones are born in April or May (Nowak & Paradiso 1983).

Threats to survival : Nothing is known in India. However, it is persecuted for its fur.

Conservation measures taken : This species is listed in Schedule I of the Wildlife (Protection) Act. Nothing is known about its conservation status in Nepal or China.

Conservation measures suggested : The status of this species should be studied so as to suggest measures for its future conservation.

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Desert Fox

Order CARNIVORA

Vulpes vulpes pusilla Blyth, 1845Family CANIDAE

Common local names : Lomri (Hindi) ; Lokri (Sindhi).

Diagnostic characters : Smaller than a jackal, with slender muzzle, relatively larger ears and a longer, bushy tail. Back of ears velvety black and tail-tip white. Coat colour varies from red to grey ; face rufous in colour, with a dark spot below each eye ; outer side of limbs and paws having extensive white areas (Blanford 1888-91, Roberts 1977, Prater 1980).

Measurements : Head and body length 48-60 cm ; tail 30-46 cm (Pocock 1941, Roberts 1977).

Distribution : The Desert Fox occurs in India in the north-western arid region from Punjab to Gujarat. Extraliminally, found in Pakistan, Iran and Iraq (Pocock 1941, Ellerman & Morrison-Scott 1966). Other subspecies of the Red Fox occur in north and west of the Northern Hemisphere but absent in Central Plains and the Arctic (Honacki *et al.* 1982).

Intraspecific variations : Out of 38 subspecies of *Vulpes vulpes* listed by Ellerman & Morrison-Scott (1966) for the Palaearctic and Indian regions, only one, namely, *Vulpes vulpes pusilla* occurs in India and is characterised by its comparatively smaller size, shorter fur, less bushy tail and lighter pelage colour (Roberts 1977).

Population : Wild : Nothing is known about the population of this subspecies in the wild, in India. In Pakistan, it is still common in the extensive desert region (Roberts 1977).

In captivity : Not known.

Habitat and ecology : This fox is an inhabitant of arid and semiarid regions. It occurs in sandy wastes, sand dunes and river beds, with scattered bushes. It is nocturnal in habit and feeds on birds, small mammals, insects, etc ; also takes fruits and picks up discarded food and offal near human habitation. It breeds around winter and young-ones, usually between five to seven, are delivered in March-April (Roberts 1977, Prater 1980).

Threats to survival : The Desert Fox is killed for its valuable pelt (Saharia 1981, Tikader 1983). Besides, the destruction of habitat due to human interference is another cause of decline in its population.

Conservation measures taken : This species is included in Schedule I of the Wildlife (Protection) Act, thus legally protected from killing. It further gets protection in the Desert National Park.

Conservation measures suggested : The species deserves to be included in Appendix I of CITES to stop trade in its pelt.

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Malayan Sun Bear

Order CARNIVORA

Helarctos malayanus (Raffles, 1821)Family URSIDAE

Diagnostic characters : Smaller than the Himalayan Black Bear ; coat short, coarse and black, with a pale patch on chest. Muzzle and ears short. Paws large, with inturned pointed claws. Soles naked.

Measurements : Head and body length 110-140 cm ; height at shoulder about 70 cm.

Intraspecific variations : Out of two subspecies of the Malayan Sun Bear, the nominate subspecies occurs in India and is distinguished by its larger size. The other subspecies, *H. m. euryspilus* is found in Borneo (Pocock 1941).

Distribution : Hills of northeastern India (Bedi & Bedi 1984, Ghosh 1987). Also found in Bangladesh, Burma, Thailand, Vietnam, Southern China, Malaysia and Indonesia (Ellerman and Morrison-Scott 1966).

Habitat and ecology : Lives in forested hilly regions, occasionally seen in high trees. Nocturnal and a good climber (Medway 1969). Omnivorous in diet; feeds on locally available fruits, buds, invertebrates and small vertebrates. Malayan Sun Bear is believed to be monogamous (Walker 1964). Breeds throughout the year and one or two young are born in a litter after a gestation of 95-96 days.

Population : Wild : No population estimate of this species has ever been made in India. In the past too, only a few records of this species are available. Sclater (1891) recorded two specimens from Assam and one from Meghalaya. Mammal Survey could collect one specimen from Duragiri, Meghalaya. However, Hinton and Lindsay (1926) commented that these bears were common and frequently seen on high trees in Garo Hills, Meghalaya. Gee (1967) confirmed the occurrence of this bear in eastern India at Nowgong (Sibsagar district), Cachar and Mizo Hills. Ghosh (1987) recorded this species from Namdapha National Park in Arunachal Pradesh, and Chattopadhyay (Pers. comm.) saw it in southern Mizoram in 1989. As per recent records, this species appears to be very rare.

In captivity : Five specimens were maintained, in 1986, in the National Zoological Park, New Delhi, where they bred in captivity. A specimen in Nehru Zoological Park, Hyderabad lived for 14 years.

Scientific interest and potential value : It is one of the smallest species of bears and is said to be most dangerous. Inflicts severe damage to coconut plantation (Lekagul & McNeely 1977). Its flesh is eaten in Nagaland, and skins are used for the preparation of caps and other fancy articles. Gall bladder contents are highly valued for medicinal purpose.

Threats to survival : Destruction of forests is the major threat to its survival. It is also killed as a pest of coconut. Illegal hunting for its skin, flesh and gall bladder is another important factor for the depletion of its population.

Conservation measures taken : Legally protected from hunting by inclusion in Schedule I of the Wild Life (Protection) Act, and from trade by inclusion in Appendix I of CITES. It also gets protection in some of the conservation areas where it occurs.

Conservation measures suggested : Field surveys are needed to authentically know the current distribution, concentration and population-size of this species in northeastern India so that more areas may be declared as conservation areas for its protection. Strong enforcement of wildlife Protection laws is also a necessity.

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Himalayan Brown Bear

Order CARNIVORA

Ursus arctos isabellinus Horsfield, 1826

Family URSIDAE

Common local names : Barf-ka-richh (Hin.), Haput (Kash.), Drin-mor (Ladaki), Dub (Nepali), Tom-khaina (Tibetan).

Diagnostic characters : Heavier than the Himalayan Black Bear, having a brown coat which varies from pale to dark even reddish brown, depending on the season. Sometimes hairs silvery grey, with white tip. A white half collar usually present on chest. Fur, in winter, longer, thicker and with profuse underwool than in summer (Roberts 1977, Prater 1980, Tikader 1983).

Measurements : Head and body length : ♂ 150-220 cm; ♀ 137-183 cm; tail about 7.5 cm (Pocock 1941, Roberts 1977)

Distribution : Occurs at high elevations in western and central Himalayas. Also reported from Afghanistan, NW. Pakistan, Pamirs, Tien Shan and Bhutan (Pocock 1941, Roberts 1977, Tikader 1983).

Intraspecific variations : Out of 7 subspecies of *Ursus arctos* only *isabellinus* is found in India (Ellerman and Morrison Scott 1966) and is distinguished by its paler colour (Blanford 1888-91). This subspecies is now considered by many as conspecific with the Giant Alaskan Brown Bear, the North American Grizzly Bear and the Syrian Bear of Asia Minor and Caucasus (Roberts 1977).

Population : Wild : Exact population size not known. Within the Indian limits, it is rarely seen in inaccessible parts of the Himalayas (Tikader 1983). Also rare in Pakistan (Roberts 1977). Other subspecies too show declining trend (Nowak & Paradiso 1983).

In captivity : Kept in some zoos in India and Pakistan but the actual number is not known.

Habitat and ecology : The Himalayan Brown Bear inhabits grassy slopes above the tree line close to the snow. In winter, it hibernates or remains torpid until the spring. It enjoys a wide variety of food like young sprouts of

grass, berries, wild fruits, insects, various species of rats, etc., and at times takes larger animals. It mates in early summer, and the cubs, usually two, are born in winter (Blanford 1888-91, Prater 1980).

Threats to survival : This bear is hunted for its fur, flesh, fat and gall bladder. The latter is supposed to have medicinal properties (Saharia 1981). Human interference in the Indian range of its occurrence is another threat to its survival.

Conservation measures taken : The Himalayan Brown Bear is included in Schedule I of the Wildlife (Protection) Act and Appendix I of CITES. It is also protected in some of the conservation areas in Jammu & Kashmir and Himachal Pradesh.

Conservation measures suggested : Stricter enforcement of the wildlife protection laws is needed. Captive breeding may also be tried.

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Red Panda***Ailurus fulgens* Cuvier, 1825**

Order CARNIVORA

Family PROCYONIDAE

Common local names : Woker (Bhotia); Sankam (Lepcha).

Diagnostic characters : Of the size of a jungle cat; coat bright chestnut, with ringed tail. Rounded head, large erect pointed ears, stumpy muzzle and short hairy-soled legs characterise this animal. Face and lower lip white.

Measurements : Head and body length 51-64 cm; tail 28-48 cm.

Intraspecific variations : Out of two subspecies, namely, *A. f. fulgens* and *A. f. styani*, the nominate subspecies occurs in India and differs from the other in being smaller in size and less swollen forehead (Ellerman & Morrison-Scott 1966).

Distribution : Central and eastern Himalayas from Nepal to Arunachal Pradesh (Chakraborty & Sen, 1991). Also found in N. Burma and S. China (Corbet & Hill 1980).

Habitat and ecology : Red Panda inhabits temperate forests at elevations from 1500 m to 3500 m. Nocturnal, and sleeps during the day in holes of trees or in the open branches. Bamboo sprouts, grasses, roots, fruits, acorns, etc., comprise its principal diet but also takes eggs, birds, mice, insects and their grubs. Usually one or two young are born during spring in the hollows of trees or in rock crevices after a gestation of 90 to 150 days. Such variation in the gestation period is possible due to delayed implantation (Walker 1964). A pair lived for more than 14 years in the Nehru Zoological Park, Hyderabad (T. Ramkrishna, 1988, pers. Comm.). Young remains with the parent until another brood is about to appear (Blanford 1888-91).

Population : Wild : No information is available on the exact population size of the Red Panda. But it is rated as very rare (Dollinger 1984). However, the animal has been sighted on many occasions in the Neora valley, Kalimpong Forest Division, West Bengal, in Singhik, Chunthang, Menshithang, Lachen, Yaksum and Lachung areas of Sikkim, and in the Mehao Wildlife

Sanctuary, Arunachal Pradesh by the survey parties of the Zoological Survey of India.

In captivity : A good number of specimens of Red Panda are maintained in some of the Zoological Gardens in India. However, the exact number is not known.

Scientific interest and potential value : The systematic position of the Red panda is still obscure and debatable. Pocock (1921) included this species under the family Ailuridae, Corbet & Hill (1980) under the family Ailuropodidae and Honacki *et al.* (1982) under Procyonidae. Thus, studies on its relationship and evolutionary significance are still much needed. Its luxuriant and colourful pelt is in great demand in international market.

Threats to survival : Destruction of habitat and trapping are major threats to its survival. Its movement on the ground is slow, thereby can easily be trapped or hunted for its charming pelt.

Trade data : Twenty three live specimens have been recorded by CITES parties from 1979 to 1982. Most of these are inter-zoo exchanges of captive breed specimens. A few are exported from China (Dollinger 1984).

Conservation measures taken : Enlisted in Schedule I of Wild Life (Protection) Act and Appendix II of CITES. Some of the areas where it occurs have been declared as conservation areas.

Conservation measures suggested : A detail survey of its range in India is necessary to know its population size and areas of its concentration to chalk out the future conservation strategy. As the Red Panda breeds well in captivity, release of captive animals in already identified suitable habitats may yield good result.

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Oriental Small-clawed Otter
Aonyx cinerea (Illiger, 1815)

Order CARNIVORA
 Family MUSTELIDAE

Common local name : Udbilao (Hindi).

Diagnostic characters : Smallest of the Indian otters. Feet narrow, webbed only to about last joint of toes; claws rudimentary, no more than small upstanding spikes, and except in juveniles, do not project beyond toe pad. Tail gradually tapering and cylindrical. Hindfoot moderate in length, less than 100 mm. Body colour above dark brown, paler below, throat whitish. Skull short and broad, cranial width over one-half of total length; postorbital width more than interorbital width (Blanford 1888-91, Pocock 1941, Prater 1980).

Measurements : Head and body length 46-58 cm, tail 25-35 cm, hindfoot 7.5-10 cm.

Intraspecific variations : Three subspecies, namely, *cinerea*, *concolor* (N. India), and *nirnai* (S. India) occur in India. South Indian otters are darker than the northern ones (Pocock 1941, Davis 1978).

Distribution : The Himalayan foothills (Atkinson 1974) from Himachal Pradesh to Arunachal Pradesh (Ghosh 1987), also West Bengal, and Nilgiri Hills in southern India (Agrawal *et al.* in press). Elsewhere found in Nepal, Bhutan, Bangladesh, China, Burma east to the Philippines (Palwan Is.) and southeast to Malaysia and Indonesia (Ellerman & Morrison-Scott 1966).

Habitat and ecology : Lives in the lower slopes of the Himalayas and the plains of West Bengal. It haunts together in groups, up to 18 individuals, in streams, rivers, tanks, creeks, estuaries and rice fields. Feeds mainly on crabs and molluscs, less on fish.

Wild population : No specific data available on the population estimate of the Small Clawed Otter in the wild, but it is still widespread.

Captive population : No data available.

Economic value : During seventies, a substantial number of otters were killed in India for their pelt for export. However, the same has now

been considerably reduced.

Trade data : None from India. From 1979 to 1981, the export of six live specimens from Malaysia and Singapore, and the reexport of 8 skins have been recorded by CITES parties.

Threats to survival : In India, loss of habitat as a result of reclamation of marshy areas for new townships, roads and industrial complex, and pollution of water-bodies appear to be the major threats to otter population. Other factor responsible for its decline is persecution by man for its flesh and pelt (Agrawal *et al.*, in press).

Conservation measures taken : The species is enlisted in Schedule I of the Indian Wild Life (Protection) Act, and Appendix II of CITES as Lutrinae. Otters are protected in conservation areas where these occur in good numbers.

Conservation measures suggested : Wetlands should be preserved as far as possible. A thorough survey of rivers, water bodies and marshy areas is needed to get an idea of the exact population-size of this species in India so that the conservation strategy may be framed accordingly.

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Hog Badger***Arctonyx collaris* Cuvier, 1825**

Order CARNIVORA

Family MUSTELIDAE

Common local names : Bahla Sur (Hindi); Nulaong (Kuki); No-ok (Manipuri); Chom-hurho, Thembakso (Naga).

Diagnostic characters : Broad squat body, stumpy legs with long powerful digging claws, and long truncated, mobile, naked snout distinguish this animal. Back blackish, with a pattern of white and black stripes on head. Dark stripes run through the eyes and bordered by white stripes merge with the white of the throat. Ears and tail white, feet and belly black; claws pale-coloured.

Measurements : Head and body length 55-70 cm; tail 12-17 cm.

Intraspecific variations : Six subspecies have been recognised (Schreiber *et al.* 1989), of which two viz., *A. c. collaris* and *A. c. consul* occur within the Indian limits. The nominate subspecies differ from the other in being smaller (HB less than 64 cm and the condylobasal less than 12 cm). Moreover, in *consul*, the winter coat is less thickened.

Distribution : Northeastern India. Also found in Bangladesh, China, Burma east to Vietnam, Sumatra and probably Perak in Malaysia.

Habitat and ecology : Lives in stoney ground or small hills amongst tropical jungle. Spends the day in rock crevices or in deep burrows. Nocturnal and seclusive. Nothing is known about its food or breeding habits. In captivity, it is omnivorous (Prater 1980). A female specimen from China had four newly born young in April (Walker 1964).

Population : Wild : Nothing definite is known about its population size. Even during British days, hog-badgers were nowhere plentiful in India (Pocock 1941). However, Tikader (1983) stated that its exact status is unknown and appears to have colonised in eastern India in recent times.

In captivity : From the available information, there is no captive specimen in the Indian zoos.

Scientific interest and potential value : Hog-badger is one of the few

mammalian species whose coloration is interpreted as warning coloration and helps in the protection of this animal (Walker 1964). In China, pelt of hog-badger is used for making rugs, their guard hairs for making brushes, and fat in medicine (Bangjie 1989).

Threats to survival : Habitat destruction is one of the major threats to its survival, in India. However, in China, its pelt is used for commercial purposes which may prove fatal to its population (Bangjie 1989).

Conservation measures taken : Enlisted in Schedule I of the Wild Life (Protection) Act, hence, legally protected from killing. It further gets protection in some of the conservation areas in its distributional range.

Conservation measures suggested : Surveys are needed to identify its existing populations, distribution and conservation needs. Captive breeding may be tried in different zoos. A taxonomic study to determine the intraspecific variations is also needed.

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Honey Badger or Ratel

Order CARNIVORA

Mellivora capensis (Schreber, 1776)

Family MUSTELIDAE

Common local names : Biju (Hindi); Bajru Bal (Bhojpuri); Ghurnar (Cutch); Tara Karadi (Kanara and Tamil); Biyu Khawar (Telegu); Gorpat (Sindhi).

Diagnostic characters : Body squat and bear-like, tail and ears small, and muzzle not protruded. Forefeet large and armed with strong claws. Upper surface of head and body pale yellow or whitish and contrast strongly with blackish undersurface.

Measurements : Head and body length 60-77 cm; tail 20-30 cm; height at the shoulder 25-30 cm.

Intraspecific variations : Out of 15 subspecies of Ratel (Schreiber *et al.* 1989), two subspecies, namely, *M. c. inaurita* and *M. c. indica* occur in India. The coat is much thicker and longer, and the heel hairy in the former than in the latter (Pocock 1941). Completely black individuals are reported from Africa (Walker 1964).

Distribution : From the base of the Himalayas to Kanya Kumari except the Malabar coast, the eastern limit being West Bengal. Also found in Nepal, Southwestern Asia and Africa.

Habitat and ecology : Ratels live in the desert and in the dry and moist deciduous zones, avoiding regions of heavy rainfall. They prefer hilly broken country, and when living in the plains, choose the banks of streams or rivers where burrows can easily be dug. Food consists of mammals, birds, reptiles and insects; also take fruit and honey. Very little is known about the breeding habits. They breed throughout the summer months and usually produce two young at a birth after a gestation of six months (Prater 1980). Young are carried on the back (Ranjitsinh 1982). Life span, in captivity, is about 24 years (Walker 1964).

Population : Wild : Nothing definite is known about the wild population of Ratel in India. During the Indian Mammal Survey (1911-28) a few specimens were only caught. Survey parties of the Zoological Survey of India

though could obtain reports of its occurrence in Rajasthan, Gujarat, Bihar and Andhra Pradesh but could not see or collect any individual. Hence, Tikader (1983) has rightly opined that the population of Ratel has depleted greatly in the last few decades.

In captivity : A good number of Ratels are thriving well in some of the zoos in India.

Scientific interest and potential value : Ratel is of special interest because of its symbiosis with honey-guides. Its black and white pelage is an example of nature's warning coloration, since it is conspicuous even on moonless nights. Ratel is beneficial to man, since it preys upon insects, snakes and rodents.

Threats to survival : Destruction of habitat due to modified land use is the major threat to its survival. Ratel is surrounded by many kinds of superstitions. Hence, this relatively harmless animal is killed whenever encountered (Eates 1968).

Conservation measures taken : Ratel has been enlisted in Schedule I of the Wild Life (Protection) Act which gives it legal protection from killing.

Conservation measures suggested : Detailed survey is required to identify the areas of its concentration and conservation requirements. People should be educated to get rid off the superstitions about Ratel. Captive breeding of Ratel should be encouraged in zoos, with occasional exchange of animals within them.

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Ermine or Stoat

Order CARNIVORA

Mustela erminea ferghanae Thomas, 1895 Family MUSTELIDAE

Diagnostic characters : Body slender and soles covered with hairs except over toe-pads. Fur soft, with woolly underfur. Summer coat chestnut or reddish brown above and white below; winter coat entirely white except the black tail-tip. Fore and hind paws white, contrasting with legs (Pocock 1941, Anon 1981, Roberts 1977, Tikader 1983).

Measurements : Head and body length 19-23 cm; tail 7-9 cm (Roberts 1977, Pocock 1941).

Distribution : Within the Indian limits, this subspecies of Ermine occurs in Jammu & Kashmir only. Extralimittally, found in Pakistan, Afghanistan and Eastern Russian Turkestan (Ellerman & Morrison-Scott 1966, Roberts 1977, Anon 1981).

Intraspecific variations : Out of 21 subspecies of Ermine occurring in the Palaearctic and Indian regions, only one namely, *Mustela erminea ferghanae* occurs within the Indian limits. It is very similar to European races but smaller than the smallest European race and shorter in tail (Pocock 1941).

Population : Wild : Not known. It is not only rare in India but its population has also depleted in Europe and Asia.

In captivity : Not known.

Habitat and ecology : The ermine lives in holes in the ground, amongst rocks and heaps of stones or in hollows of trees. Usually nocturnal but hunts during the day time also. It can climb and swim well. The diet consists of small rodents, birds, frogs and insects. It mates about March and from 5 to 8 young ones are born in April or May (Blanford 1888-91, Pocock 1941, Roberts 1977).

Threats to survival : The glossy white fur of ermine has always been prized for human adornment (Roberts 1977, Anon 1981), hence, the animal is persecuted. The human interference in the area of its occurrence within

the Indian limits is also another factor responsible for the decline of its population.

Conservation measures taken : The ermine is listed in Schedule I of the Wildlife (Protection) Act, hence, legally protected from killing.

Conservation measures suggested : Since *Mustela erminea ferghani* is localised in a particular area in our country, greater enforcement of existing wildlife protection laws are needed to preserve it.

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Binturong***Arctictis binturong* (Raffles, 1821)**

Order CARNIVORA

Family VIVERRIDAE

Common local name : Young (Assamese).

Diagnostic characters : Fur long, coarse, black and lustrous, often with grey, fulvous or buff tips. Head finely speckled with grey and buff ; edges of ears and whiskers white. Ears having tuft. Tail muscular at base and prehensile.

Measurements : Head and body length 61-96 cm ; tail 56-89 cm.

Intraspecific variations : Out of seven subspecies of binturong, only one namely, *A. b. albifrons* (Cuvier) occurs within the Indian limits (Pocock 1939). It differs from the nominate subspecies by its much longer, luxuriant winter coat and lighter colour.

Distribution : Central and eastern Himalayas from Nepal to Arunachal Pradesh, east to Vietnam, north to China and southeast to Indonesia and the Philippine Islands.

Habitat and ecology : Lives in dense, tropical foot-hill forests. Secretive and nocturnal. It is arboreal and spends the day curled up in a tree hole. Omnivorous in diet, and feeds on small mammals, birds, fish, insects and other plant material including carrion. Said to breed year round ; litter size 1-3 (Lekagul & McNeely 1977). Gestation period about 92 days (Medway 1969).

Population : Wild : Nothing is known about the exact population size. In 1982, three specimens were observed by a party of the Zoological Survey of India in Menshithang and Hee Gyanthum Reserve Forests of North Sikkim (Tikader 1983). Ghosh (1987) and Chakraborty & Sen (1991) of the same department recorded this species from Namdapha National Park and Mehao Wildlife Sanctuary of Arunachal Pradesh respectively. Only a few reports in recent years are indicative of its rarity in the area of its occurrence. It is also rare in Thailand (Lekagul & McNeely 1977).

In captivity : Ten binturongs were maintained in three different zoos

of India in 1988.

Scientific interest and potential value : Binturong is the only carnivore in the old world that has a prehensile tail. The Chinese use this animal for medicinal purposes. It is said to be easily domesticated and kept like a pet (Walker 1964).

Threats to survival : Habitat destruction appears to be the major threat to its survival.

Conservation measures taken : Enlisted in Schedule I of the Wild Life (Protection) Act and also in Appendix III of CITES. Protected in some of the conservation areas occurring within its range of distribution.

Conservation measures suggested : Specific surveys will help in the estimation of present population and identifying the areas of its concentration. Protection of such areas is desirable. Captive breeding and release in the wild may also be tried.

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Compiled by S. Chakraborty

Malabar Civet***Viverra megaspila* Blyth, 1862**

Order CARNIVORA

Family VIVERRIDAE

Common local name : Jawad (Malayalam)

Diagnostic characters : Of the size of Large Indian Civet, with a mane of black, erectile hairs extending from between the shoulders to the entire length of tail. Soles of feet almost naked. Body colour distinctly yellow with large black spots at the hinder part of body ; yellow rings on tail incomplete.

Measurements : Head and body length 75-80 cm, tail 32-35 cm.

Intraspecific variations : Out of two subspecies of *V. Magaspila*, the subspecies *V. m. civettina* occurs within the Indian limits (Ellerman & Morrison-Scott 1966, Honacki *et al.* 1982). It is distinguished from *V. m. megaspila* by the naked soles of feet. Some authors regard *civettina* as a full species (Schreiber *et al.* 1989).

Distribution : Earlier distribution of this species was in western coast of Western Ghats from Honnavar in Karnataka (15°N lat.) to Kannya Kumari in Tamil Nadu (Jerdon 1874). It was common in the coastal districts of Malabar and Travancore (Prater 1980, Ashraf *et. al.* 1993).

According to Schreiber *et al.* (1989), this species still occurs in Periyar and Silent Valley in Kerala ; Dandeli, Badra, Brahmagiri, Mookambika, Sharavati Valley, Someshwara and Nagerhole in Karnataka ; Anaimalai and Kalakkad in Tamil Nadu. Outside the conservation areas, it also occurs in Parambikulam, Peechi-Vazhani, Wayanad, Idukki, Aralam, Chimeni, Shentaruni, etc.

Habitat and ecology : The Malabar Civet inhabits the richly wooded plains and adjoining hill slopes of the coastal regions of Kerala and Karnataka. Its feeding habit is very similar to that of the Large Indian Civet, and is destructive to poultry (Tikader 1983). Practically nothing is known about its breeding habits.

Population : Wild : This civet was in plenty during the last century (Jerdon 1874), but became rare at the turn of the century (Pocock 1939). In the Red Data Book (Goodwin and Holloway 1972) it was regarded as

extinct as there was no record of its occurrence for a long period in the present century. Based on sighting at Bhagarathy Valley (lat. 13°12' N, long. 70°12' E), Koppa Forest Division in Karnataka, Karanth (1986) stated that this species still maintains a large distributional range and is unlikely to be extinct in the absence of selective hunting pressure. Further, sighting of a specimen in 1970 at Thiruvalla, Pathanamthitta district, and capture of three specimens in 1987 at Elayur, about 60 km east of Calicut, Kerala (Kurup 1987), proves its existence beyond doubt.

Ashraf *et al.* (1993) identified the different localities of Malappuram district, Kerala from where Malabar Civet could be captured for captive breeding.

In captivity : At present, there is no information.

Threats to survival : Destruction of habitat is the major threat to its survival. Large scale clearance of cashew plantation for planting rubber is regarded as one of the most serious threats (Ashraf *et al.* 1993). Although there is no selective hunting pressure, but due to ignorance, these are being killed by villagers (Kurup 1987).

Commercial value : The Malabar Civet was hunted in the past for its ornamental pelt as well as for its musky civet glands. Both the derivatives are highly prized.

Conservation measures taken : The Malabar Civet is included in Schedule I of the WILD LIFE (Protection) Act, thereby legally protected from killing. It is also included in Appendix III of CITES. Many parts of its probable range are protected as conservation areas.

Conservation measures suggested : Following action has been recommended by Schreiber *et al.* (1989).

The status surveys along the Western Ghats to locate the surviving population, particularly within the listed conservation areas are desirable.

Detailed ecological study of areas where the species still occurs is necessary to elucidate the causes of the civet's rarity, and to suggest conservation measures to prevent its further decline.

If remnant populations are found in isolated habitats where immediate protective measures are unlikely to succeed, consideration should be

given to capture those specimens, a founder stock, for a captive breeding programme.

The species should be enlisted in Appendix I of CITES to curb International trade, if any.

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Spotted Linsang

Order CARNIVORA

Prionodon pardicolor Hodgson, 1842Family VIVERRIDAE

Common local names : Zik-chum (Bhotia) ; Suilu, Silu (Lepcha).

Diagnostic characters : Elongated body, pointed muzzle, short limbs, rich orange to fulvous body colour, and large black spots arranged in longitudinal rows, characterise this animal. Tail having 8 - 10 black rings. Scent gland absent in both sexes.

Measurements : Head and body length 35 - 37 cm, tail 31 - 34 cm.

Intraspecific variations : Variations are marked in the shape, size and arrangement of black spots, and in the degree of brightness of body colour. Out of two subspecies, the nominate subspecies *viz.*, *P.p. pardicolor* occurs within the Indian limits (Pocock 1939). The subspecies *P. p. presina* differs from the nominate subspecies in being lighter in tint and having smaller, more oval, less symmetrical and less lineally arranged spots. However, the validity of these two subspecies is uncertain (Wang Ying-Xiang in Schreiber *et al.* 1989).

Distribution : *India* : Northeastern India, Sikkim. Eastern Nepal, Bhutan, Eastern Burma, Laos, Northern Thailand, Northern Vietnam and southern China (Ellerman and Morrison-Scott 1966).

Habitat and ecology : The Spotted Linsang is confined to hill and mountain forests from 150 m to at least 2,700 m altitude. It is not gregarious and moves freely in the trees as well as on ground. It preys chiefly on insects, small birds and mammals. However, Hodgson (in Pocock 1939), stated that a captive specimen lived only on raw meat. According to Pocock (1939), it breeds and dwells in the hollows of decayed trees ; breeds twice in a year once in February and again in August, and each litter consists of two young.

Population : *Wild* : It seems to be nowhere common (Pocock 1933, Lekagul and McNeely 1977, Prater 1980, Tikader 1983). Bain and Humphrey (1982) regarded it is an endangered animal in Thailand. There are only a few recent records of this species which were summarised by Schreiber *et al.* (1989) as follows :

In 1982, a team of the Zoological Survey of India received reports of a spotted linsang from northern Sikkim, and some years ago a specimen was caught by a hunter from Lachung, north Sikkim (2,700 m ; Ganguli-Lachungpa in litt. 1987). Wang Ying-Xiang (in litt. 1988) photographed one captured specimen from Mount Ailao in central Yunnan. Several Vietnamese zoologists informed Ratajzok (in litt. 1988) that the species may still be common in Vietnam. In addition to this, Sunquist (1982) recorded it (3 in 1975, 1 in 1979) in the lowland forests and grassland (150 m) of Royal Chitwan National Park in southern Nepal (latitude 27°30' N ; longitude 84°20' E).

In captivity : Though there is no recent record of any captive specimen in India, but Bangkok (Thailand) and Hongkong zoos are known to maintain this species. In 1986, two youngs were born in Bangkok zoo and successfully raised by their parents.

Scientific interest and potential value : This species show a remarkable combination of feline characters in its structure and equally cat-like in its ways. Scientific study and adequate information about this species will help in better understanding of the natural history of this insufficiently known group of carnivorous animal and its phylogenetic significance. Moreover, it might play an important role in the control of rodent species.

Threats to survival : Although habitat destruction is the major threat to the survival of the Spotted Linsang, it was rare even in the beginning of the present century as it is obvious from a few specimens collected during the Mammal Survey. Thus, there must be some other factors for the decline in number of this species, which could not be unravelled due to lack of sufficient data. Interspecific competition may be an important factor.

Conservation measures taken : It is already included in the Schedule I of the Indian Wildlife (Protection) Act, 1972 as amended upto 1986. It is also kept in Appendix I of the CITES. Many areas of its range are protected as conservation areas.

Conservation measures suggested : Detailed survey and field research will help in locating the existing populations, their ecological requirements, and identifying the threats to their survival. Further, taxonomic study is needed to determine the geographic variations. Attempt should be made to establish a captive colony of this species in Indian zoo after procuring a

few specimens from the Bangkok and Hongkong zoos.

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Asiatic Cheetah or Hunting Leopard Order CARNIVORA
Acinonyx jubatus venaticus (Griffith, 1821) Family FELIDAE

Common local names : Hunting Leopard (English).

Diagnostic characters : A distinctive large cat, having a slender body, small rounded head and long legs. Coat varies from tawny to bright ruddy fawn above, white below. Body covered with small solid round or oval spots. A black stripe runs from inner corner of each eye to edge of mouth. Ears short and rounded, backside black except at tip. Tail long, more than half of head and body, spotted on its greater part. Claws partially retractile; claw-sheath absent (Pocock 1939, Prater 1980, Tikader 1983).

Measurements : Head and body length 120 - 150 cm ; tail 60 - 80 cm; hindfoot 28 - 30 cm ; height at the shoulder 60 - 80 cm.

Intraspecific variations : There are two subspecies of *Acinonyx jubatus*. The nominate subspecies occurs in Africa and the other namely, *venaticus* occurs in Iran, USSR, etc. The latter is distinguished from the former by its thinner, less woolly winter coat, and absence of mane, probably in summer coat (Pocock 1939).

Distribution : Extinct in India. Now found as a few scattered survivors in Turkmenistan, USSR, and in northeastern Iran (Honacki *et al.* 1982). The last record in India is from near Hyderabad in 1951 and near Chandragiri in southern India in 1952. In the past the species used to occur in northern India as far east as the then Bengal (Mukherjee 1982). There are two reports of Cheetah being killed north of Santsar near Pakistan - Iran border (Roberts 1977) in 1967.

Habitat and ecology : Lives in open semi-arid grassland, savanna, scrub or isolated low hillocks amidst plains but never in forested areas. It is the fastest running animal, and preys upon gazelle, antelope, deer, hare, birds, etc. It is tamed easily. Although it has been tamed and trained for sports yet captive breeding has been a complete failure.

Population : Wild : No estimates available for the Asian race. However, about 200 individuals were present at Khosh Yeilagh in Iran in 1971 (Anon

1981). African race probably ranges between 10,000 and 15,000 individuals (IUCN 1972).

In captivity : Not known.

Trade data : Imported for zoos as pets. Also, there is exchange of captive breed specimens between zoos. 39 live specimens and 16 skins (hunting trophies) from African countries were recorded by CITES parties in 1979 (CITES 1981).

Threats to survival : Destruction of habitat due to increase in human habitation and overgrazing by domestic stock, and consequent loss of prey species and its most favoured areas are the main threats to its survival. It is further alleged that taming of this animal for the purpose of sports was another factor which brought its early decline (Gee 1964, Anon 1981, Mukherjee 1982, Panwar and Gopal 1984).

Conservation measures taken : Hunting Leopard is listed in Schedule I of the Wildlife (Protection) Act and Appendix I of CITES. Totally protected by law in USSR and Iran, Where it struggles for continued existence (IUCN 1972, CITES 1981, Panwar and Gopal 1984).

Conservation measures suggested : Possibility of reintroducing the animal in some of the most suitable pockets of its earstwhile distribution, in India, may be explored (Panwar and Gopal 1984).

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Leopard Cat

Felis bengalensis (Kerr, 1792)

Order CARNIVORA

Family FELIDAE

Diagnostic characters : About the size of a domestic cat, with rather long legs possessing black bars. Head small, with short narrow muzzle ; ears long and rounded, black on backside and with a conspicuous white spot. Colour varies from ochraceous buff to yellow above and white below, with black or brownish spots throughout. Four distinct bands run from crown over neck and break up into bars and spots on shoulder. A pair of horizontal cheek stripe runs from inner corner of eyes. Tail about half of head and body length, spotted above, indistinctly ringed towards tip ; tip buffy (Pocock 1939, Prater 1980, Tikader 1983).

Measurements : Head and body length 61-68 cm ; tail 28-30 cm ; hindfoot about 12 cm.

Intraspecific variations : Several subspecies have been described, but the validity of some is doubtful. Coat, in general, is darker in humid region than in cooler and drier tracts (Pocock 1939, Ellerman & Morrison-Scott 1966).

Distribution : Throughout India. Also found in Pakistan, northeast to China, Korea and eastern Siberia, and southeast to Taiwan, Java, Bali, Borneo and the Philippines (Pocock 1939, Ellerman and Morrison-Scott 1966, Honacki *et al.* 1982).

Habitat and ecology : A forest living animal, adapted to different ecological conditions. Nocturnal ; prefers to take shelter in the hollows of tree trunks. It is a good climber and efficient swimmer. It preys upon small birds and animals ; also destructive to poultry. In southern India, breeds from March to May ; litter size 1-3 (Blanford 1888-91).

Population : Wild : Not exactly known. Intelligent estimates suggest that the species is still holding on its distribution but in much reduced number.

In captivity : According to Zoo Yearbook, 1979, 52 leopard cats were born in different zoos. It is also kept as a pet by private persons (CITES

1981).

Commercial value : Pelts of the leopard cat are much sought after in international trade for making ladies coat and fancy articles.

Trade data : In 1979, a complete ban on the export of its hide was enforced, hence, no data is available (CITES 1981, Panwar and Gopal 1984).

Threats to survival : Although widely distributed, this cat is heavily persecuted because of its beautiful pelt. Depletion of its habitat has also proved a constraint.

Conservation measures taken : The species is enlisted in Schedule I of the Wildlife (Protection) Act and Appendix I of CITES. The cat gets the advantage of protection in all the conservation areas falling under the range of its distribution (CITES 1981, Honacki *et al.* 1982, Panwar and Gopal 1984).

Conservation measures suggested : No special action is needed except stringent control on its illegal fur trade (Panwar and Gopal 1984).

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Compiled by R. K. Ghose

Pallas's Cat***Felis manul* Pallas, 1776**

Order CARNIVORA

Family FELIDAE

Diagnostic characters : About the size of a domestic cat, with a broad head, and long, dense and soft fur. Coat colour silvery or iron grey ; chin and throat white. Two parallel black stripes radiating downwards from outer corner of eyes, some scattered black spots present on forehead and crown, and dark transverse stripes on lower back and limbs. Tail thick and rounded, with black tip preceeded by 5 or 6 black rings. Ears short, rounded and set wide apart ; backside buff without any black spot. Undersurface of paws reddish buff (Pocock 1939, Prater 1980, Roberts 1977).

Measurements : Head and body length 50 - 65 cm ; tail 21 - 31 cm ; hindfoot 12 - 13 cm.

Intraspecific variations : Three subspecies are recognised on minor variations in colour and body-size. The subspecies *Felis manul nigripsecta* occurs within the Indian limits in Jammu & Kashmir and Tibet and differs from the nominate subspecies in its more silvery-grey winter coat. The adjacent subspecies from Pakistan namely, *F. M. ferruginea* is erythristic, the pelage being rich orange.

Distribution : A central Asian species, occurring within the Indian limits in ladak (Jammu & Kashmir). Elsewhere found from Caspian Sea to Jammu & Kashmir, China and Mongolia (Honacki *et al.*, 1982).

Habitat and ecology : Generally remains confined to the higher reaches of the mountain. In Ladak, it is associated with barren stony valleys and hill ranges above the tree-line from 360 to 4800 m alt, and feeds mainly on pikas and other small mammals and birds which it affords to catch (Stockley 1936, Roberts 1977).

Population : Wild : Nothing has been recorded about the population-size of this cat.

In captivity : 54 manuls were kept in different zoos outside India up to 1981 (CITES 1981).

Commercial use : Occasionally known in the fur trade, not in India but in Mongolia.

Trade data : From Mongolia, 437 fur skins were exported in 1979. The same year, reexport of 2631 fur skins were recorded by the CITES parties (CITES 1981).

Threats to survival : Trapping and hunting of the species in the areas of its occurrence, and disturbance in its habitat are main reasons of its decline.

Conservation measures taken : The Pallas's Cat is enlisted in Schedule I of the Wild Life (Protection) Act and Appendix II of CITES. Hence, trade in this species or its products is subject to regulation and monitoring by ratifying nations.

Conservation measures suggested : Since the total world population of Pallas's Cat is so restricted, detailed field studies for determining its exact distribution and current population status are needed for suggesting effective conservation measures. A few protected areas need to be set up in Ladakh where this species is expected to occur.

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Compiled by R. K. Ghose

Marbled Cat***Felis marmorata*** (Martin, 1837)

Order CARNIVORA

Family FELIDAE

Diagnostic characters : Like a miniature clouded leopard ; coat rich ochraceous brown to rufous brown, consists of stripes on crown, neck, and back, of large and small blotches making a marbled pattern, and spots on underside of limbs ; undersurface whitish with solid black spots, head short and broad, marked with one black stripe running from upper margin of each eye, two black stripes on each cheek, and small spots on forehead. Ears short and rounded, backside black, with grey median bars. Tail dark and its pattern obscurely defined. Legs short, heavily spotted, with large padded feet (Pocock 1939, Prater 1980).

Measurements : Head and body length 45 - 61 cm ; tail 35 - 54 cm.

Intraspecific variations : Two subspecies have been described of which one, namely, *Felis marmorata charltoni* occurs in India.

Distribution : Nepal east to northeastern India, Burma, Thailand and Vietnam, and southeast to Malaysia and Indonesia (Honacki *et al.* 1982).

Habitat and ecology : Found in dense evergreen forests ; arboreal and nocturnal. It preys upon birds and small and medium-sized mammals (Prater 1980, Panwar and Gopal 1984).

Population : Wild : Nothing is known about its population-size. In Sikkim, Bhutan and Arunachal Pradesh, the population appears to be somewhat better than in other areas (Panwar and Gopal 1984).

In captivity : Eleven marbled cats were kept in different zoos in 1980 (CITES 1981).

Trade data : Mainly in zoo trade. One live specimen was recorded by CITES parties in 1979 (CITES 1981).

Threats to survival : Destruction of habitat, human interference and poaching for its pelt are the main threats to its survival.

Conservation measures taken : Enlisted in the Schedule I of the Wild Life (Protection) Act and Appendix I of CITES. About 800 Km² of its habitat

out of about 10,000 km² in Arunachal Pradesh is protected as conservation areas. The position in Assam and Meghalaya is unknown (Panwar and Gopal 1984).

Conservation measures suggested : More conservation areas need to be declared in Arunachal Pradesh where its status is expected to be good. Perhaps some precautions in forestry work will be able to help in the conservation of this cat even outside protected areas (Panwar and Gopal 1984). Status survey of this species is needed, in India, to suggest measures for its conservation.

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Rusty-spotted Cat

Order CARNIVORA

Felis rubiginosa Geoffroy, 1831

Family FELIDAE

Diagnostic characters : Smaller than the domestic cat, with short and rounded head, and tail about half the length of head and body. Coat soft, smooth and fawn-coloured, with brown bars and spots arranged in linear pattern, those on hind quarters reduced to small spots ; underside white with black spots. Several dark stripes present on forehead, two dark streaks on cheeks, and four rusty brown longitudinal stripes extending along the nape. Tail more rufous-coloured than the body. Backside of ears rufous grey with dark tip and lighter basal spot (Pocock 1939, CITES 1981, Anon 1981).

Measurements : Head and body length 35 – 48 cm ; tail 15 – 25 cm.

Intraspecific variations : Out of two subspecies of Rusty-spotted Cat, the nominate subspecies occurs in India, and *phillipsi* in Sri Lanka.

Distribution : Occurs in scattered pockets in India. Reported from Western Ghats, Maharashtra, Madhya pradesh and Jammu & Kashmir ; also found in Sri Lanka.

Habitat and ecology : The species inhabits grassland, scrub and jungle; arboreal in habit. Not much is known about the breeding habit except that the litter consists of 2 or 3 kittens (Anon 1981).

Population : Wild : Nothing is exactly known but is very rare. However, one specimen was collected from Jammu & Kashmir in 1975 (Chakraborty 1979).

In captivity : Nine Rusty-spotted cats were kept in different zoos up to 1981 (CITES 1981).

Trade data : Only one skin was recorded by CITES parties in 1979 (CITES 1981).

Threats to survival : Localised distribution and scanty reports suggest that it is very rare. The species is also in the target list of the professional trap-hunters for the fur trade.

Conservation measures taken : This cat is included in Schedule I of

Wild Life (Protection) Act and Appendix I of CITES (only Indian population). The Sri Lankan population is in Appendix II.

There is conservation cover for the species approximately in 8000 km² area in different national parks and sanctuaries in Maharashtra, Karnataka, Tamil Nadu, Kerala and Dangs of Gujarat (Panwar and Gopal 1984).

Conservation measures suggested : Rigid enforcement of law against nomadic trappers and furriers is desirable.

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Desert Cat***Felis silvestris* Schreber, 1777**

Order CARNIVORA

Family FELIDAE

Diagnostic characters : Of the size of a domestic cat, with head broader. Coat thick, with abundant fur. Colour pale sandy, with numerous black spots ; terminal half of tail ringed with black ; black stripes present on forehead and neck, two horizontal stripes on cheeks, numerous transverse stripes on limbs, and two black bars on inner side of forearm ; chin, throat and breast white. Ears rather small and pointed, with a few black hairs at tip. Legs slightly longer than in the domestic cat ; soles black.

Measurements : Head and body length 55-80 cm ; tail 25-40 cm ; hindfoot 11-15 cm ; height at the shoulder 25-35 cm.

Intraspecific variations : A large number of subspecies have been described which can be attributed to three distinct groups. i) *silvestris* group, with 5 subspecies (European), ii) *libyca* group, with 11 subspecies (African), and iii) *ornata* group, with 5 subspecies (Asian). Cats belonging to *ornata* group are smaller than *silvestris* group ; coat colour vary from pale sandy to fulvescent grey ; body marked with numerous dark spots unlike the striped pattern that runs down from the spinal band in *silvestris* group, tail slightly tapering (CITES 1981).

Distribution : Indian subspecies, *Felis silvestris ornata* occurs in arid and semiarid zones of western India (Gujarat, Rajasthan, Central India), Pakistan, southern Afghanistan west to Iran and southern Iraq (Pocock 1939, Honacki *et al.* 1982).

Habitat and ecology : Deciduous woodland, savanna and steppe are the preferred habitats of the desert cat. In northwestern India and Pakistan, it lives in scrub jungles or in burrows dug by itself or in natural caves. It mainly preys upon rodents, lagomorphs, birds and reptiles ; also takes termites, beetles and cockroaches. Breeds throughout the year ; gestation period is about 56 days ; litter size 2-3 (Roberts 1977, Anon 1981, Panwar and Gopal 1984).

Population : Wild : No exact estimate is available. However, the

population is relatively scarce.

In captivity : There are records of 88 zoo-born cats of this species up to 1979 (CITES 1981).

Commercial value : Pelts of the desert cat are most sought after in international fur trade.

Trade data : 50 live specimens were recorded by CITES parties in 1979 (CITES 1981, Panwar and Gopal 1984), probably non-Indian population.

Threats to survival : High market value of its pelt appears to be the main reason of its persecution by man, leading to its scarcity.

Conservation measures taken : Included in Schedule I of the Wildlife (Protection) Act and Appendix II of CITES.

The species receives protection cover in more than 15,000 km² of its habitat in different conservation areas in western India and in the Desert National Park (3160 km²) in Rajasthan and Great Indian Bustard Sanctuary (7800 km²) (Panwar and Gopal 1984).

Conservation measures suggested : Upgradation of management efforts in existing national parks and sanctuaries is needed, besides stricter control over nomadic hunting tribes and pelt dealers in the country (Panwar and Gopal 1984).

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Compiled by R. K. Ghose

Golden Cat

Order CARNIVORA

Felis temmincki (Vigors and Horsfield, 1827) Family FELIDAE

Common local name : Sunahli Billi (Hindi).

Diagnostic characters : A medium-sized, sturdy built cat, with coat golden brown to grey without any pattern above, paler below. Head with horizontal white cheek stripes running from below eyes to behind gape ; another conspicuous white stripe present on inner side of eyes which bifurcates above and continuous with a greyish stripe passing on to crown. Ears rounded, backside black, with a whitish central spot. Legs stout, rather long, with large padded feet. Tail about one-third to two-thirds of head and body length, dark on the tip (Pocock 1939, Prater 1980, CITES 1981).

Measurements : Head and body length 75-105 cm ; tail 49 cm ; hindfoot 17-18 cm.

Intraspecific variations : Three subspecies are recognised of which the nominate subspecies occurs in India. The melanistic specimens occur fairly frequently (Pocock 1939, Prater 1980).

Distribution : From Nepal to northeastern India, Burma, S. China, east to vietnam, and southeast to Sumatra (Honacki *et al.* 1982).

Habitat and ecology : Inhabits forests in the Himalayan foot-hills as well as throughout its range. In Meghalaya, it avoids pine forests. It preys upon small games, poultry and livestock. It is an expert climber and uses hollows of trees for bringing up young. Generally, two cubs are born at a time (Anon 1981, Panwar and Gopal 1984).

Population : Wild : No information is available on its exact population-size. However, it is decreasing in number due to destruction of habitat. (CITES 1981, Biswas & Ghose 1982, Panwar & Gopal 1984, Biswas *et al.* 1985).

In captivity : 52 cats were kept in zoos, in 1980, contributing to the International Zoo Yearbook (CITES 1981).

Trade data : Occasionally known in zoo trade. One live specimen was

recorded by CITES parties in 1979 (CITES 1981).

Threats to survival : Destruction of habitat is the main threat to its survival. It is also trapped in good numbers for zoological parks.

Conservation measures taken : The Golden Cat is listed in **Schedule I** of the Wild Life (Protection) Act and Appendix I of CITES.

In India, about 5000 km² in its range of distribution is covered by conservation areas. The existing coverage is, however, inadequate (Panwar and Gopal 1984).

Conservation measures suggested : It is necessary to set up more protection areas in Sikkim, Arunachal Pradesh, Meghalaya and in other northeastern states (Panwar and Gopal 1984).

Studies on its population status may be taken up.

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Fishing Cat

***Felis viverrina* Bennett, 1833**

Order CARNIVORA

Family FELIDAE

Diagnosis characters : Much larger than the leopard cat in size, but tail relatively shorter. Body covered with short, coarse, earthy grey fur, infused with brown, and elongate dark spots arranged in longitudinal rows. From 6 to 8 dark lines run from forehead to neck, and two longitudinal black stripes on each cheek. Tail marked with incomplete rings ; tip black. Limbs short, forelegs with two elbow bars, and feet having moderately developed interdigital webs ; claw-sheath not completely enclosing the retractile claws (Pocock 1939, Prater 1980).

Measurements : Head and body length 70-86 cm ; tail 25-32 cm ; hindfoot about 16 cm.

Intraspecific variations : No subspecies. Specimens from Java are, however, somewhat smaller than others.

Distribution : Pakistan, India, Nepal, Bhutan, Sri Lanka, Bangladesh east to Vietnam and southeast to Indonesia.

Distribution is discontinuous. Inhabits forests in the Himalayas (1525 m alt.), swamps in the Himalayan foot-hills, Sunderbans in West Bengal, Chilka Lake (Orissa), and backwaters of Kerala (Prater 1980, Honacki *et al.* 1982, Panwar and Gopal 1984).

Habitat and ecology : Inhabits thick jungles, scrub, grassy swamps, reed beds, small rivers and tidal creeks. It is equally at home in estuarine mangrove, coastal backwaters and inland perennial water-bodies. It preys upon various animals, birds, fish and molluscs. Nothing much is known about the breeding habits of this cat ; litter-size 1 or 2 per brood (Anon 1981).

Population : Wild : Exact population in the wild is not known. Rare in India. The population in Sunderbans (West Bengal) and Chilka lake (Orissa) is somewhat better.

In captivity : In 1977, five fishing cats were born in different zoos (CITES 1981).

Commercial use : Pelts of Fishing Cat are most sought after, in international trade for making garments and fancy articles. Its claws, bones, etc., are used in magical cults by native witch doctors.

Trade data : In 1979, a complete ban on the export of pelts of wild cats was enforced. During 1975-81, there are records of Swiss import of three live specimens (CITES 1981) of this species.

Threats to survival : Loss of habitat and poaching are the main threats to its survival. Now restricted to a few pockets within its range of distribution.

Conservation measures taken : Enlisted in Schedule I of the Wild Life (Protection) Act and Appendix I of CITES. It enjoys protection in a number of conservation areas.

Conservation measures suggested : Efforts should be made to conserve its habitat outside the conservation areas.

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Caracal

Order CARNIVORA

***Felis caracal schmitzi* Matschie, 1912**

Family FELIDAE

Common local name : Siyeh gush (Hindi).

Diagnostic characters : A medium-sized cat, with broad head, tufted ears, higher on the hindlimbs than on the fore and a short tail. Coat thick and soft. Colour reddish grey above and white below, with some faint spots. Cheeks without any ruff. Buffy stripes on inner side of forelimbs (Pocock 1939, Prater 1980).

Measurements : Head and body length 62 - 82 cm ; tail 23 - 32 cm ; hind foot 17 - 21 cm ; height at the shoulder about 45 cm.

Intraspecific variations : There are nine subspecies of *Felis caracal* (Ellerman and Morrison-Scott 1966) of which *F. c. schmitzi* occurs in India. These subspecies are recognised on minor variations of colour.

Distribution : Sub-Saharan Africa, Arabia, Iraq, Iran, Pakistan and northern India. The Indian subspecies is found in Punjab, Rajasthan, Gujarat, eastern Uttar Pradesh and western Madhya Pradesh (Pocock 1939, Ellerman & Morrison-Scott 1966), also Pakistan.

Habitat and ecology : Inhabits sandy deserts, semiarid open bushes, grass plains and low hillocks. Feeds on smaller animals like birds, rodents, lizards, etc ; also preys upon hare, gazelle and antelope. It rears its young in crevices among rocks or hollows of trees ; litter-size ranges from 2 to 4 (Prater 1980, Anon 1981, Mukherjee 1982).

Population : Wild : The information on the population size of this species is not known, but is considered to be very rare. Even earlier workers refer to the rarity of this animal (Murray 1884, Sterndale 1884, Pocock 1939). Roberts (1977) mentioned about sightings of a few specimens in Pakistan between 1955 and 1966. The species is also reported from Sariska Tiger Reserve. Recently, it has been sighted at Matapahar near Sambar Lake, Rajasthan by a party of the Zoological Survey of India.

In captivity : According to Zoo Yearbook of 1979, 56 caracals were

born in different zoos during that year (CITES 1981).

Commercial use : The hyde of caracal had been in great demand in the international market before the ratification of CITES in 1976.

Trade data : Ten live specimens were recorded by CITES parties in 1979. The same year, 563 skins of caracal were exported from South Africa (CITES 1981, Panwar and Gopal 1984).

Threats to survival : The species has depleted in number mainly due to destruction of its habitat and nomadic trap-hunting. Pocock (1939) has alerted that 'it will in all probability follow the fate of the hunting leopard' and feared about its extinction from India. However, the present trend is neither known nor is there any detailed information on the current threats to its existence (Mukherjee 1982).

Conservation measures taken : The species is legally protected from hunting and trade by enlisting in Schedule I of the Wild Life (Protection) Act and Appendix I of CITES (Asian population only). There are reports of the species being marginally benefitted by improved protection in conservation areas in Rajasthan and Gujarat. The total conservation cover is about 10,000 km² (CITES 1981, Panwar and Gopal 1984).

Conservation measures suggested : Severe action is needed against poachers and traders. Hence, stricter implementation of the wildlife laws is desirable.

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Himalayan Lynx

Order CARNIVORA

Lynx lynx isabellinus Blyth, 1847Family FELIDAE

Common local names : Patsalan (kashmiri).

Diagnostic characters : A strongly built cat, high on the legs, and with a short tail, less than one-fourth of head and body length. Ears long and pointed, with a long tuft of hair at the end. Hairs of lower cheeks lengthened forming a partial ruff. Fur in general long and thick. Coat, in Himalayan subspecies, isabelline, with faint spots on the flanks and limbs. Pads of feet concealed by fur (Pocock 1939, Roberts 1977, Nowak & Paradiso 1983).

Measurements : head and body length 86 - 107 cm ; tail 14 - 20.5 cm ; ear tuft 45 - 73 mm.

Intraspecific variations : Out of 10 subspecies of lynx (Ellerman & Morrison-Scott 1966), only one occurs in India. The Himalayan lynx is distinguished by its smaller size and slaty grey to isabelline pelage, hair on the toes being shorter. The Canadian and Spanish Lynx, however, are considered as separate species by Honacki *et al.* (1982).

Distribution : Within the Indian limits, Lynx is confined to Gilgit and Ladak in Jammu and Kashmir. Also occurs in northern mountain ranges of Pakistan and through Tibet to outer Mongolia and Tianshan (Ognev 1935, Prater 1980, Roberts 1977).

The nominate subspecies occurs in Europe, Canada and USA.

Habitat and ecology : The Himalayan lynx lives in dense cover of scrubs, patches of reeds and tall grass between 1700 and 3400 m alt. In Pakistan, it is said to be restricted to the alpine slopes above the tree-line. It preys on birds and small mammals from mice to goat and sheep that it is able to kill. It is said to have 2-3 young, the mother usually hides its litter in a cave or hole among rocks. Half grown cubs have been observed in Ladak, in late August. The gestation period is about 60-63 days. The Himalayan Lynx is recorded to survive about 16 years (Stockley 1928, Dover 1933, Crandell 1964, Ewer 1973, Prater 1980).

Population : Wild : No estimate of its population, in India, is available but due to its limited distribution at high altitudes in western Himalayas, the population of this subspecies, in all probability, is scarce.

The population density in Alberta in Canada varied from 2.3 individuals per 100 sq. km. in the winter of 1966-67 to 10 per 100 sq km in winter of 1971-72. The maximum density in eastern Europe and the Soviet Union is 5 per 100 sq km. (Ewer 1973).

In captivity : According to Zoo Yearbook 1979, 83 lynx were born in different zoos (CITES 1981).

Commercial use : Its pelt is used for making ladies coats, hand bags, etc.

Trade data : International trade in lynx is now under strict control of CITES. However, incidence of illegal trade in its pelt is not uncommon in Jammu and Kashmir, in India (Roberts 1977).

Reported trade of this species in Canada was 1,92,440 pelts between 1949 and 1980; between 500 and 1000 pelts per year in early thirties in China, and between 1000 and 1500 pelts in Manchuria-Mongolia (Harrison 1968, Roberts 1977, Statistics Canada 1981, Nowak and Paradiso 1983, Panwar and Gopal 1984, Bangjie 1984). The average price in Canada in 1978-79 was about \$ 336.00 per pelt.

33 live specimens were recorded by CITES parties in 1979. Swiss trade in live specimens (1975-1981) : 18 imports, 8 exports. Export of fur skins (1979) : Canada 23953; USSR 153.

Threats to survival : Principal threats are habitat destruction thereby reducing its natural prey-species, and uncontrolled hunting for its valuable pelt. The picture is analogous in India, Pakistan and China (Harrison 1968, Roberts 1977, Panwar and Gopal 1984, Bangjie 1984).

Conservation measures taken : The Himalayan Lynx is legally protected from hunting in India by its inclusion in Schedule I of the Wildlife (Protection) Act, and controlled trade by inclusion in Appendix II of CITES. In India, the conservation cover has been provided to the Himalayan lynx in three sanctuaries in Himachal Pradesh and two in Jammu and Kashmir, covering an area of about 400 sq km (Panwar & Gopal 1984).

Conservation measures suggested : The management of the existing sanctuaries and national parks needs strengthening, beside providing protection to the small population surviving outside the reserves.

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Clouded Leopard
Neofelis nebulosa (Griffith, 1821)

Order CARNIVORA
 Family FELIDAE

Common local names : Pungmar, Satchuk (Lepcha), Kung (Bhutanese), Amchitd (Nepalese).

Diagnostic characters : Clouded leopard has a long body and tail, short limbs and rounded black ears. Body colour grey to earthy brown or rich yellowish brown above, white below. Head spotted, and face marked with cheek stripes ; large 'clouded' spots present on body, formed by dark blotches. Tail marked with rings, and tipped black. Feet with large paws (Pocock 1939, Prater 1980, CITES 1981).

Measurements : Head and body length 75-105 cm ; tail 70-90 cm ; height at the shoulder 50-60 cm.

Intraspecific variations : Several subspecies have been described but their validity is doubtful.

Distribution : Found in north eastern India and Sikkim. Also reported from Nepal, Bhutan, Burma, extending northeast to southern China and southeast to Indonesia and Malaysia (Ellerman and Morrison-scott 1966, Medway 1969).

Habitat and ecology : Lives in dense forests. Nocturnal and arboreal. Preys upon birds, small and medium-sized mammals and even domestic animals. It brings forth its young in the hollow of a tree. Litter-size generally two.

Population : Wild : In India, the species has become increasingly rare throughout its range. The exact population size is not known. It has been assigned vulnerable status in IUCN Red Data Book.

In captivity : Up to 1980, 150 animals were present in different zoos of the world (CITES 1981).

Commercial use : Before 1976, the skin of clouded leopard was in great demand in the international market.

Trade data : At present, only known in zoo-trade. Seven live-specimens

were recorded by CITES parties in 1979 (CITES 1981).

Threats to survival : Loss of forests may account for its decline (Denis 1964, Midway 1969).

Conservation measures taken : The clouded leopard is enlisted in Schedule I of the Wild Life (Protection) Act and Appendix I of CITES. Gets protection in the conservation areas which is about 1,000 km² in Sikkim, Meghalaya and Arunachal Pradesh, out of a total of 18,000 km² (Panwar and Gopal 1984).

Conservation measures suggested : The current status, range of distribution, food and habitat requirements of this species need to be determined for suggesting measures for its protection and management. In Meghalaya, particularly in Garo Hills, the areas of existing sanctuaries may be enlarged (IUCN 1972, Panwar and Gopal 1984).

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Compiled by R. K. Ghose

Asiatic Lion

***Panthera leo persica* (Meyer, 1826)**

Order CARNIVORA

Family FELIDAE

Common local names : Sinh (Hindi), Sawachh (kathiawari).

Diagnostic characters : A large powerfully built cat, with broad head and short, uniform body-coat ; females a little smaller than males. Coat colour varies from pale yellowish brown to sandy grey ; underparts white. Male possesses an almost black mane. Ears rounded, with black marks on basal part of backside. Tail having a black tuft at tip. Foot pads large ; forelimbs more powerfully built than hind. Young spotted or striped (Pocock 1939, Prater 1980).

Measurements : Head and body length 140-250 cm ; tail 70-105 cm ; hindfoot 35 cm ; height at the shoulder 80-110 cm.

Intraspecific variations : Several subspecies have been described but their validity is controversial. Indian subspecies differs from the nominate one in the mane being a little less developed and tail tuft longer.

Distribution : Sasan Gir in Gujarat, India (in about 1412 sq km area).

A little over 100 years ago, the Asiatic Lion ranged from western Iran to eastern India (Kinnear 1920). During 19th century, it was reported in India from Gujarat to Bihar (Rashid 1986). However, by the second half of the 20th century it had been shot out of its entire range except Sasan Gir.

Habitat and ecology : The lion inhabits scrub savanna country, interspersed with open dry deciduous forests. Because of diversion of the scrub to agriculture and other uses, the lion in Gir has been forced to live in the mixed dry deciduous forest, composed of Teak (*Tectona grandis*), Jamun (*Syzygium cumini*), Sadad (*Terminalia crenulata*), Semal (*Bombax ceiba*), Khakhar (*Butea monosprma*), etc., with bamboos (*Dendrocalamus strictus*) and thorny bushes of dense *Acacia*, *Zizyphus*, *Euphorbia*, etc. (Mukherjee 1982).

Lion is gregarious and territorial. Lives in groups of 8-10 individuals. It preys upon cattle, antelope, deer and other animals. There is no definite

breeding season. Mating generally takes place in October or November. Cubs are born in January or February after a gestation of about 116 days ; litter size 2 or 3.

Population : Wild : Four organised censuses carried out in Gujarat by counting pug-marks of the right front paw of the Asiatic Lion on roads, tracks, trails, waterholes, etc., in the years 1936, 1950, 1955 and 1963, showed 287, 227, 290 and 285 animals respectively. Subsequently, census was carried out by direct visual count method in 1968, 1974, 1979 and 1985, which gave a population of 177, 180, 205 and 239 individuals respectively (Winter Blyth 1956, Dalvi 1969, Rashid 1986). Thus there was a marginal increase of 34 animals in its population between 1979 and 1985, possibly because of some improvement of its degraded habitat.

In captivity : In 1971, at least 34 males and 32 females were held captive in 13 collections. Not all of these specimens are necessarily pure breed stock (IUCN 1972). According to CITES (1981), about 140 lions were kept in different zoos in 1980.

Threats to survival : The Asiatic Lion is legally protected from hunting but the enforcement of protection laws within 1265 km² Gir sanctuary is far from adequate. The main threats are poaching, encroachment of habitat for agriculture, decline in number of preyspecies, overgrazing by domestic stock, etc. Due to reduction in prey species, lions attack cattle but they are unable to consume them as these are being taken away by local inhabitants who have the practice of collecting meat and hide of these kills (Jasolin 1970, Panwar and Gopal 1984,,).

Conservation measures taken : The lion is legally protected from hunting by its inclusion in Schedule I of the Wildlife (Protection) Act and from trade by inclusion in Appendix I of CITES.

The lion's habitat in Gir National Park (24.50 km²) and Gir sanctuary (1265 km²) is highly preserved. An alternative home for the lions is being developed in 200 km² at Barda Sanctuary in Jamnagar District of Gujarat. There is also a plan to create a captive breeding centre at Wankaner, about 240 km north of Gir.

Conservation measures suggested : On 26th December, 1971, the Gujarat State Ecological Council suggested that i) all cattle to be removed

immediately from the National Park area and in stages from remainder of the sanctuary, ii) all forestry operations to cease within the National Park, iii) collecting of hides and meat from lion-kills to cease completely, iv) a wall to be erected along the boundary of the sanctuary in areas suffering from severe illegal trespass and v) area to be set free of local inhabitants at a greater pace.

Trade data : Not known for the Indian subspecies.

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Compiled by R. K. Ghose

Leopard

Panthera pardus Linnaeus, 1758

Order CARNIVORA

Family FELIDAE

Common local names : Tendwa, Chita bagh (Hindi), Bibalya bagh (Marathi), Pulli poolee (Malayalam), Chiruthai (Tamil), Chinna puli (Telegu).

Diagnostic characters : A large, powerfully built cat, with elongated body, a long tail, and short, stout legs. Coat above short and soft, with numerous black 'rosettes' ; underparts and innerside of limbs white. Head rather small, with convex profile ; ears rounded, backside black, with a conspicuous white spot. Tail with black rings, and tip black (Pocock 1939, Prater 1980, CITES 1981).

Measurements : Head and body length about 160 cm ; tail about 100 cm ; hindfoot 20-27 cm.

Intraspecific variations : Out of 14 subspecies (Ellerman & Morrison-Scott 1966), three occur in India namely, *fusca* (penninsular India, Sri Lanka), *millardi* (jammu & Kashmir), and *pernigra* (Sikkim and Nepal). These subspecies mainly differ in colour. Melanistic individuals are relatively frequent in the Indo-Malayan range.

Distribution : Whole Africa except Sahara, SW. Asia, Oriental region to Java, north to Korea. In India, the species occurs from the Himalayas to Cape Comorin (Pocock 1939, Ellerman & Morrison Scott 1966, Honacki *et al.* 1982).

Habitat and ecology : Lives in a variety of habitats, from tropical forests and rocky areas with heavy scattered vegetation to high, cold regions of the Himalayas. It usually hunts during night and preys upon all kinds of animals including crabs and domestic animals. Breeds throughout the year, and from two to four cubs are born after a gestation of 12-14 weeks (Anon 1981).

Population : Wild : Exact population-size in the wild is not known. However, it is still widespread and is generally maintaining good numbers. The number of leopards in ten out of 15 Tiger Reserves during 1984-85 was

about 550. (IUCN 1972, Panwar and Gopal 1984, Tiger Project report 1986).

In captivity : In 1978, a total of 280 cubs were born in different zoos (CITES 1981).

Commercial use : The pelts of leopards were most sought after in the international fur trade in 1960's. However, after the ratification of CITES in 1976, the fur trade in this species has practically stopped.

Trade data : Eighty eight live specimens and 129 skins were recorded by CITES parties in 1979, mainly from Africa (CITES 1981, Panwar and Gopal 1984). In India, since 1979 there is a complete ban on export of wild pelts.

Threats to survival : Destruction of habitat and overhunting for skin are the main threats to its survival.

Conservation measures taken : The leopard is legally protected from hunting and trade by inclusion in Schedule I of the Wildlife (Protection) Act and Appendix I of CITES respectively. The International Fur Trade Federation has imposed ban on the use of leopard skins. The animal further gets protection in various conservation areas.

Conservation measures suggested : Strict implementation of wildlife laws is desirable. Because of the leopard's preference for peripheral wilderness, the multiple use inter-space between adjacent wildlife reserves should be developed and protected (IUCN 1972, Panwar & Gopal 1984).

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Tiger

Order CARNIVORA

Panthera tigris tigris (Linnaeus, 1758)Family FELIDAE

Common local names : Bagh (Hindi), Wagh (Marathi), Kaduwa (Malyalam), Poolee (Tamil & Telegu).

Diagnostic characters : A large cat, having prominent black vertical stripes on its body. Coat coarse, short, brownish yellow to golden rufous above and white below. Ears short and rounded, backside with a conspicuous white spot. Tail long, with stripes and rings, black at tip; forelimbs more powerful than hind ; foot pads large. Females smaller (Pocock 1939, Prater 1980, CITES 1981).

Measurements : Head and body length 140-280 cm ; tail 60-110 cm; hindfoot 30-40 cm ; height at the shoulder 95-110 cm.

Intraspecific variations : Out of six subspecies of tiger (Ellerman & Morrison-Scott 1966), the nominate subspecies occurs in India. The subspecies are distinguished on size, colour and development of mane (Pocock 1939).

Distribution : Found practically throughout India except the deserts of Rajasthan, Gujarat, Punjab, and higher reaches of Himalaya. Also occurs in Nepal, Bhutan, Bangladesh and Burma. However, the number of tigers is negligible in Goa, Haryana, Tripura and Manipur, in India (Honacki *et al.* 1982, Ellerman & Morrison-Scott 1966, Burton 1952, Mountfort 1970).

Habitat and ecology : Occurs in most of the major forest types of the Indian sub-continent (thorny, dry & moist deciduous, semievergreen, evergreen, mangrove, swampy, tall grasses, grassland scrub mosaic, and high altitudes up to 3600 m). It avoids deserts and desicated zones. Tiger is generally a solitary hunter and takes to game of all kinds including livestock. Generally incapacitated tigers, which are unable to kill their natural prey, become maneaters. Tiger becomes sexually mature at the age of 3 or 4 years. It breeds after rains. Three or four, sometime up to seven

cubs are born after a gestation of about 15 weeks between February and May.

Population : Wild : The nation-wide tiger survey, in India, in 1972 recorded 1827 animals. In 1970, 20 tigers were estimated to be present in Bangladesh and possibly 200 in Nepal. There are non reliable estimate of tigers in Sikkim, Bhutan and Burma (Singh 1972, Waller 1971, IUCN 1972). All India Tiger census, in 1979, put the population at 3015. The population in 15 tiger reserves was estimated to be 978 in 1983-84. Again the animals counted in 1984, in India, stood at 4005, and in tiger reserves at 1241

In captivity : In 1971, 181 males, 209 females and 2 unsexed tigers were held in 126 collections (Lucas and Duplaix-Hall 1972). According to the Zoo Yearbook 1979, the number of pure-bred tigers kept in different zoos were about 1125 all of which may not be of Indian origin. In addition, many subspecific hybrids are kept by zoos and circusses (CITES 1981).

Commercial use : Hide of the tiger is much sought after in International trade.

Trade data : In 1979, a complete ban on export of the tiger's pelt was enforced. However, about 200 live-specimens and 7 skins were recorded by CITES Parties in 1979 (CITES 1981, Panwar and Gopal 1984).

Threats to survival : The habitat of tiger has shrunk substantially as a result of clearing of wilderness for agriculture, overall development, exotic forest plantation, etc. Its number has dwindled due to over-hunting, and depletion in its prey-species. Further, excessive disturbance in the area of its occurrence is probably responsible for its low reproductive rate (Schaller 1967, Mountfort 1970, Singh 1972, CITES 1981, Mukherjee 1982).

Conservation measures taken : The tiger is totally protected by law in India, Nepal and Bangladesh. This species is included in Schedule I of the Indian Wildlife (Protection) Act and Appendix I of CITES. A nation-wide programme for the conservation of tigers was launched, in India, in 1974. Gradually 19 tiger reserves have been established throughout India and in most of its habitats. The total coverage is about 26000 km² where the animal enjoys the highest statutory protection. The country-wide ban on tiger hunting since 1972, setting up of tiger reserves in 1974 onwards, improvement in the protection and management of these reserves, passing of stringent

Forest Conservation Act in 1980, etc., have made a significant difference not only to the tiger population but to most of the endangered species of fauna, in general.

Conservation measures suggested : Strict enforcement of the wildlife protection laws and periodical monitoring of the population of tigers are necessary. For further improvement in its number it is necessary to develop adequate diffusion areas outside the reserves, i. e. core-buffer regions of the established tiger reserves. Such areas on the intervening habitat will enable the sporadically harbouring individuals to become productive to raise new population (Mukherjee 1982, Panwar and Gopal 1984).

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Snow Leopard***Panthera uncia*** (Schreber, 1776)

Order CARNIVORA

Family FELIDAE

Common local names : lkar, zig, sachak (Bhotia), Barhal he (Himachali), Barhel haye (Kumaon).

Diagnostic characters : A big cat, with short muzzle, high forehead, vertical chin and possessing traits of lesser cats. Coat pale grey above, bearing dark spots grouped into 'rousettes' ; undersurface white. Ears short and rounded, its tip and margin black. Tail extremely long, tufted and spotted ; spots sometimes forming incomplete rings. Legs short, with large padded paws, provided with hairy cushions to withstand the snow (Pocock 1939, Prater 1980).

Measurements : Head and body length 100-150 cm ; tail 90-105 cm; hindfoot 23-26 cm ; height at the shoulder about 50 cm.

Intraspecific variation : No subspecies.

Distribution : The mountains of central Asia from Altai through the Tien Shan, the Pamir Ranges, Afghanistan and Himalayas to western and north-central China (Pocock 1939, Honacki *et al.* 1982).

Habitat and ecology : The Snow Leopard inhabits the Himalayas between the treeline and snow, but sometimes seen in woodlands. In summer, the animal is found at altitudes between 3000 and 4000 m, and during winter descends to 1500 m. The prey-species consist of ibex, markhor, wild sheep, tahr, deer, wild boar, gazelle, rodents, etc., and also livestock near human habitation (IUCN 1972, Anon 1972, Panwar and Gopal 1984).

Population : Wild : A number of population estimates have been made for the snow leopard in various geographical regions, but in the absence of more precise data, these are nothing more than guesses. Dang (1967) suggested that there are possibly 400 snow leopards in the entire Himalayas. Mallon (1984) estimated about 200 in Ladak alone. Jackson (1979) estimated a population of 350 in 30,000 km² of Nepal Himalaya. Fox *et al.* (1991) arrived

at about 400 individuals in northwest India and about 100 in Sikkim and Himachal Pradesh. Chundawat *et al.* (1988) estimated 95,000 km² of snow leopard habitat in India, with 72,000 km² in NW. India including 20,000 km² in Pakistan and China.

In captivity : About 184 snow leopards were kept in different zoos in 1980 (CITES 1981).

Commercial use : Excessively hunted for its attractive winter pelt which is utilised for making dresses, handbags, gloves, cushion cover, etc.

Trade data : A complete ban on the export of its pelt was enforced in 1979. At present, limited trade in live specimens, mainly exchange of captive breed animals between zoos are known (CITES 1981, Panwar and Gopal 1984). Five live-specimens and 45 skins were recorded by CITES Parties in 1979 (CITES 1981).

Threats to survival : The greatest threat to snow leopards in India lies in retaliatory hunting for its predation on livestock, specially on the southern side of the Himalayas and in parts of southern and western Ladak (Fox *et al.* 1991). Inadequacy of protected areas in the snow leopard habitat in northwest India to maintain a viable population in the long term, poaching of animals for its skin, and reduction in its prey species are some of the other factors.

Conservation measures taken : The snow leopard is now included in Schedule I of the Wildlife (Protection) Act and appendix I of CITES. In India out of about 98000 sq. km of habitat available for Snow Leopard, 18627 sq. km. covering 26 national parks and sanctuaries in Jammu & Kashmir (8521 sq. km), Himachal Pradesh (3429 sq. km.), Uttar Pradesh (3238 sq. km.), Sikkim (850 sq. km.) and Arunachal Pradesh (2589 sq. km.) (Chundawat *et al.* 1986) are under protected area status.

Conservation measures suggested : More accurate data are required on the population status of this species. Protection standards for snow leopard, its prey species and habitat, and control of over grazing-stocks in conservation areas should be strengthened. There have been management proposals to provide villagers throughout Ladak with the necessary construction material to protect their livestock-pens from entry of snow leopard (Mallon and Nurbu 1988).

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Gangetic Dolphin

Order CETACEA

Platanista gangetica (Roxburgh, 1801) Family PLATANISTIDAE

Common local names: Susu (Hindi) ; Susuk (Bengali) ; Sisumar (Sanskrit); Hiho, Seho (Assamese).

Diagnostic characters: Body fusiform ; females larger than males. head prolonged into a compressed rostrum ; forehead steeply rising ; eyes very small ; neck distinct but very short. Flippers more or less triangular ; dorsal fin low and ridge-like ; tail-fluke notched in the middle. Body colour varies from lead grey to lead black dorsally, lighter ventrally. Number of teeth varies from 27 to 32 in each side of each jaw ; lower jaw may have a slightly higher count (Anderson 1878, Blanford 1888-91, Nowak & Paradiso 1983).

Measurements: Total length 2.3 - 3.0 m ; width of flukes about 46 cm.

Intraspecific variation: None. The population from Indus river is now considered as a separate species, *Platanista minor* Owen.

Distribution: Ganga and Brahmaputra river systems of India, Nepal and Bangladesh (Jerdon 1867, Kasuya & Haque 1972, Nowak & Paradiso 1983).

It has been reported from Hulgi, Bhagirathi, Ganga, Jamuna, Dudwa, Banas, Chambal, Brahmaputra, Tista and Duduya rivers (Nath 1974, Gupta 1986, Singh & Sharma 1986, Ghosh 1992, Dey *et al.* 1992).

Habitat and ecology: The Gangetic Dolphin is a freshwater species. It may move to the tidal creeks, but never enters the sea.

The Gangetic Dolphin is essentially non-gregarious, and is mostly found singly or in pairs, and not more than four at a time. They have a migratory tendency, moving towards the foot-hills or the estuary during the monsoon. It is a bottom feeding species. The food consists mainly of fishes, especially cat-fishes and carps, prawns, shrimps, etc. It remains submerged under water from half-a-minute to three minutes after which it surfaces for breathing. The vision is very poor.

The breeding biology of the Gangetic Dolphin is not fully known. Usually one young is born at a time. Birth may take place any time during the

year, but mostly during December-January and May-June. The gestation period has been estimated as eight to nine months.

Population : Wild : 4000-5000 dolphins are estimated to be present (Jones, 1982), 500-750 in the river Ganga, 500 in Brahmaputra, 750 in Meghana and 3000-4000 in the estuarine belt, and about 45 in Chambal river (Singh & Sharma 1986). A population of 1326 dolphins has been estimated in Brahmaputra by Dey *et al.* (1992) though it may belong to two species, one with and another without dorsal fin. However, Mohan (1992) estimated about 3500 dolphins in India.

Scientific interest and potential value : Gangetic Dolphin is the only fresh water (fully aquatic) mammal of India. Its biology needs to be studied systematically and its population in Indian waters to be estimated precisely.

Commercial use : The Gangetic Dolphin is hunted for its flesh and fat. The meat is eaten by fishermen. The oil prepared from the fat is used for burning lamps and for various other uses. The meat of dolphin is being sold @ Rs. 20 - Rs. 40/- per kg. and oil for Rs. 175 - Rs. 200/- per litre in Assam (Dey *et al.* 1992).

Trade data : Not known.

Threats to survival : Construction of dams has caused not only the splitting of the Gangetic Dolphin population, but has also restricted the seasonal movements of these animals, as also deterioration of water quality resulting in less production of food species. Together with this, the hunting pressure has also caused further depletion of population. The dolphins are killed for its flesh and oil (Mohan 1989, Jones 1982, Gupta 1986). According to Mohan (1992) about 350 dolphins are killed annually by gill nets and poaching.

Conservation measures taken : Included in Schedule I of the Wild Life (Protection) Act, 1972, in India, and in Appendix I of CITES.

Conservation measures suggested : i) Since the Gangetic Dolphin is fully protected, legal sanctions should be strictly enforced. ii) The tracts in which the animal is still to be found in good number should be declared as conservation areas. iii) Immediate emphasis should be given to the protection of the populations which are already within some kind of conservation area, as for example in National Chambal Sanctuary.

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Irrawaddy Dolphin or Snub-nosed Dolphin Order CETACEA
***Orcaella brevirostris* (Gray, 1866) Family DELPHINIDAE**

Common local names : Snub-fin Dolphin, Irrawaddy Porpoise, Large Indian porpoise (English).

Diagnostic characters : Small dolphin, with small beak, rounded head, downwardly pointing mouth, everted lips that come to a point in front, and very small eyes. Short but distinct neck. Flippers broadly triangular ; dorsal fin small, more or less sickle-shaped and placed on the posterior half of back. Twelve to nineteen small conical teeth on each side of each jaw. Body above slaty blue or slaty grey in colour, underparts slightly paler (Anderson 1878, Blanford 1888-91, Nowak & paradiso 1983).

Measurements : Total length 2.0 - 2.15 m.

Intraspecific variation : None.

Distribution : Bay of Bengal (East coast of India and Burma), Thailand, Straits of Malacca, East coast of Malay Peninsula, Sumatra, Java, Borneo, New Guinea and northern Australia (Ellerman & Morrison-Scott 1966, Lekagul & McNeely 1977, Honacki *et al.* 1982).

Within the Indian limits, it has been recorded from Vishakhapatnam (Andhra Pradesh), Chilka Lagoon (Orissa) and mouth of Hugli river (West Bengal) (Annandale 1915, de Silva 1988).

Habitat and ecology : Lives in warm, tropical, often silty waters. An inshore form which freely enters rivers more than thousand kilometres from the estuary. Breaths at intervals of 70 to 150 seconds, the head comes out of water first after the disappearance of which the back surfaces ; a sort of audible sound is produced during expiration. Closely associates itself with fishing boats, and is usually seen in small parties of three or four. Food consists of crustaceans (mainly) and fish. Gestation period about nine months. Only one young is born at a time.

Population : Not known, but becoming scarce. Population of this species in Chilka Lake, Orissa appears to be isolated and in danger of

extermination (Dhandapani 1992).

Scientific interest and potential value : Practically nothing is definitely known about this monotypic genus, which should be studied in detail.

Commercial use : In India, it is hunted for its oil which is considered as a cure for rheumatism, when applied externally.

Trade data : Not known.

Threats to survival : In India, hunting as well as catching of dolphins accidentally in gill nets appear to be the main threat to its survival. Pollution of water is another contributing factor.

Conservation measures taken : Included in Schedule I of the Indian Wild Life (Protection) Act, 1972, and in Appendix II of CITES.

Conservation measures suggested : i) Strict application of the Wild Life (Protection) Act. ii) Attempts should be made to include the Indian population in Appendix I of CITES. iii) Chilka lagoon should be declared as a suitable conservation area for the protection of the local population. The use of nets especially in the southwestern lagoon should be regulated (Dhandapani 1992).

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Little Indian Porpoise

Order CETACEA

Neophocaena phocaenoides
(G. Cuvier, 1829)

Family PHOCOENIDAE

Common local names : Black finless Porpoise, Southeast Asiatic Porpoise (English), Molagan (Tamil), Bhulga (Marathi).

Diagnostic characters : One of the smallest cetaceans, females slightly larger than males ; no dorsal fin. Body colour purplish brown or purplish grey; lower jaw, throat and area around mouth pinkish grey ; dead specimens appear blackish. Head bluntly rounded without any distinct beak ; 15 to 21 spade-shaped teeth present in each jaw ; eyes rather well-developed; Blowhole crescentric. Neck slightly developed. Flippers rather small and elliptical. Middle region of back covered with small hard tubercles. Tail region compressed laterally (Blanford 1888-91, Roberts 1977, Nowak & Paradiso 1983).

Measurements : Total length 1.2 – 1.6 m ; pectoral fin about 28 cm in length; width of flukes about 55 cm.

Intraspecific variation : None.

Distribution : Persian Gulf, coasts of Pakistan and India, Straits of Malacca, Sumatra, Java, Borneo, Thailand, China, Ryukyu Islands, Korea and Japan (Ellerman & Morrison-Scott 1966, Lekagul & McNeely 1977, Honacki *et al.* 1982, de Silva 1988).

Occurs along the West and East Coasts of India, and has been reported from Bombay, South Canara, Goa, Malabar coast (Calicut, Trivandrum, etc.), Madras and Calcutta.

Habitat and ecology : The Little Indian Porpoise is an inhabitant of shallow coastal waters, and is often found in tidal creeks, along reefs and islands, sometimes ascending fresh water rivers. Usually found singly or in pairs (a cow and its young or a male and a female), occasionally in groups of three to five, though school of 20 individuals has also been reported. A rather sluggish animal which rolls to the surface to breathe. Food consists of shrimp, prawn, small squid and cuttlefish, and small fish. Breeding varies

with locality. In India, most births take place during October, though foetus has been found in late February. A single young is born at one time which is carried on the back of the mother. Gestation period has been estimated as 11 months (Blanford 1888-91, Nowak & Paradiso 1983, Hafeezullah 1984, Shirai 1986).

Population : No information on Indian population is available. The Japanese population, perhaps the largest, consists of about 4900 individuals (Kasuya & Kureha 1979).

Scientific interest and potential value : Biology in general and breeding biology in particular as also accurate population estimate of this smallest cetacean need to be studied urgently.

Commercial use : The Little Indian Porpoise is taken in nets set for prawns and shrimps. It is also hunted for its edible meat, and for its skin and fat (Mitchell 1975).

Trade data : Not available.

Threats to survival : Persecution by man, pollution, collusion with motor boats, especially motorised fishing vessels and increased fishing activities during the past several decades are the main threats to the survival of the Indian population, which, in recent years, has depleted much.

Conservation measures taken : Included in Schedule I of the Indian Wild Life (Protection) Act, 1972, and in Appendix I of CITES.

Conservation measures suggested : i) Strict enforcement of the laws as are available. ii) Modification of fishing methods may result in the reduction of accidental catch in fishing nets.

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Dugong

Order SIRENIA

Dugong dugon (Muller, 1776)

Family DUGONGIDAE

Common local names : Sindhu gavi (Bengali) ; Kadalpuntri (Tamil).

Diagnostic characters : Streamlined body, with massive head truncated anteriorly, and small mouth. Fleshy pad-like upper lip, projecting over the lower, and provided with fine stiff bristles around the muzzle. Nostrils situated on top of head; eyes small and deeply sunk; ears just circular apertures; neck indistinguishable. Clawed, flipper-like forelimbs; hindlimbs absent; tail fluke horizontal and deeply notched in middle. Incisors, in adult males, tusk-like. Body colour grey, bluish grey or brownish grey dorsally, whitish or flesh-coloured ventrally (Jerdon 1867, Blanford 1888-91, Nowak & Paradiso 1983).

Measurements : Total length 2.5 - 3.2 m.

Intraspecific variations : None. Gohar (1959) considers the Red Sea population as a distinct subspecies, *Dugong dugon tabernaculi* (Ruppell, 1834) which is said to be marginally smaller. However, this has not been widely accepted. Moreover, *Halicore hemprichii* Ehrenberg, 1833 is an earlier name available for this population.

Distribution : The Dugong has been reported from the Gulf of Kutch, Konkan coast and the malabar coast on the West coast, and from Tuticorin, Dhaneskodi Island, Rameshrawam Island, Krusadai Island and Pambam Island on the East coast of India, as also from the Andaman and Nicobar Islands. Outside the Indian limits, it is widely distributed in tropical coasts, along eastern Africa from Durban north to the Red Sea, including Madagascar and Indian ocean islands, eastwards to Ryuku Island, south to the Philippines and Indo-Australian Archipelago to the Solomon Islands and northern Australia to 34°S (Blanford 1888-91, Mani 1960, Chandrasekhara Rao 1990, Frazier & Mundkur 1991,).

Habitat and ecology : The Dugong is restricted to coastal, shallow, marine habitat with ample food plants.

Usually, dugongs are seen singly or in small groups only. In the past, however, these animals were seen in herds of several hundred individuals. They are sluggish creatures by nature, but can attain a maximum speed of 22 km per hour, under pressing conditions. The usual mode of locomotion is by upward and downward movement of the tail, but while feeding, they 'walk' on the substratum with the help of their flippers.

Dugongs are bottom feeding, nocturnal herbivores. They feed mostly on the marine grass, though some algae are also eaten.

Breeding in the dugong may be seasonal in parts of its vast distributional range. The gestation period is about 12 months at the end of which a single calf is born. Birth takes place in shallow, sheltered places. The young actively swims very close to the back of the mother (Jerdon 1867, Blanford 1888-91, Prater 1928, Nowak & Paradiso 1983).

Population : Wild : No data on Indian population could be traced. However, an estimated population of one thousand to two thousand is thought to occur in northeastern region of Australia. An estimated population of roughly 30,000 dugongs may inhabit the whole Indo-pacific region.

Scientific interest and potential value : The only member of the Order Sirenia to be found in India. No definite information regarding its social structure is available which needs to be studied urgently.

Commercial use : The dugong has been hunted for its flesh, hide, fat, bones and tusks. The flesh is said to taste like veal and is eaten throughout its range. The hide has been used to make good quality leather, and the fat to prepare a kind of oil for cooking and for various other purposes. The powdered bones have been used as native medicines for various ailments. The tusks, are used to make ivory artifacts (Nowak & Paradiso 1983).

Trade data : Not known.

Threats to survival : Hunting pressure appears to be the main, if not the only cause of the depletion of the dugong population. It has become very scarce practically throughout its range of distribution, except Australia. In India, there existed a kind of dugong 'fishery' of some importance in the Gulf of Mannar, where special nets were used to capture these animals while they were in their feeding ground. Dugongs are so scarce now that only

occasionally a specimen is caught (Jones 1976, 1981, Sailas & Fernando 1988).

Conservation measures taken : Fully protected in India under the Wild Life (Protection) Act of 1972 (included in Schedule I). It is also protected under Appendix I of CITES (excepting the Australian population). The Dugong and its habitat enjoy full protection in the Gulf of Mannar Biosphere Reserve.

A 'Dugong Research and Conservation Fund' has been started under the auspices of Marine Biological Association of India (Sailas & Fernando 1988).

Conservation measures suggested : i) Effective implementation of the existing law with sufficient protective force and its frequent review. ii) Creation of a marine national park at a remote place free from human interference, such as the Ritchie's Archipelago and/or the Great Nicobar Island, Bay of Bengal. iii) Special emphasis should be given on the protection of dugongs in the Gulf of Kutch Marine Park where a breeding population exists.

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Asian Elephant***Elephas maximus*** Linnaeus, 1758

Order PROBOSCIDEA

Family ELEPHANTIDAE

Common local names : Hathi (Hindi), Anai (Tamil), Ane (Kan.), Ana (Mal.)

Diagnostic characters : Smaller than the African elephant ; doubledomed forehead, rounded back, relatively short ears, trunk ending in a single tip, four nails on hindfoot, and coat colour grey brown. Tusks present in males, absent or in form of tushes in females and some males.

Measurements : Height at the shoulder 275-320 cm; length of tusks 260-300 cm.

Distribution : In India, found in northern Uttar Pradesh, Bihar, Orissa, West Bengal, northeastern India, Karnataka, Tamil Nadu and Kerala. Elsewhere occurs in Sri Lanka, Nepal, Bhutan, Bangladesh, east up to Vietnam, also S. China and Malaysia (Khan 1980, Mishra 1980, Singh 1980, Gupta 1985, Lahiri Choudhury 1985, Sukumar 1985, 1986, 1989).

Intraspecific variations : Out of three subspecies of Asian elephant namely, *indicus*, *maximus* and *ceylanicus*, only *indicus* is found in India, other two occur in Sri Lanka.

The percentage of males carrying tusks varies from about 7% in Sri Lanka to about 90% in southern India. However, this may not be taken as a subspecific character.

Population : Wild : Population in Asia is estimated to be between 34000 and 54000 (Santiapillai & Jackson 1990), and in India between 17000 and 22000 (Sukumar 1986) of which about half is in northeastern India. The average crude density of elephants vary from 0.04/km² in hilly habitats to 1-2/km² in dry deciduous forests in southern India. The population is less than 100 individuals in Nepal and Bhutan and about 300 in Bangladesh (Nair *et al.* 1980, Shahi 1980, Jackson 1983).

The elephant-habitat in India covers about 400 km² of sal forest in Uttar Pradesh, 98293 km² in northeastern India, about 20000 km² of highly

fragmented deciduous forest in Bihar and Orissa, and unspecified area of deciduous and evergreen forests in southern India.

In captivity : The total number of captive elephants in the Indian subcontinent were around 40000 in the 19th century (Jardine 1836). At present, 1460 - 1660 domesticated elephants are present in northeastern India, 500 - 750 animals in northern India, and 300 - 350 in southern India (about 150 in forestry operation and about 200 in temples).

Habitat and ecology : Elephants are forest animals requiring a shady environment but having free access to grasses, an important part of their diet, and water. Their tracks have been seen up to a height of 3660 m in Sikkim.

Elephants have a complex social system with strong maternal bonds. Mature males live singly or in small groups and may associate females while feeding or during mating. They spend more than two-thirds of the day in feeding and may consume 150 - 270 kg of vegetation in a day. Exact breeding season is not known but most of the young are dropped in late autumn after a gestation of 20 - 22 months. Elephants live up to an age of 60 - 70 years (Ali 1981, 1986)

Commercial value : Male elephants possess tusks. The percentage of elephants carrying tusks varies from 7% in Sri Lanka to about 90% in southern India. A kg of ivory is sold in India for about US \$ 125. The annual value of poaching trade is estimated at US \$ 225000 (Sukumar 1985).

Trade data : Export of ivory is completely banned in India. However, live specimens were exported from Burma (9), India (2), Sri Lanka (1) and Thailand (1) between 1980 and 1982.

Threats to survival : The major cause of threat to elephant populations in India is the degradation and fragmentation of its habitat as a result of human population explosion and consequent developmental needs. As a result, several populations have been hemmed in such isolated populations that no genetic continuity with any other population can be maintained, hence, are susceptible to genetic degradation, and thus highly vulnerable.

Agriculture in the former elephant habitat has resulted in man-elephant conflict. Further, absence of bamboos in the Eastern Ghats area is

one of the reasons for the increased crop depredation.

Poaching of elephants for ivory is still a serious problem in India. Almost all large tuskers have been eliminated from Periyar Sanctuary. About 100 - 150 tuskers were sought annually in southern India between 1975 and 1983 (Sukumar 1985). Capture for domestication, mortality due to outbreak of epidemic diseases, and drought are some of the other factors responsible for the decline in its population.

Conservation measures taken : The Asian elephant is enlisted in Schedule I and Appendix I of the Wild Life (Protection) Act and CITES respectively. This completely bans its killing and commerce in its product, viz. ivory.

The Forest Conservation Act, 1980 was designed to arrest the large scale habitat loss caused by deforestation. There has been a shift from a commercially oriented to conservation oriented management of forests. This has resulted in overall selective timber felling. The elephants get protection in many of the conservation areas in India. New conservation areas like the Raja ji National Park and Niligiri Biosphere Reserve encompassing large areas have been added to the list. The capture of elephants for domestic use has been banned.

On the pattern of the Project Tiger, an Elephant Project has been started in 1992 by the Government of India with the main objective of maintaining all such populations of elephants that are viable (more than 1000 individuals) in the long term prospective by conserving and restoring their habitats.

Conservation measures suggested : The integrity of the present reserves containing elephants should be maintained and their areas extended where possible to cover seasonal migration routes. Forest corridors for migration should also be maintained or revived (Santiapillai and Jackson 1990).

Eco-development projects to be started to meet the needs of human population around key elephant areas to reduce dependance on forest usufructs. Selective felling of trees and regulated grazing to be allowed so that rural communities do not get affected from this programme.

Problematic populations may be translocated to viable elephant

habitats or such elephants be captured and domesticated.

Expeditious payment for loss of life and property caused by elephants to be made.

Efforts to be made to change the cropping pattern to save it from damage incurred by elephants.

Antipoaching measures should be strengthened.

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Tibetan Wild Ass or Kiang
***Equus kiang* Moorcroft, 1841**

Order PERISSODACTYLA
 Family EQUIDAE

Common local name : Kiang (Tibetan).

Diagnostic characters : Somewhat larger and more robust, and the dorsal stripe narrower than in Indian Wild Ass. Winter coat much longer and darker (dark brown) than the reddish summer coat. Mane and tail deep blackish brown. Tail possesses long hairs on lateral surface almost up to root. Dorsal stripe runs from mane to tail-tuft. A wedge of white colour present behind shoulders, reaching very high in dorsal direction (Blanford 1888-91).

Measurements : Chinese specimens : Height at the shoulder 139-141 cm ; southern Tibet specimens : Height at the shoulder 104-113 cm (Allen 1940).

Intraspecific variations : Groves and Mazak (1967) have assigned *kiang* under the genus *Asinus*, but Honacki *et al.* (1982) maintained it under the genus *Equus*. There are three recognisable subspecies ; the small southern race *polyodon* (Southern Tibet including Sikkim), the large western race *kiang* (Ladak), and even larger eastern race *holdereri* (eastern Tibet and Szechuan) with its large teeth and long nasal bones. The eastern and southern kiangs are lighter in colour with greater extent of white on the undersurface than the western kiang which are often very dark (dark auburn or brick red) in winter (Groves & Mazak 1967).

Distribution : India : Ladak (jammu & kashimir) and Sikkim. Also occurs in Tibet, Tsinghai and Szechuan (China) and probably Nepal (Hodgson 1847, Honacki *et al.* 1982).

Habitat and ecology : Occurs on high open plateaux regions and in dry, intermontane basins of Ladak. Nothing is known about its feeding or breeding habit.

Population : Wild : Population figures for the most part unavailable. It is generally acknowledged, however, that the species has suffered serious

decline during this century. Kiangs are scattered over a large territory and may be slightly more than 2000 (CITES 1982).

In captivity : According to International Zoo Yearbook there are 13 males and 16 females present in eight collections (CITES).

Trade data : CITES parties reported trade in 5 specimens in 1982.

Threats to survival : The human interference in the range of its occurrence is the main threat to its survival.

Conservation measures taken : The species is protected from killing and trade by inclusion in Schedule I of the Wildlife (Protection) Act and Appendix II of CITES.

Conservation measures suggested : Accurate data is required on the population status of this species. Protection standards and control of overgrazing stocks should be strengthened.

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Indian Wild Ass
***Equus onager khur* Lesson, 1827**

Order PERISSODACTYLA
 Family EQUIDAE

Common local names : Ghor-Khar (Hindi).

Diagnostic characters : Indian Wild Ass is larger than the domestic ass, with short, erect mane continuing as a dark brown stripe on the back, long ears, moderately long tufted tail, hairs reaching at least to middle of legs, absence of forelocks, and small feet. Coat colour varies from reddish grey to pale chestnut, lighter on nose, belly and flanks. Each foot has a single complete toe encased in a larger solid hoof.

Measurements : Head and body length 200-220 cm, height at shoulder 110-120 cm, length of tail 42-49 cm.

Intraspecific variations : Taxonomy disputed. Groves and Mazak (1967) included *onager* under *hemionus*, but Bennett (1980) considered *onager* as a distinct species. It includes four subspecies, namely, *onager* (Persian), *khur* (Indian), *hemippus* (Syrian), and *kulan*.

Distribution : The Indian Wild Ass once ranged from southwest Iran through Pakistan to northwest India. It is now restricted to a small area in the Little Rann of Kutch. Recently, reported from Radhanpur, Santalpur, Jhinjhuvada, Kharaghoda, Bajana, Sami, Kuda, Bhachau, Maliya miyana and Rapar in Gujarat (Ali 1986).

Habitat and ecology : The Indian Wild Ass is an inhabitant of salt incrustated flats (on which almost nothing grows), dotted with a few scattered islands or bets which are the only source of vegetation in the Rann. The bets bear grass, scrub and low trees, and perennial source of water.

Asses live in herds. It may be a small family group of 3 - 10 animals to as big as 48 individuals. It subsists mainly on grasses ; also raids nearby cultivation of wheat, cotton, millet and jowar. It covers long distances (about 125 sq. km. per day) in search of food. It apparently drinks at least every third day. Rut starts in June July ; mating takes place between August and October and a single foal is born after a gestation of 11 - 12 months. Sexes live apart in separate parties till the foal is three months old.

Wild population : The population was estimated between 3000 and 5000 individuals by Salim Ali in 1946, 4000 in 1956 (Wynter Blyth 1956), 870 in 1962 (Gee 1964) and 368 in 1969 (Schaller and Simon 1970). But the census conducted by the State Forest Department of Gujarat in 1976 showed a population of 720 individuals.

Capitve population : Total 472 animals are reported to be present in captivity (*kulan* 115 ♂ , 167 ♀ in 51 collection; *onager* 68 ♂ , 82 ♀ in 26 collection; *khur* 2 ♂ , 2 ♀) (CITES 1983)

Scientific interest : The Asiatic Wild Ass is the only true wild ass left in the world to-day, hence, of scientific interest.

Trade data : Not known. However, trade in this species is banned. CITES parties reported 2 specimens of *khur* and 6 of *onager* in 1982 and 3 of *kulan* in 1983.

Threats to survival : One of the threats is the *surra* disease which is being spread by the domestic animals. Successive epidemics in 1958 and 1961 caused substantial decline in its population (Mukherjee 1982).

Though the local people do not molest the wild ass, yet the military personnel posted in the Indo-Pakistan border area kill them by long range rifles.

Conservation measures taken : The species is enlisted in Schedule I of the Indian Wildlife (Protection) Act, and Appendix I of CITES as *Equus hemionus khur*.

Little Rann of Kutch has been declared as a sanctuary, having an approximate area of 4840 sq. km.

Conservation measures suggested : Donkeys and other domestic animals in the area should be vaccinated to check the spread of disease to wild population. Reclamation and cultivation of marshland should be stopped.

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Great One-horned Rhinoceros Order PERISSODACTYLA
Rhinoceros unicornis Linnaeus, 1758 Family RHINOCEROTIDAE

Common local names : Gairda (Hindi), Gondar (Bengali), Gor (Assamese).

Diagnostic characters : Largest among the Asiatic rhinoceroses. Characterised by a long horn on the snout, skin folded into shields and studded with wart like tubercles ; fold in front of shoulders not continued up to the back. Tail short and tufted. Each foot has three digits, and hooves distinct. Horns present in both sexes, grow throughout life, and if lost, reproduced (Prater 1980, Mukherjee 1982).

Measurements : Length from snout to tail 210-420 cm; height at shoulder 170-180 cm; length of horn 30-60 cm.

Intraspecific variation : No subspecies.

Distribution : Several centuries ago, the One-horned Rhinoceros had a wide distribution throughout the northwestern, northern and eastern India, including parts of Nepal and Bhutan (Mukherjee 1982, Rookmaaker 1984). The present distribution is limited to east of Gandak river (Chitawan N.P.) in Nepal (Mishra and Mishra 1982), and northern West Bengal and Brahmaputra valley in Assam (North Kamrup, Nowgong, Sibsagar and Darrang districts) (Ali 1985).

Habitat and ecology : Inhabits wooded jungles up ravines and low hills ; prefers tall grass and reed beds in swampy areas. Mostly early hours of the morning and from late afternoon to evening are its feeding time. It is a grazer and subsists on a variety of succulent vegetation, chiefly grass; often visits cultivation. Mating takes place between February and April and the young is born after a gestation of about 485 days. It gives birth in captivity. The female attains sexual maturity in 4 years and the male in 7 years (Prater 1980). The one-horned rhinoceros lives for about 70 years (Mukherjee 1982).

Wild population : The population of rhinoceros in India and Nepal was estimated to be 669 in 1966 (Spillet 1967), and 745 in 1969 (Sheshadri

1969). Lahan and Sonowal (1973) gave the census count of 658 rhinos in Kaziranga National park alone in 1972. There had been a substantial increase in the number since 1972. There were about 1300 rhinos in Assam (Kaziranga 1080, Laokhowa 5, Pabitra 40, Orang 65 and Manas 80) (Khan 1985) and about 400 in Nepal (Chitawan and Bardia) in 1984 (Chaudhury 1985), besides a few in Jaldapara in West Bengal. The density of rhino was reported to be 2.78 - 3.13 per sq. km. in Kaziranga (Chaudhury 1985). Recently, three pairs of rhinos have been introduced in Dudwa National Park, Uttar Pradesh.

Captive population : There are about 75 animals in captivity. It is present in many zoos in India (Calcutta, Gauhati, Delhi, Mysore, etc.) (Khan 1985) and abroad.

Economic value : Rhinoceros is commercially a valuable animal. Every part of its body has a market ; the flesh as invigorating tonic, blood offered in religious ceremonies, hide used in making war-shields, urine as antiseptic and cure of gout, nasal horn as of aphrodisiacal value and also renders poison innocuous, etc. Of all the parts of this animal, horn fetches fabulous amount and today it is worth its weight in gold.

Trade data : Trade in this species or its part is completely banned in India. However, there is great demand of rhino-horn in China.

Threats to survival : Shrinkage of habitat as a result of tremendous increase in human population, destruction of grassland for agriculture in fertile lowlands, and tea plantation in hilly areas, excessive grazing by domestic cattle, poaching of rhinos mainly for its horns, low breeding rate, transmission of foot and mouth disease from domestic cattle, are the main threats to its survival.

Conservation measures taken : The animal is enlisted in Schedule I of the Indian Wildlife (Protection) Act and Appendix I of CITES.

The areas where rhinoceroses occur have been declared as sanctuaries or national parks.

Efforts are being made to reallocate it at a number of places in its former range of distribution, the first being at Dudwa National Park in Uttar Pradesh. Other areas proposed are Madanpur forest in West Champaran

district of Bihar, Lali Wildlife Sanctuary in Arunachal Pradesh, and Intaki Sanctuary in Nagaland (Chaudhury 1985).

Conservation measures suggested : Habitat modification should be minimised as far as possible.

Strict vigilance be maintained to stop poaching.

Livestock in no case be allowed in rhino territory to prevent the spread of viral infections to wild animals.

The captive population be increased to at least 150 rhinos mainly through propagation already in zoos.

To continue efforts to establish other wild populations elsewhere in India and Nepal through translocations.

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Compiled by V. C. Agrawal

Andaman Wild Pig

Order ARTIODACTYLA

Sus scrofa and amanensis Blyth, 1858

Family SUIDAE

Diagnostic characters : Much smaller than the mainland pig ; tail very short, as long as the hind foot, with a brown tuft. Coat black, covered with somewhat shaggy, long bristles ; indistinct crest present over neck and back. Snout elongated, terminating in a truncated, mobile, flat disc bearing nostrils. Young striped (Blanford 1888-91, Finn 1929, Anon 1981, Tikader 1983).

Measurements : Height at the shoulder 50 – 53 cm.

Intraspecific variations : There are 22 subspecies of *sus scrofa* Linn. The Andaman Wild Pig is endemic to Andaman Islands and is the smallest of the wild pigs.

Distribution : Middle, South and Little Andamans and Havelock Island.

Habitat and ecology : Lives in forest and comes out for feeding on cultivated crops. Feeds mainly on roots, tubers, seeds, insects, offal and the carrion (Anon 1981, Tikader 1983).

Population : Wild : Not exactly known but the population has greatly reduced due to loss of habitat and indiscriminate killing by local inhabitants.

Trade data : Nothing is known.

Threats to survival : Shrinkage of habitat due to human encroachment for making new settlements, cultivation, timber work, etc., and poaching of animals for meat have drastically brought down the population of the Andaman Wild Pig in the last few decades (Tikader 1983).

Conservation measures taken : The subspecies is enlisted in Schedule I of the Wildlife (Protection) Act, hence, legally protected from killing.

Conservation measures suggested : Stringent enforcement of law towards non-killing of the animal, besides improvement in its natural habitat is an immediate necessity for the species.

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Pigmy Hog***Sus salvanius* Hodgson, 1847**

Order ARTIODACTYLA

Family SUIDAE

Common local name : Sano banel (Nepalese).

Diagnostic characters : A small pig. Tail very short. Coat blackish brown, covered with coarse bristly hairs ; no crest on back. Ears small. Upper tusk and snout short. Three pairs of teats present instead of six in the wild boar. Fourth toe present. Jaws bear 40 teeth. Young having longitudinal rufous bands on body (Blanford 1888-91, Prater 1980, Oliver 1980).

Measurements : Head and body length 50 - 71 cm ; tail less than 4cm ; height at the shoulder 25 - 30 cm.

Intraspecific variation : No subspecies.

Distribution : Pigmy Hog is at present known from Assam (Kochugaon, North Kamrup and Darrang Forest Divisions, and Manas Biosphere Reserve). Also known from Nepal Terai.

Earlier, it was known to occur throughout the Himalayan Terai from Siwalik foot-hills to Arunachal Pradesh (Mukherjee 1982).

Habitat and ecology : Chiefly found in tall grass jungles and is said to live in herds of 5 to 20 individuals. Generally nocturnal but according to Mallinson (1977) it is active after dawn and before sunset. Food comprises of roots, bulbs, occasionally insects and birds' eggs (Mukherjee 1982). Adult male joins the oestrous female from late December to early February. Birth has been recorded during April-May and September, in captivity. Litter-size varies from 2 to 6 (Oliver 1980).

Population : Wild : Not exactly known but appears to be extremely low. An estimated 100 to 150 individuals are said to survive in north-western Assam (Mukherjee 1982, Nowak and paradiso 1983). The only known viable population is reported from Manas Biosphere Reserve i.e. 500 individuals in 1983-84 (Anon 1989) but it appears to be on the very high side.

In captivity : Fourteen adults and four young were held in captivity in the Mangaldai subdivision of Darrang district, Assam by 3 Tea Estates in May,

1971, but ultimately all of them died by 1976.

Trade data : One pair was exported to Zurich Zoo in November, 1976, as part of a conservation breeding programme.

Threats to survival : Main threat is due to destruction of its habitat and poaching for meat. Its habitat is being lost due to human settlement, agriculture, forest plantation and cattle grazing. The species as well as its habitat get some protection in the Manas B. R. But an emergent threat to this reserve has arisen due to the proposed construction of two dams on the Bhutan side of Manas for the supply of power and irrigation to this area. These dams would certainly destroy the Manas Reserve on the Bhutan side and irretrievably damage the adjoining Indian side (Mallinson 1971, Ranjitsinh 1972, Oliver 1981, 1985). There has been a considerable increase in the Nepalese and Bengalee settlements in this area. The settlers undoubtedly hunt the hog for pork.

Conservation measures taken : The species is enlisted in Schedule I of the Wildlife (Protection) Act and Appendix I of CITES. It is also classified as endangered by USDI (1980).

Conservation measures suggested : Top most priority should be given to preserve its habitat in the north and northeastern India, particularly in Assam. Moreover, further data should be collected to find out the current information as to the population and/or distribution of the hog, with a view to create new sanctuaries for its conservation.

Consideration should be given to establish a large enclosure at Manas B. R. where Pigmy Hog could be protected, studied and bred. The transfer of a breeding nucleus to research institute or zoological garden in Europe and North America has been suggested (Mallinson 1971, Ranjitsinh 1972, IUCN 1972).

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Mouse Deer

Order ARTIODACTYLA

***Tragulus meminna* (Erxleben, 1777)**

Family TRAGULIDAE

Common local names : Pisora (Hindi), Koorandi (kanarese), Pisori, Aheda (Marathi), Kooran panni (Tamil), Kura-pandi (Telegu).

Diagnostic characters : Much smaller than a spotted deer, having small, slender limbs and high hindquarters. Antlers absent. A pair of tusks present in males. Coat colour brown, speckled with yellow ; under surface white ; three white stripes present on throat (Blanford 1888-91, Tikader 1983).

Measurements: Head and body length 45 - 56 cm ; tail 2 - 4 cm ; height at the shoulder 25 - 31 cm.

Distribution : Sri Lanka, Peninsular India and Nepal (Honacki *et al.* 1982). Within the Indian limits, it occurs in southern India, the northern limit being Gujarat, Madhya Pradesh, southern Bihar and Orissa.

Intraspecific variations : No subspecies.

Population : Wild : Exact population-size in the wild not known. However, about 3000 individuals were estimated in the Similipal Tiger Reserve in 1986 and 10 in Bandipur Tiger Reserve in 1982-83.

In captivity : The International Zoo year-book (1983) reports four captive births in 3 collections.

Habitat and ecology : Mouse deer inhabits dense forests, amongst rocks, and grass-covered hill sides up to an elevation of 1850 m. A solitary and seclusive creature, crepuscular in habit. The rutting season is during June-July and the young, usually twins, are born at the commencement of winter (Jerdon 1867, Finn 1929, Prater 1980, Nowak and Paradiso 1983).

Threats to survival : The population has become very thin due to its persecution by man for flesh. Destruction of habitat as well as predation by carnivores are other factors responsible for its decline.

Conservation measures taken : Mouse Deer is enlisted in Schedule I of the Wildlife (Protection) Act, hence, its killing is legally banned. However,

the species has a conservation cover of about 30,000 sq. km in national parks, sanctuaries and biosphere reserve in Goa, Maharashtra, Madhya Pradesh, Karnataka, Kerala and Tamil Nadu (Saharia 1981).

Conservation measures suggested : The population status of this species should be worked out to formulate the future conservation strategy.

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Swamp Deer

Cervus duvauceli G. Cuvier

Order ARTIODACTYLA

Family CERVIDAE

Common local names : Bhelingi pohu (Assamese) ; Barasingha (Hindi); Baraya, Gond, Gonr, Ghos (Nepal Terai); Goinjak, Gaoni (Madhya Pradesh).

Diagnostic characters : A little smaller than Sambar but with much branched antlers ; beam remains unbranched for more than half its length and then subdivides into 10-12 tines. Coat fine and woolly ; colour varies from brown to yellowish brown in winter and paler during summer. Females smaller and lighter than males (Blanford 1888-91, Prater 1980).

Measurements : Head and body length about 180 cm ; height at the shoulder 115 - 125 cm ; tail 12 - 20 cm ; length of antlers 90 - 104 (Anon 1988).

Distribution : India and Nepal (Honacki *et al.* 1982). In India, it is found in the terai and duars of northern and eastern India from Uttar Pradesh to Assam, and in Kanha National Park and round about area in Madhya Pradesh.

Intraspecific variations : Represented by three subspecies *viz*, *duvauceli*, *branderi* and *ranjitsinhi*. Former is found in the swamps of northern and eastern India and Nepal, with splayed hooves to negotiate the swamps, *branderi* lives in hard open ground of Madhya Pradesh and has well knit hooves (Majupuria 1986) and *ranjitsinhi* occurs in Assam Terai.

Population : Wild : The population of *Cervus duvauceli* was estimated to be about 4500 individuals in the wild in 1977 of which 1200 - 1500 swamp deer are present in Shukla Phanta Wildlife Reserve alone in Nepal (Majupuria 1981-82). The population of *C. d. branderi* in Madhya Pradesh is between 400 and 500 (Singh 1978, Panwar 1978, Majupuria 1986, Khajuria and Sinha 1986).

In captivity : The International Zoo Year book reports 358 swamp deer maintained in 31 collections in 1985 (Anon 1988).

Habitat and ecology : Swamp deer occurs in the swampy or dry grass lands in the sal forest. It is gregarious and browses in large herds. During the

rutting season in winter, it congregates into large herds of 30 - 50 or even several hundred individuals. It gives birth usually to a single young (Schaller 1967, Tikader 1983).

Threats to survival : Major decline in its population began in 1940's, mainly because of regular burning of grasses, conversion of grass land habitat into cultivated land, poaching of animals for flesh and trophy, concentration of predators, competition with domestic stock for food, and transmission of diseases from domestic to wild animals. The lowest number of swamp deer in Kanha National Park in 1970 was 66 individuals (Khajuria & Sinha 1986).

Conservation measures taken : The Swamp Deer is legally protected from killing and trade by inclusion in Schedule I of Indian Wild Life (Protection) Act and Appendix I of CITES respectively. In addition, the species is well protected in Conservation areas. Effective prevention from poaching, stoppage of burning of grasses, dispersal of tigers, reduction in number of cattle, etc., have yielded fruitful results in Kanha National Park (Khajuria and Sinha 1986).

Conservation measures suggested : Strict implementation of the wildlife laws is desirable. Reallocation of species to new areas is also suggested but an attempt to introduce this deer in Bandhavgarh National Park failed in the past.

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Kashmir Stag or Hangul

Order ARTIODACTYLA

Cervus elaphus hanglu Wagner, 1844

Family CERVIDAE

Common local names : Barasingha (Hindi), Hangal or Minyamar (Kashmiri).

Diagnostic characters : A large deer, with a pair of magnificently spreading antlers. Each antler has generally 5 or 6 tines, sometimes more, second tine considerably exceeds the first in length. Coat colour varies from light to dark brown, with a white rump patch or caudal disc ; sides and limbs paler, and chin and ears whitish (Blanford 1888-91, Prater 1980, Tikader 1983).

Measurements : Head and body length about 190 cm ; height at the shoulder 122 - 127 cm ; length of antlers 112 - 128 cm (Anon 1988).

Distribution : The distribution of this subspecies is now mainly limited to the Dachigram Sanctuary in Jammu & Kashmir, with some scattered population in other parts of the State, and in Gamagul Sanctuary of Himachal Pradesh (Honacki *et al.* 1982, Kurt 1986).

Intraspecific variations : Out of 23 subspecies of Red Deer, only *Cervus elaphus hanglu* is found in India. The Indian subspecies is relatively light-coloured and has simple antlers. In other subspecies, the brow-tine sprouts immediately above the coronet, and the coat is spotted either in adolescent years or in some throughout life.

Population : Wild : The population declined drastically from about 3000 individuals around 1940 to not more than 180 in 1970 (Holloway 1970). The census conducted in March, 1980 indicates a population of 347 heads (Inayatullah 1981). Due to effective implementation of a conservation plan, the population has increased to 482 in 1983 (Anon 1988).

In captivity : Apparently none.

Habitat and ecology : Occurs singly or in small parties of 2 - 18 individuals in dense forests or in the riverine areas of Dachigram at elevations between 1750 and 3650 m. During winter, it congregates into larger herds

and moves to lower elevations. The rut starts from mid-September and ends by the end of October. The stag establishes a harem and young are born during April-May. There is usually a single offspring at a birth.

Threats to survival : Factors such as wanton destruction of habitat, cattle grazing, extension of cultivation in the area of its occurrence, diseases and poaching have caused depletion in the population of the Kashmir Stag (Mishra 1986).

Conservation measures taken : The Kashmir Stag is included in Schedule I of the Indian Wildlife (Protection) Act and Appendix I of CITES. These completely ban its killing and trade.

The Government of Jammu & Kashmir in collaboration with the experts of IUCN and WWF have enforced a Management cum Ecological Plan, since 1980. This plan recommended and strived a total protection against grazing by domestic stock, indiscriminate habitat destruction, improvement of fodder, and immunity from diseases (Mishra 1986).

Conservation measures suggested : As this species is localised in a particular area of our country, greater enforcement of existing laws are needed to conserve it. Captive breeding and reintroduction to new habitat nearby Dachigram or round about areas may be tried.

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Manipur Brow-antlered Deer or Sangai Order ARTIODACTYLA
Cervus eldi eldi M'clelland, 1842 Family CERVIDAE

Common local names : Thameng (Burmese), Sangai (Manipuri).

Diagnostic characters : A sambar-like deer, with shaggy, dark brown coat in males, during winter, and fawn in summer ; females lighter. Antlers arise from erect pedicel ; brow-tine extremely long forming a continuous curve with the beam ; terminal tines vary from 2 to 10 (Prater 1980 ; Tikader 1983).

Measurements : Head and body length about 180 cm ; tail about 20 cm ; height at the shoulder 105 - 115 cm ; length of antlers along the beam about 100 cm.

Intraspecific variations : Out of the three subspecies, the nominate subspecies *C. eldi eldi* occurs in India. The Indian subspecies is characterised by small antlers, upper part of beam not flattened, and hind pasterns greatly developed and applied to the ground while walking (Lekagul & McNeely 1977).

Distribution : India (Keibul Lamjao National Park, Manipur) (Honacki *et al.* 1982 ; Ellerman & Morrison-Scott 1966).

Habitat and ecology : Prefers open scrub jungle and floating swamps (Phumdis) between rivers and hills. The present habitat of sangai does not exceed 16 sq Km at Keibul Lamjao National Park, Manipur. Its favourite food is the Tshing Kombong grass (*Saccharum latifolium*). The rutting season starts in February-March and the young, usually one at a time, is born in October or so. Master stags are seldom noticed with the herd after the rut is over.

Population : Wild : The population of Manipur Sangai was about 100 in 1960 (Gee 1960). But subsequent aerial census conducted in March 1975, February 1977 and March 1979 indicated the presence of 14, 18 and 30 deer respectively. (Mukherjee 1975, Ranjitsinh 1975, Desai 1986). However, a ground census conducted by the officials of the National Park in 1985 revealed 50 individuals.

In captivity : According to the International Zoo Year book, the population of *C. e. eldi* was 94 specimens in 13 Indian zoos in May 1988 ; *C. e. thamin* : 162 specimens in 13 collections ; *C. e. siamensis* : 5 specimens at Paris (Anon 1988).

Threats to survival : The increase in human settlement, extension of cultivation, burning and cutting of thatch grass in the dry season have lead to shrinkage of its favourite habitat, and this coupled with poaching have driven them to a point of no return.

Conservation measures taken : The Brow-antlered Deer is legally protected from poaching by inclusion in Schedule I of the Indian Wildlife (Protection) Act, and from trade by inclusion in Appendix I of CITES.

With the upgradation of the Keibul Lamjao sanctuary to a national park and with enhanced allocation of fund and staff, the prospects of survival of the deer and its habitat have notably improved (Saharia 1981).

Conservation measures suggested : This species breeds well in zoos. Hence, captive breeding in zoos and then its reintroduction to natural habitat other than keibul Lamjao N. P. is desirable. However, any attempt to reintroduce deer in the wild, at present, is not conducive to the overall welfare of the species. Reintroduction must depend on the development of a proper management plan in confirmation with a parallel programme for rehabilitation. The first step in such a strategy is to acquire more detailed information on the habitat and related aspects (Desai 1986).

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Himalayan Musk Deer

Order ARTIODACTYLA

Moschus chrysogaster (Hodgson, 1839)

Family CERVIDAE

Common local names : Kastura (Hindi), Raos or Rons (Kashmiri).

Diagnostic characters : A small deer, head without antlers ; upper canines long, extending below upper lip in males, inconspicuous in females ; ears large and rounded, rump higher than shoulders, and the tail extremely short and flattened. Hair long, coarse and brittle. Coat light brown, speckled with grey above, paler beneath ; rows of light spots on back and flanks. Males possess musk gland, situated anterior to sex organs. Females possess a single pair of teats (Flerov 1928, Groves 1975).

Measurements : Head and body length 80 - 100 cm ; height at shoulder 50 - 70 cm.

Intraspecific variations : Taxonomy rather disputed. Earlier work mentions only one species, *M. moschiferous*, with several subspecies. Flerov (1928) suggests three species, *moschiferous* (Siberian), *chrysogaster* (Himalayan), and *berezovskii* (Chinese). Groves (1975) recognises two species from India, namely, *chrysogaster* (alpine form) and *sifanicus* (forest form). *M. chrysogaster* differs from *M. moschiferous* in having a lighter coat.

Distribution : Southern slope of the Himalayas from northern Pakistan through India, Nepal and Bhutan to northern Burma. In India, musk deer occurs in Jammu & Kashmir (Kamraj, Langet Jhelum valley, Pir Panjal, Sindh, Kistwar, Bhaderwah, Ramban, Reasi, Udhampur, Poonch, Dachigram and Gulmarg), Himachal Pradesh (Kinnaur and Rajgarh), Uttar Pradesh (Kedarnath, Badrinath, Tons Forest Division), Sikkim (Khangchendzonga N. P.) and Arunachal Pradesh (Namdapha N.P.) (Green 1986).

Habitat and ecology : Himalayan musk deer favours rugged terrain between 2200 and 4400 m altitude in the Himalayas and occupies both alpine and forest belt (Groves 1975). Very shy and secretive animal, normally moves solitary, maintaining a territory of its own. Feeds on grasses, herbs, mosses, ferns and lichens. Mating takes place in December and January, and fawns either one or two, are born between April and June

after a gestation of 5 - 6 months. Females attain sexual maturity within 16 or 17 months, and males after two or three years.

Population : Wild : Once widespread in forested regions up to the tree line. Now restricted to isolated pockets in many regions. Population is estimated to be 30,000 individuals (CITES). But it appears to be on the high side.

Captive population : The International Zoo Year book reports 12 specimens of musk deer kept in two collections in 1985. In India, the species is held captive at Dachigram Sanctuary, Kufri and Darjeeling Zoo. An enclosure for breeding musk deer has recently been constructed in Kedarnath Sanctuary. In captivity, musk deer lives up to 13 years of age.

Farms have been established in China at Quang Xian and Szechuan.

Scientific interest : This group is of academic interest as it is considered to be intermediate between Bovidae and Cervidae, hence, first accommodated under a separate family Moschidae, and afterwards under subfamily Moschinae.

Commercial value : The species is being exploited for the extraction of musk. In China, each male yields on an average 6 - 8 gm musk annually, but, in India, at Kufri the average yield is 3.2 gm. In 1978, the international price of musk was US \$ 40,000 - 50,000 per kg. Musk is used in the preparation of medicines and also in perfumery.

Breeding of musk deer in captivity and extraction of musk have been achieved in India at Kufri in 1975. Musk was first extracted by surgical operation. But it can also be extracted by inserting a sliver grooved spatula into the musk gland *via* its external orifice. After extraction, the musk is dried for about a week and exported. Maximum yield of musk comes from animals between 3 and 8 years of age (Gupta & Jain 1980).

Trade data : From 1981 to 1985, Japan imported 215-300 kg of musk annually from China. In India, the export of musk is completely banned.

Threats to survival : i) Indiscriminate persecution of musk deer throughout its range for musk pods. ii) Destruction of its habitat (subalpine forests and scrub) for timber and fuelwood. iii) Unrestricted grazing by livestock during summer months, resulting in the loss of undergrowth, and

inhibiting natural regeneration. iv) Predation by leopard, marten, wolf, lynx, etc.

Conservation measures taken : The species is enlisted in Schedule I of the Wildlife (Protection) Act and appendix I of CiTES, thereby fully protected from killing and trade. It is also enlisted as 'Vulnerable' in the Red Data Book (Holloway, 1973).

Sancturaies, national parks and biosphere reserves in its range of distribution help to restore its habitat and offer full protection.

Captive breeding programme and extraction of musk without sacrificing the animal have been started.

Conservation measures suggested : Musk from India and Nepal is smuggled to the West and Japan. Coordinated action at official level is required to curb this traffic by increasing vigilance at Ports. People should be educated about the threatened status of the musk deer and availability of synthetic products allied to musk in the market. This will reduce the demand for the natural substance. Captive breeding programmes should be encouraged. Adequate staff should be deployed for antipoaching work in the musk deer country.

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Blackbuck or Indian Antelope

Order ARTIODACTYLA

Antilope cervicapra (Linnaeus, 1758)

Family BOVIDAE

Common local names : Harna, Harni (Hindi), Hoola Kerra, Chigri (Kanarese), Moorkoo marn (Tamil), Ledi, Jinka (Telegu), Haran, Kalwit (Marathi), Barant, Sasin, Krishna sar (Nepali).

Diagnostic characters : Coat in males blackish brown above, and whitish below; females yellowish fawn above and invariably hornless. Males possess a pair of spirally twisted horns (Blanford 1888-91, Prater 1980).

Measurements : Head and body length about 120 cm; height at the shoulder 74-83 cm; length of horns 50-60 cm (Anon 1987).

Distribution : India, Pakistan and Nepal (Honacki *et al.* 1982). Within the Indian limits, it occurs throughout the plains, the eastern limit being Chilka Lake in Orissa, and southwards to Point Calimere in Tamil Nadu. It is, however, not known from the Malabar coast.

Intraspecific variations : Four subspecies occur in India (Ellerman & Morrison-Scott 1966), however, the status of these is doubtful.

A. c. cervicapra : Horns short (less than 50 cm), with open spiral; coat dark brown. Southern India.

A. c. centralis : Horns large, with tight spiral. Madhya Pradesh and southern Rajasthan.

A. c. rajputanae : Horns large, with tight spiral. Northwestern India and Pakistan.

A. c. rupicapra : Horns medium-sized; coat with dark markings. Northern India, north of the river Ganga.

Population : Wild : The number of blackbuck has fallen from an estimated population of 80,000 in 1947 to about 8000 in 1964. However, the population has recovered in recent years (Schaller 1967, Krishnan 1972, Nair 1976, Rashid 1979, Majupuria 1986). According to the census report of the Forest Department, Government of Rajasthan, there were about 9000 heads in Rajasthan in 1980. However, the views of Indian experts differ

widely on the current status of blackbuck in India from 10,000 to 50,000 individuals (Saharia 1981, Anon 1987).

In captivity : The International Zoo Year book reports 664 blackbuck bred in 92 collections in 1983. 15-20 specimens are kept in an enclosure in the Royal Karnati Bardia Wildlife Reserve in Nepal (Majupuria 1981-82) and 54 specimens in two enclosures in the Lalsuhanra National Park in Pakistan - trend increasing (Roberts 1977).

Habitat and ecology : Usually gregarious ; seen in herds of 10 - 30 or even over 100 individuals. Prefers flat open ground covered with grass, scrubs, bushes, etc., but avoids forest and hilly tracts. Feeds on grass, weak-stemmed plants, scrubs, pods of Acacia, fruits, etc. The rutting season is in spring or winter. However, according to some, mating takes place throughout the year (Schaller 1967).

Threats to survival : The blackbuck has disappeared from many places where it was quite common a few decades ago. It is prized for its meat and as a sporting trophy. Further, decimation of its population has been accelerated due to rapid agro-industrial development in its preferred habitat throughout the country (Schaller 1967).

Conservation measures taken : The blackbuck is included in Schedule I of the Wildlife (Protection) Act and Appendix III of CITES. After the enforcement of the Indian Wildlife Protection Act, its population is increasing steadily in the favourable habitats. It gets protection in at least 21 wildlife sanctuaries and national parks; and many more are in the offing.

Conservation measures suggested : Cattle grazing and human interference in and around its habitat should be stopped by strictly enforcing the wildlife laws.

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Chinkara or Indian Gazelle

Order ARTIODACTYLA

Gazella dorcas bennetti (Sykes, 1831)Family BOVIDAE

Common local names : Chinkara (Hindi), Kalsipi (Marathi), Tiska, Budari, Mudari (Kanarese), Burudu jinka (Telugu).

Diagnostic characters : A slender-bodied antelope ; with sandy brown to light chestnut coat. Horns, in males, relatively longer than in females, sinuous and closely ringed (Blanford 1888-91, Tikader 1983).

Measurements : Height at the shoulder about 65 cm; length of horns 25-30 cm in males, and 10-13 cm in females (Prater 1980).

Distribution : Eastern Iran through Pakistan to India (Corbet 1978). Within the Indian limits, it occurs in the plains and low hills of north-western and central India, extending southward to a little south of Krishna river (Tikader 1983).

Intraspecific variations : Out of five subspecies of *Gazella dorcas*, *G. d. bennetti* is found in India. It is characterised by the horns, in males, longer than 26 cm and closer together (less than 20 mm) (Groves 1969).

Population : Wild : Exact population-size not known. However, 311 chinkaras are reported to be present in Gir Sanctuary, Gujarat (Rashid 1986), 242 in Ranthambhore, and about 1500 in Nagarjunasagar Tiger Reserves. Schaller (1976) reported 601 chinkaras in Kalabhag Reserve, Salt Range, Pakistan.

In captivity : According to the International Zoo Year book, 4 births occurred in zoos in 1981, one in 1982, and 5 in 1983.

Habitat and ecology : Lives in small herds of 10 to 20 individuals or even less. An animal of thin forested areas, preferring ravines, broken country, rocky areas, scrub covered hills, and the sand dunes. Food consists of grass, leaves and succulent fruits such as pumpkins, melons, etc. Gives birth to one or two fawns (Nowak and Paradiso 1983, Prater 1980).

Threats to survival : Habitat destruction for human settlements and agro-industrial use, and poaching for flesh and hide are the main threats to

its survival (Nowak and Paradiso 1983, Tikader 1983).

Conservation measures taken : Chinkara is enlisted in Schedule I of the Wildlife (Protection) Act. It is also well protected in sanctuaries and national parks.

Conservation measures suggested : Strict implementation of the wildlife protection laws and study of its population status are desirable.

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Tibetan Gazelle

Order ARTIODACTYLA

Procapra picticaudata Hodgson, 1845

Family BOVIDAE

Common local names : Goa, Ragao (Tibetan).

Diagnostic characters : Slightly shorter than Tibetan Antelope. Coat short and grey coloured in summer, dense and sandy fawn in winter; undersurface white but not sharply contrasting with that of the back; a white rump patch extends all round the base of tail, forming a caudal disc. Tail short, with a blackish tip. Horns, in bucks, rise vertically, curve sharply backwards and have 25 - 30 annulations; females without horns (Blanford 1888-91, Prater 1980, Tikader 1983).

Measurements : Head and body length about 100 cm; height at the shoulder about 60 cm; length of horns 30-33 cm (Tikader 1983).

Distribution : India, Mongolia, Tibet and S. China (Honacki *et al.* 1982). In India, it is known from the northeastern Ladakh to hills north of Kumaon (Uttar Pradesh) and Sikkim.

Intraspecific variations : Out of two subspecies, namely, *picticaudata* and *przewalskii*, the former is found within the Indian limits whereas the latter in China and Mongolia (Ellerman & Morrison-Scott 1966, Corbet 1978).

Population : Wild : No authentic estimate is available.

In captivity : No data is available.

Habitat and ecology : Tibetan Gazelle inhabits the Tibetan plateau at altitudes varying from 3950 to 5500 m in small parties of 2-12 individuals. Feeds in areas of scanty vegetation. The rutting season is in December and one or two young are born about May (Tikader 1983, Nowak & Paradiso 1983).

Threats to survival : The population of the Tibetan Gazelle has depleted to an endangered level due to illegal hunting of this species for flesh and skin, specially for its long and soft winter fur (Tikader 1983, Nowak and Paradiso 1983).

Conservation measures taken : This gazelle is legally protected from hunting by its inclusion in Schedule I of the Wildlife (Protection) Act.

Conservation measures suggested : The population status of this animal in the wild may be studied. Further, captive breeding programme and studies on its behaviour may be taken up.

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Four-horned Antelope

Order ARTIODACTYLA

Tetracerus quadricornis Blainville, 1816Family BOVIDAE

Common local names : Bhokra (Gujarati), Chousingha (Hindi), Koondoo Kooree poki (Kanarese), Nari komboo marn (Tamil), Konda gori (Telugu).

Diagnostic characters : Smaller than the blackbuck. Males possess four smooth horns on the head, front pair shorter than hind and keeled in front. Females hornless. Coat colour varies from brown to rufous brown above, and white below. A dark stripe runs down the front of each leg (Blanford 1888-91, Prater 1980, Tikader 1983).

Measurements : Head and body length 80-110 cm; height at the shoulder 55-65 cm; length of anterior horns 2-3 cm and of posterior 8-10 cm (Anon 1987).

Distribution : India and Nepal (Honacki *et al.* 1982). In India, it is found in the deciduous woodland from south of Himalayas to Kanya Kumari, Tamil Nadu. In Nepal, occurs in Amlekhganj, Bara district (Majupuria 1981-82).

Intraspecific variation : No subspecies (Ellerman & Morrison-Scott 1966).

Population : Wild : Total population-size is not known (Anon 1987). However, in 1985, about 4300 antelopes were present in 7 tiger reserves, and 1063 in the Gir Lion sanctuary alone (Rashid 1986).

In captivity : The International Zoo Year book reports 24 specimens born in 4 collections in 1982, 7 specimens in 2 collections in 1983, and 9 specimens in 3 collections in 1984 (Anon 1987).

Habitat and ecology : Lives singly or in pairs, in wooded hilly country, near water. Nocturnal and shy in nature. The rutting season is during the rains and the young, one or two, are born around January - February (Nowak and Paradiso 1983).

Threats to survival : Shrinkage of habitat and poaching of the animal for its flesh are the main threats to its survival.

Conservation measures taken : Chousingha is enlisted in Schedule I of the Wildlife (Protection) Act and thus legally protected from killing. In addition, these get protection in sanctuaries and national parks falling in their distributional range.

Conservation measures suggested : Strict implementation of the wildlife (Protection) laws is desirable to protect the species.

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Tibetan Antelope

Order ARTIODACTYLA

Pantholops hodgsoni (Abel, 1826)

Family BOVIDAE

Common local name : Chiru (Tibetan).

Diagnostic characters : A rufous brown antelope, slightly larger than the blackbuck, with a black face and white undersurface. A black stripe runs down the front of each leg. Body covered with thick wool. Muzzle swollen in males, and nostrils furnished inside with an extensive sac. Horns, in male, long, erect, arising close to each other, slightly curved forward, ringed in front but not behind; females without horns (Blanford 1888-91, Tikader 1983, Nowak & Paradiso 1983).

Measurements : Head and body length 130-140 cm; height at the shoulder about 80 cm; length of horns 60-65 cm.

Distribution : India, Tibet and S. China (Honacki *et al.* 1982). This species occurs throughout the Tibetan plateau from 3800 to 5500 m elevation and crosses into the Changchenmo valley in Ladakh by way of the Lanak la Pass (Corbet 1978, Prater 1980, Tikader 1983).

Intraspecific variation : No subspecies (Elleman & Morrison-Scott 1966).

Population : Wild : No definite record of its population in the wild is available. But it is said to occur throughout the Tibetan plateau (Nowak & Paradiso 1983).

In captivity : No record is available.

Habitat and ecology : The Chiru inhabits plateau steppes at elevations between 3600 and 5500 m. It occurs singly or in parties of 3 or 4 individuals. Feeds on patches of grass in the vicinity of streams and rivers. Mates during winter and produces a single young, in the summer.

Threats to survival : The population of the Tibetan Antelope has greatly reduced due to increased human interference in the area of its occurrence.

Conservation measures taken : Inclusion of this species in Schedule I

of the Wildlife (Protection) Act and in Appendix I of CITES has legally protected it from killing and trade.

Conservation measures suggested : Monitoring of its population in the wild, captive breeding programme and habitat preservation should be undertaken.

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Yak***Bos mutus* Przewalski, 1883**

Order ARTIODACTYLA

Family BOVIDAE

Common local names : Ban chour (Hindi), Brong dong (Tibetan).

Diagnostic characters : Massively built oxen, with short sturdy limbs and drooping head; back straight, with high humped shoulders. Body covered with long shaggy hairs, fringes of which hang down the flanks, chest, shoulders, thigh and rump, and form a bushy tuft between horns and a great mane on neck. Tail long, extraordinarily bushy and tufted on distal half. Body colour blackish brown, with a little white about the muzzle (Blanford 1888-91, Tikader 1983).

Measurements : Height at the shoulder 170-185 cm; size of horns 65-75 cm (Prater 1980).

Intraspecific variations : No subspecies. However, many authors are of the opinion that the wild population distributed in isolated pockets be called as *Bos mutus*, and the name *Bos grunniens* be restricted to the domesticated form only.

Distribution : Changchen-mo valley (Ladak) in Jammu & Kashmir. Sometimes it strays into Suttlej valley and Kangri Bingi Pass in the Kumaon Hills (Uttar Pradesh), through Tibet to northern Nepal and Sikkim. Domestic yaks, however, are common in Arunachal Pradesh. Also found in Szechwan (China) (Honacki *et al.* 1982).

Habitat and ecology : Lives in coldest, desolate and rugged mountain terrain, near the snow line (alt. 4000-6000 m). Moves in small herds but during spring many such herds may assemble together in the grazing fields. Subsists mainly on grass and shrubs, also takes frozen snow and salt encrusted earth. Yak-herds travel on snow in a single file carefully stepping on imprints left by the leader. Rut takes place in autumn and the young ones are born in April or May after a gestation of about nine months. Breeds freely with domestic cattle (Prater 1980).

Population : Scarce. Only a few are surviving in isolated pockets in remote areas. Exact number is not known. Feral and domesticated yaks also occupy the wild terrain and make it difficult to ascertain the wild ones (Mukherjee 1982).

Scientific interest & potential value : Yak is important for its gene pool from which domesticated stocks have been derived. domesticated yak is indispensable beast of burden in the alpine and subalpine mountain terrain and traditionally used for many purposes. Its meat and hide are widely used articles. Domesticated yaks are largely kept for their milk.

Commercial uses : Wool and tail-tuft are much sought after articles for trade.

Trade data : Not known.

Threats to survival : Disturbance in its habitat, competition from domestic stock and contagious diseases are some of the major threats.

Conservation measures taken : Prohibited from killing by inclusion in the Schedule I of the Wildlife (Protection) Act, and from trade by inclusion in Appendix I of CITES as *Bos mutus*.

Conservation measures suggested : Captive breeding programme should be initiated.

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Compiled by S. S. Saha

Gaur or Indian Bison
***Bos gaurus* H. Smith, 1827**

Order ARTIODACTYLA
 Family BOVIDAE

Common local names : Gaur (Hindi), Karkona (Kanarese), Gariya (Marathi), Paothu (Malayalam), Gayal (Oriya), Kutu-erimai (Tamil).

Diagnostic characters : Largest of all bovines, with heavy body, short limbs and elevated hump like ridge of shoulder. Horns flattened on base, curves first outward then inward. Tail reaching the hocks. Old bull black and hairless, cow dark or reddish brown, with short hairs; forehead ashy, stockings white.

Measurements : Height at the shoulder 175-220 cm, horns along the curve 68-76 cm.

Intraspecific variations : Three subspecies have been recognised, of which the nominate subspecies occurs in India, and, on average, is the largest. The other two subspecies occur in south-east Asian countries (Lekagul 1965, Weigum 1971, Goodwin and Holloway 1972, Mukherjee 1982). Albinistic individuals have also been reported (Williams 1970). Blanford (1888-91) remarked that the skulls of the specimens from Bhutan duars and Mishmi Hills are much broader in proportion around the forehead than those from the Indian Peninsula.

Distribution : Once gaur was found throughout the hilly forests of the Himalayan foot-hills and peninsular India, Nepal, Sri Lanka, Burma, Thailand, Laos, Vietnam and Malaysian countries.

At present, in India, gaur occurs in certain pockets of West Bengal, Assam, Bihar, Madhya Pradesh, Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu, Goa and Kerala (Blanford 1888-91, Ellerman & Morrison-Scott 1966, Lekagul and McNeely 1977, Prater 1980, Saharia 1981, Mukherjee 1982, Subba Rao *et al.* 1984, Conry 1986).

Habitat and ecology : The gaur is essentially a hilly animal and dweller of dense tropical forests, interspersed with glades or open meadows. In the Himalayas, it mainly keeps itself to foot-hills but in the peninsular India it occurs up to an altitude of 1830 m or even more (Prater 1980). Lives in small

herds of 5 - 20 individuals, occasionally uniting with other families in large pasturing areas. It is both a grazer and a browser (Schaller 1967, Krishnan 1975). It has also the habit of visiting salt-licks. The main rutting period is December and January. Peak season of birth is August or September but newborn could also be seen in other months of the year (Blanford 1888-91). Gestation period is about 270-280 days. A gaur in captivity lived up to an age of 24 years (Grizimek 1972).

Population : Wild : Large herds of gaur was once common in the tropical forests of south-east Asia but its number has drastically reduced in recent years.

No thorough census of gaur has ever been made in India. However, Mukherjee (1982) estimated about 5000 heads present in the country, the maximum concentration being at Kanha (Madhya Pradesh), Baresand and Betla (Bihar), Madumalai (Tamil Nadu) Bandipur (Karnataka), and Melghat and Kolhapur (Maharashtra).

Scattered reports of their number in some of the conservation areas, in India, are available which are given below :

Andhra Pradesh : Marripakala, 66 (Subba Rao *et al.* 1984) ; Eturnagaram, 1 Male gaur per square mile area (Spillett 1968).

Assam : Kaziranga, 20 in 1966 (Spillett 1967a) Manas, 1,200 in 1984 (Tiger Project Report 1986).

Bihar : Betla, 26 in 1970 ; Palamau about 500 in 1984.

Karnataka : Bhadra and Nagerhole, 1,000 at each place (Karanth 1987) ; Bandipur, 551 in 1983 (Tiger Project Report 1986).

Kerala : Periyar, 500 in 1973 (Waller 1973).

Maharashtra : Melghat, 1,839 in 1985 (Tiger Project Report 1986).

Orissa : Similipal, about 200 in 1986 (Tiger Project Report 1986).

Madhya Pradesh : Kanha, about 500 (Bedi & Bedi 1984) ; Indravati, 124 in 1985 (Tiger Project Report 1986).

Tamil Nadu : Madumalai, about 400 (Krishnan 1972).

West Bengal : Jalapara, 8 in 1971 (Spillett 1967b).

In captivity : There are about two dozen gaurs in 9 different zoos of

the world (Grizimek 1972).

Scientific interest and potential value : The gaur plays an important part in the economy of nature. It puts a check on the abundant growth of various types of grasses, the most spreading of all vegetation and return the nutritive material to the forest floor through faecal matter. Gaurs also form staple food of tigers and other carnivores (Fox 1984). It has contributed to improve the gene-pool as well as new breed of cattle. It breeds well with domestic cattle and has given rise to a handsome breed of cattle known as Mithun in Arunachal Pradesh. Flesh of gaur is excellent if not too old (Jerdon 1874) and a single bull may yield 700 kg of meat.

Threats to survival : Destruction of habitat due to modified land use, poaching for meat and various types of diseases (Rinderpest, and Foot & Mouth) are the main threats to its survival. Competition with domestic stock for food is another factor (Prater 1980, Mukherjee 1982, Ramchandran *et al.* 1986, Davidar 1987, Karanth 1987).

Conservation measures taken : Enlisted in Schedule I of the Wild Life (Protection) Act and Appendix I of CITES. Most of the habitats of gaur have been declared as the conservation areas. Recently, the Central Zoo Authority of India has assigned Bangalore, Mysore and Hyderabad zoos to carry out the captive breeding of this species. Innoculation of the domestic cattle against Rinderpest is in practice to minimise the chances of infection passed on to the wild population.

Conservation measures suggested : As it has been established that destruction of habitat and spread of Rinderpest disease in the wild population are the main threats to gaur population, efforts should be intensified in this direction. Innoculation of cattle against Rinderpest should be made legal compulsion and hence, free inoculation facilities should be extended. Reintroduction of gaur in their lost range may also be tried.

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Wild Buffalo

Bubalus bubalis (Linnaeus, 1758)

Order ARTIODACTYLA

Family BOVIDAE

Common local names : Jangali Bhainsh (Hindi) ; Moh (Assamese) ; Jangali Mosh (Bengali) ; Misip (Cachari) ; Siloi (Kuki) ; Iroi (Manipuri) Gubui, Rili, Le (Naga).

Diagnostic characters : Of the size of domestic buffalo but more robust and heavier. Coat slaty black ; legs dirty white just above hocks and knees. Horns present in both sexes, triangular in cross section and flat, with marked cross wrinkles. Ears small; hooves large and splayed. Tail tufted at tip.

Measurements : Head and body length 250-300 cm; tail 60-100 cm; height at the shoulder 150-180 cm; spread of horns up to 120 cm.

Intraspecific variations : Two subspecies occur in India, namely, *B. b. bubalis* and *B. b. fulvus* (Ellerman and Morrison-Scott 1966). The latter occurs in Mishmi Hills, Arunachal Pradesh and differs from the nominate subspecies in having much convex forehead and dun-coloured body (Blanford 1888-91). However, individual variations in the nature of horns are not uncommon. In some, horns curve upwards in a semicircle and the tips separated by a small interval ; in others, horns spread outwards almost horizontally and curve slightly upward and inward near the tip (Prater 1980).

Distribution : Found in the grass jungles of Assam (Manas, Pabha, Kaziranga, Laokhowa and Lakhimpur), Orissa (Koraput district), Madhya Pradesh (West, south and north Bastar, and southern Raipur), and Maharashtra (eastern Chandrapur). Also found in Nepal, Vietnam and Borneo. Feral animals are found in SE. Asia, S. Europe, N. Africa, N. Australia and eastern south America.

In the past but within historic times, the wild buffalo was associated with the large rivers and their tributaries in the Gangetic as well as Brahmaputra plains and peninsular India. Its distribution extended from the

riverine grass jungles of Ruhelkhund Terai to Assam in the east and the Godawari in the southeast. However, it has lost many of its earlier ranges in the Terai and Duars of Uttar Pradesh, Bihar and West Bengal (Daniel and Grubh 1966, Divekar *et al.* 1984).

Habitat and ecology : Lives in grass jungles and reed brakes in the neighbourhood of swamps in eastern India, and in drier, harder ground broken up into nullahs in peninsular India. Lush grasses and vegetation growing besides rivers and lakes are its favourite food ; sometime also attacks cultivation. Main period of rut is spread over several months and not confined to autumn (Daniel & Grubh 1966). Gestation period is about 10 months. Maximum number of calves have been recorded during April-May.

Population : Wild : Goodwin and Holloway (1972) gave a total estimate of 2000 animals in India including Nepal. The break up is about 400-500 in peninsular India including 200-250 in Bastar and Chandrapura (Daniel & Grubh 1966), 1,425 in eastern India including about 550 in Kaziranga (Waller 1973), and 63 in Nepal (Dahmer 1976). Again, Divekar (1976) reported only 50 animals in West Bastar. Tikader (1983) however, mentioned its population as less than 1,000 in India.

In captivity : No information is available.

Scientific interest and potential value : Domestic buffaloes have evolved from wild buffaloes and differ very little from the wild (Prater 1980). They are most useful as beast of burden, and resources of protein, high quality milk and leather. Selection and elimination have produced numerous domestic breeds. thus, with a sustainable resource management they can be utilised as good source of leather, meat, etc., and genepool, as and when necessary. Interbreeding is encouraged in Bastar district of Madhya Pradesh (Noronha 1954). However, chances of survival increase with the second generation (Gee 1953, Lall 1953).

Threats to survival : Destruction of its habitat by reclaiming the riverine region of Gangetic Plains for cultivation, and cutting down of forests for timber, bamboo, roads and other development schemes, are the main threats to its survival. These have reduced their feeding ground as well as cover. Poaching and contagious diseases particularly the rinderpest are some of the other factors.

Conservation measures taken : Legally protected from hunting by inclusion in Schedule I of the Wild Life (Protection) Act. Most of the areas of their concentration have been declared as the conservation areas.

Conservation measures suggested : Daniel and Grubh (1966) have recommended the following measures.

Most of the people living in and around the range of wild buffalo are very much dependant on forest resources and there is tremendous pressure on the grazing land. Thus, a developmental strategy involving the local people to be initiated so as they may utilise the forest resources but maintaining the quality of the forests.

Fodder to be cultivated in all available waste land around the forests so as to reduce the pressure on the grazing land within it. This will also reduce the chances of infection from domestic cattle.

Necessary monitoring is required as regards the increase of tigers in the Project Tiger area to prevent the rate of predation of buffaloes.

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Takin

Order ARTIODACTYLA

Budorcas taxicolor Hodgson, 1850Family BOVIDAE

Diagnostic characters : A heavily-built, clumsy looking animal, with convex face, heavy mouth and a thick neck. Heavy body is supported by extraordinarily short, thick legs, slightly raised withers and arched spine. Horns thick, arise close together, curve outwards and then make a sharp turn pointing backwards. Long shaggy hairs drooping particularly from shoulders and sides of body. Colour varies from golden yellow to deep dark brown; a dark stripe present on the back; withers conspicuously lighter in tone (Blanford 1888-91, Prater 1980, Tikader 1983).

Measurements : Head and body length about 120 cm; tail about 100 cm; height at the shoulder 80-110 cm.

Intraspecific variations : Three subspecies are known of which the nominate subspecies occurs in India.

Distribution : Eastern Himalayas between 900 and 3000 m altitude in Arunachal Pradesh. Extralimittally, found in Bhutan, SW China and N. Burma (Honacki *et al.* 1982).

Habitat and ecology : Lives in thickly wooded montane country, with tropical and subtropical forests, usually in dense bamboo and rhododendron jungles (900-3000 m). Moves in small parties in winter but may congregate in very large numbers during the summer months. Subsists mainly on leaves and shrubs. It mates in July-August and single young is dropped in March-April (Walker 1968, Prater 1980).

Population : No estimate is available. However, its population has drastically reduced. It is reported that they aggregate in large numbers (upto 300 individuals) at hot water sulphur spring in July and August in the Jorging valley of Siang (Arunachal Pradesh).

Scientific interest and potential value : Takin exhibits physical char-

acteristics of cattle, musk oxen and goat antelopes. The knowledge about its biology, ecology, zoogeography and population is obscure. Takin is hunted by tribals in Arunachal Pradesh for its meat, hide and horns.

Commercial uses : No commercial uses known.

Trade data : Not known.

Threats to survival : Destruction of habitat, increased human interference and hunting pressure are some of the threats to its survival.

Conservation measures taken : Legally protected from hunting by inclusion in Schedule I of Wildlife (Protection) Act. It further gets protection in various conservation areas in Arunachal Pradesh.

Conservation measures suggested : Study on its biology, ecology, and population status is needed to formulate the future conservation policy.

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Markhor***Capra falconeri* Wagner, 1839**

Order ARTIODACTYLA

Family BOVIDAE

Common local names : Raphoche or Rawache (Ladakhi).

Diagnostic characters : Wild goat, with short, thick legs, broad hooves, and a pair of twisted, serpentine-shaped horns. Body reddish grey in colour, grey in winter and reddish buff in summer ; belly and legs creamy white, with a conspicuous dark brown pattern on forepart of shank and a white patch on carpal. A mid-dorsal, dark brown, stripe extends from below the shoulder to base of tail. Tail covered with long black hairs. A long black beard on chin, followed by a shaggy grey mane down the neck and shoulders (Blanford 1888-91).

Measurements : Height at the shoulder 90-100 cm; length of horns 120-150 cm.

Intraspecific variations : Seven subspecies are known of which two, namely, Astor Markhor (*Capra falconeri falconeri*) and Pir Panjal Markhor (*Capra falconeri cashmiriensis*) are found within the Indian limits in Gilgit (Nanga Parbat) and Pir Panjal range of Jammu & Kashmir respectively. Subspecies are mainly recognised on the basis of size and shape of horns, coloration body and extension of mane and beard.

Distribution : Western Himalaya, Afghanistan and South Uzbekistan (Honacki *et al.* 1982).

Habitat and ecology : Markhor is an inhabitant of dense pine and birch forests, and grassy glades in Jammu & Kashmir. Prefers steep, precipitous, high rocky cliffs between 1800 and 3600 m. altitudes. Seldom crosses snow-line. Gregarious, lives in herds of 4-40 individuals. Mature ram moves solitary and joins the herd in rutting season. Feeds upon tussocks of grass during spring and summer, and on leaves and acorns of oak, larches and shrubs in winter. It mates in winter and one or two young are born in May June (Blanford 1888-91, Prater 1980).

Population : Reported to be drastically reduced in the last few decades. The world population of the species is estimated between 2000 and 2500 individuals (IUCN Red Data Book).

Scientific interest and potential value : Fleece is used for making woollen yarn. Snow leopards prey upon Markhor, and the Golden Eagle takes away its newborns.

Commercial use : No specific uses known.

Trade data : Not known.

Threats to survival : Disturbance in the habitat of its occurrence, local hunting pressure, competition with domestic stock for food, and epidemic like the Reinderpest, Bot Fly parasites, etc., are some of the threats to its survival (Mukherjee 1982).

Conservation measures taken : The species is legally protected from hunting by inclusion in Schedule I of the Wildlife (Protection) Act, and from trade by inclusion in Appendix II of CITES.

Conservation measures suggested : The area in which Markhor occurs falls under Military control. Hence, it is difficult to implement the wildlife protection laws.

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Himalayan Ibex
***Capra ibex* Linnaeus, 1758**

Order ARTIODACTYLA
 Family BOVIDAE

Common local names : Kail (Kashmiri), Tangrol (Kulu), Sakin or Danmo (Ladakhi).

Diagnostic characters : Stocky animals, with thickset body, strong limbs, and prominent beard under chin of both sexes. Horns flattened anteriorly, bearing widely spaced transverse ridges or bosses. Suborbital and inguinal glands lacking, and pit glands present in forefeet only. Sexually dimorphic. Mature rams possess almost silver white fur on body, offset by rusty grey on chest, throat and face. Females and immatures yellowish brown to reddish grey, with a mid-dorsal dark brown line extending from below shoulders to base of tail (Blanford 1888-91, Tikader 1983).

Measurements : Height at shoulder about 100 cm; length of horns 100-115 cm.

Intraspecific variations : Four subspecies, of which *Capra ibex sibirica* occurs within the Indian limits.

Distribution : Inhabits on both sides of the Western Himalaya (alt. 3650-6700 m), the eastern limit being upper reaches of Sutlej river. Extralimittally, found in N. Pakistan, NE Afghanistan, Altai mountains in USSR, south of Tiensan; also Tibet (Honacki *et al.* 1982).

Habitat and ecology : Inhabits relatively arid mountain ranges well above the tree-line in the higher precipitous regions. Often descends down to feed on open grassy slopes. Gregarious; mature rams associate themselves and follow the mixed herds during the winter and early spring. Subsists mainly on tussocks of grass (Blanford 1888-91, Prater 1980).

Population : Total estimate of its population in the wild is not available. However, its density was estimated to be 2.29 ibex per sq.km. and the total population of 700-1200 animals in Pin Valley National Park, Himachal Pradesh (Pandey 1992).

Scientific interest and potential value : Much sought after for its flesh.

Snow leopard and wolves prey upon this species. Sometimes this species hybridises with domestic goats.

Commercial uses : Its underwool is a valuable product of commerce and is used in the preparation of shawls, stockings and gloves. Ropes and blankets are made out of its coarse hair (Prater 1980).

Trade data : Not known.

Threats to survival : Persecution for its flesh and underfur, contagious diseases from domestic animals, and disturbance in its habitat are the main threats to its survival.

Conservation measures taken : Legally protected from killing by inclusion in Schedule I of the Wildlife (Protection) Act. Also finds protection in conservation areas falling in its range of distribution.

Conservation measures suggested : Study on its population status is desirable to suggest future conservation measures.

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Serow

Order ARTIODACTYLA

Capricornis sumatraensis (Bechstein, 1799) Family BOVIDAE

Common local names : Ramu, Salabhir (Kashmiri) ; Gya (Sikkimese) ; Sarao (NW. Himalayas).

Diagnostic characters : Larger than a goat in size, with large head, donkey-like ears, thick neck, short limbs, naked rhinarium and straight facial profile. Both sexes possess black, conical horns, closely wrinkled in their basal three-fourths. Coat blackish to brownish black; flanks and lower thighs rusty red, grey on inner side of limbs and belly.

Measurements : Head and body length 140-150 cm, tail 8-12 cm, height at the shoulder 85-90 cm, horns 15-25 cm (Walker 1964).

Intraspecific variations : Numerous forms have been described mainly based on colour. Within the Indian limits, 4 subspecies have been recognised, viz., *C. s. thar* (Hodgson) - head brownish or black, legs white below knee, belly paler; *C. s. rodoni* Pocock - belly sharply white; *C. s. jamrachi* Pocock - legs below knee rusty fawn; and *C. s. humei* Pocock - head pale chocolate brown.

Distribution : The Himalayas from Jammu & Kashmir to Arunachal Pradesh including Nepal. Also in central and southern China, from Burma to Vietnam, Malaysia and Indonesia.

Habitat and ecology : Serow lives at an elevation of 1850-3050 m in the recesses of thickly wooded gorges. Generally solitary, though 4 or 5 may be seen feeding on the same hill. Prefers leaves and shoots of aromatic plants as food (Peacock 1933). Nothing much is known about their breeding habits. In the Himalayas, rut commences at the end of October and the young are born in May and June, in Burma by end of September (Prater 1980), and in Thailand, October or November. Gestation period is about 7-8 months. A single kid, occasionally twin, is born at a birth. Serow has been kept in captivity for over 10 years (Lekagul & McNeely 1977).

Population : Wild : Nothing is known about its population size in India. During the survey of Arunachal Pradesh in 1988, serow was found to be

common in Mehao Wildlife Sanctuary (Chakraborty and Sen 1991) and tribals were killing them for various purposes.

In captivity : Three specimens were kept in Assam State Zoo, Guwahati in 1988, and they were breeding in captivity.

Scientific interest and potential value : Serow is said to hold an intermediate position between goats and antelopes, hence of scientific interest. It is killed by tribals for its flesh, skin and supposed medicinal value (Goodwin and Holloway, 1972).

Threats to survival : Destruction of forests for the construction of roads and bridges, human settlement, and increased military activities in the area of its occurrence, create great pressure on serow. The human presence also results in illegal hunting of the animal for flesh.

Conservation measures taken : This species is included in Schedule I of the Wild Life (Protection) Act and Appendix II of CITES. Many areas in its range of distribution have been declared as conservation areas where both the animal and its habitat get protection.

Conservation measures suggested : Wildlife protection laws should be strictly implemented and poachers should be dealt with severely. Arrangement for the supply of alternative source of protein at cheap rates may be made available to the tribals to minimise the hunting pressure on serow.

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Nilgiri Tahr

Order ARTIODACTYLA

Hemitragus hylocrius (Ogilby, 1838)Family BOVIDAE

Common local names : Kard-ardu (Kanarese), Mulla-atu (Malayalam), Warri-adu, Warri-atu (Tamil).

Diagnostic characters : Of the size of a goat, with short crisp coat, rounded outer surface of horns, and a single pair of teats. Coat dark yellowish brown above, paler below ; doe grey, old buck deep brown or black with a distinctive 'saddle patch' on the loin. A pale streak runs from each ear down the side of muzzle and a light coloured ring surrounds each eye.

Measurements : Height at the shoulder : Buck 99-106 cm, doe smaller; horn along the curve : Buck 45 cm, doe 36 cm.

Intraspecific variation : No subspecies. In addition to the sexual variation, head of specimens from the Nilgiris are smaller than those from more southerly region (Prater 1980).

Distribution : Endemic to India. Once, the Nilgiri Tahr ranged over the greater part of the Western Ghats. Even in 1954, a small herd occurred in the Agambe Ghat of Karnataka, but now it is totally wiped out from Karnataka (Davidar, 1978). The present range is restricted to Tamil Nadu and Kerala, from the Nilgiri Hills in the north to Ashambu Hills in the south (11°30' N to 8°20' N). In between, they are discontinuously found above 1300 m in the Anamalai Hills, the Palni Hills, and Eravikulam areas of the High Range. In addition, there are a few low hills where the animal is found (Davidar *op. cit.*).

Habitat and ecology : The preferred habitat of the Nilgiri Tahr is open terrain, cliffs and grass-covered hills which rise above the forest level at an altitude from 1,200 m to 2,600 m. Gregarious; flocks of half a dozen or more animals could be seen foraging in the morning and late afternoon. Usually grazers but in drier lowland habitat they are primarily browsers (Davidar *op. cit.*, Rice 1988). Feed on a variety of plants, particularly herbs, shrubs and grasses. Their selection of food items in terms of species and plant parts

probably reflects seasonal changes in nutritional quality and availability, and actual diet probably varies considerably between localities (Rice *op. cit.*). As regards the reproductive biology, there are certain controversies. Stockley (1928) opined that kids may be dropped at any time of the year, while Kinloch (1926) and Prater (1980) stated that youngs are born at the beginning of hot weather. According to Lydekker (1898) parturition takes place in June-July. Schaller (1971) observed that adult females are heavily pregnant during November and youngs are born in cool season between December and February, and main rut taking place during south-west monsoon. Though Sterndale (1884) stated that usually Nilgiri Tahrs have twins, but most authors noted one young at a time (Kinloch 1926, Stockley 1928, Schaller 1971, Prater 1980). In the Nilgiri, adult mortality was calculated as 18% (Schaller, 1971). Life span ranges from 16 to 18 years (Walker *et. al.* 1964).

Population : Wild : The population of the Nilgiri Tahr has depleted to an alarming stage and it was treated as vulnerable by Goodwin and Holloway (1972), while as endangered by Tikader (1983). Davidar (1978) gave a total estimate of 2,230 animals distributed as follows : Nilgiris (450 No.), Silent Valley (30 No.), Siruvani Hills (20 No.), Elival Hills (20 No.), Nelliampathi Hills (25 No.), Top slip and Parambikulam (120 No.), Eastern slope of Anamalai Hills (125 No.), Grass Hills in Anamalai (200 No.), Amaravathi slopes (130 No.), Swamimalai Karadu (20 No.), Eravikulam and Rajamallary (700 No.), Less Known plateaus - High Range (30 No.), Palni Hills (60 No.), High Wavy Mountains (100 No.), Srivilliputtur and Rajapalayam Hills (90 No.), Ashambu Hills (70 No.) and Tiruvannamalai Peak (40 No.). From a study of the census reports (1963, 1969, 1975) in the Nilgiris, a slight but insignificant improvement in its population could be marked, but distribution in 1963 was more even as compared to 1975 (Davidar 1976).

In captivity : There are about 20 animals in different zoos in India.

Scientific interest and potential value : From the zoogeographical point of view Nilgiri Tahr is a very significant species. "The isolated distribution of this wild goat so far south of the usual range is taken to indicate the existence, at some remote epoch of the earth's history, of temperate conditions which enabled tahr to inhabit the country now lying between the Himalayas and their present day refuge in the temperate levels of the

South Indian hill ranges" (Prater 1980). It has a special importance in the Indian fauna being endemic to this region. Flesh of young tahr is delicious and the hillmen consider the flesh as excellent medicine for fever and rheumatism. Successful captive breeding programme may meet up some amount of protein requirements, if necessary, in future.

Threats to survival : A number of threats are identified, which are responsible for decline in the tahr population (Davidar 1963, 1976, 1978; Schaller 1971, Waller 1973, Tikader 1983, Bedi and Bedi 1984). Construction of new roads, settlements, plantation, grazing, predation by panthers, tigers and wild dogs, diseases, and poaching are some of the important factors affecting the tahr populations.

Conservation measures taken : Many areas in the range of the tahr were maintained by the local wild life associations such as the High Range Game Preservation Association, owners of the Kanan Devan Hill Produce Company Limited, etc., for calculated sporting purposes. Now a days most of those areas are protected by the government by declaring them as sanctuaries, national parks, etc. At present hunting of the tahr is totally banned by including it in the Schedule I of the Wildlife (Protection) Act, 1972, as amended up to 1986.

Conservation measures suggested : From detailed survey and census, Schaller (1971) and Davidar (1976) made some definite recommendations for the conservation of tahr. Some of which are already implemented. However, as opined by them, total prohibition on hunting of the tahr might actually be detrimental to the population. For the selective hunting purpose, tahrs were protected from poachers, graziers, farmers, tribals, etc., since 1985, by the local wildlife associations, hence, tahrs have survived well (Bedi and Bedi, 1984). Total ban on hunting has eliminated the interest of private bodies. Therefore, inspite of protection by the government, poaching and habitat destruction have increased (Schaller 1971). Thus, to involve the private bodies in the conservation programme, issue of limited shooting permit may be reconsidered.

Captive breeding and release of the specimens in the still suitable areas from where tahrs have been lost in the recent past, may be tried.

Genetic material may be preserved in the DNA Library for future

utilisation.

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Himalayan Tahr

Order ARTIODACTYLA

Hemitragus jemlahicus (H. Smith, 1826)

Family BOVIDAE

Common local names : Chara (Bhutanese), Kart (Himachali), Jagla (Kashmiri), Jharal, Yang, Reiwo (Nepalese), Tehr, Jehr (Western Himalaya).

Diagnostic characters : Heavy bodied animal, of the size of a goat, with long robust limbs, narrow erect ears and strong body odour. Body covered with long, coarse flowing hairs forming a shaggy mane on neck and shoulder. Coat deep reddish brown often with dark mid-dorsal streak. Horns short, close-set, laterally compressed and sharply curved backwards.

Measurements : Height at the shoulder 91-105 cm, horn along the curve 30-38 cm.

Intraspecific variations : Based on the spread of horns and pelage, Pohle (1949) described a subspecies from Sikkim namely, *H. j. schaeferi*. The same was maintained by Ellerman & Morrison-Scott (1966). Coughley (1970) regarded the differences in pelage as seasonal variation and did not recognise the Sikkim population as separate.

Distribution : Western and central Himalayas from Pir Panjal range to Bhutan, and Tibet (Honacki *et al.* 1982). Introduced in New Zealand (Anderson and Henderson 1961). Caughely (1970) denied its occurrence in Bhutan but Holmes (1970) confirmed its presence. Similarly, occasional occurrence of this animal is claimed in Pakistan but according to Roberts (1977) it does not occur there.

Habitat and ecology : Tahr selects the most inaccessible ground to live in. It is found in thick forests, interspersed with steep, rocky cliffs (Blanford 1888-91, Kinloch 1892, Ward 1922, Burrard 1925, Prater 1934), but occasionally comes out into the open (Lydekker 1924). Coughley (1970) is of the opinion that tahr is found only in the region above the tree-line between 3,900 and 5,350 m altitudes. But according to Upreti and Majupuria (1981-82), it never lives above the tree-line in Nepal (3,040-3,600 m altitudes). Schaller (1973) found this animal very adaptable. Tahr lives in herds and grazes along the open patches. Male and female tahrs do not reach sexual

maturity before the age of two and three years respectively. Mating takes place between mid-October and mid-January (Schaller 1973). Gestation period is roughly six and half months (Caughley 1971). Young ones are born in May-June (Stockley 1928, Prater 1980, Uprety and Majupuria 1981-82) or June-July (Blanford 1888-91). Single birth seems to be the rule (Schaller 1973).

Population : It is very difficult to make a census of the Himalayan Tahr due to its inaccessible habitat and habit of going out of sight in the thicket. The Zoological Survey of India parties observed this animal at several places in Sikkim and Neora Valley in Darjiling district during the period 1979-1983. Schaller (1973) counted 45 individuals in Kang chu Valley of Nepal. Tikader (1983) regarded it as endangered.

Scientific interest and potential value : Himalayan Tahr utilises the steepest precipices, which is practically unsuitable for almost all other mammalian species. In physical characters, they appear to be a evolutionary link between rupicaprids goat-antelopes, and the true goats of the genus *Capra*. It would be of interest to find out if tahr is a behavioural as well as morphological link between the two. Almost the entire Indian range of tahr is strategically very important, thus it may be utilised as a protein resource at the time of emergency.

Threats to survival : Almost inaccessible habitat of tahr could not save them from illegal hunting, particularly during March and April when they crowd into the bottom of valleys (Prater. 1980). Implementation of the Wildlife Protection Act, for all practical purposes, is also very difficult in remote areas. Linking of the most difficult regions of the Himalayas by construction of roads, bridges, etc. has also exposed the habitat of tahr to the hunters. Increased military activity also is a serious threat to the survival of tahr.

Conservation measures taken : Killing of tahr has been totally banned by including it in the Schedule I of the Wildlife (Protection) Act, 1972, as amended up to 1986. Many parts of its habitat have been protected by including them within national parks, sanctuaries, etc.

Conservation measures suggested : Through detail surveys, areas of its concentration should be identified. Necessary ecological protection to

these areas will help a lot in the conservation of tahr. As it breeds in captivity and can be successfully introduced in suitable habitat, necessary attempts in this line may be helpful.

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Great Tibetan Sheep or Nayan
***Ovis ammon hodgsoni* Blyth, 1841**

Order ARTIODACTYLA
 Family BOVIDAE

Common local names : Nyan, Nyanma (Ladaki) ; Nyang, Nyand, Hyan (Tibetan).

Diagnostic characters : Largest of all living sheep. Hairs short, coarse and close. Males light brown, darker on withers; rump, caudal disc surrounding tail, throat, chest and inner side of legs white. Old males develop a white ruff about the neck. Females with little or no mane ; white on under surface, less bright ; caudal disc indistinct. Winter coat paler in both sexes. Horns, in male, never exceed a single circle (Blanford 1888-91, Prater 1980, Tikader 1983).

Measurements : Length from nose to rump 183-198 cm; height at the shoulder 107-122 cm; length of horn along the curve about 145 cm.

Intraspecific variations : Out of 15 subspecies of *Ovis ammon*, only two subspecies *hodgsoni* and *polii* are found within the Indian limits. Except some seasonal and sexual variations, no other variations are evident within the subspecies (Prater 1980).

Distribution : In India, it is found in northern Ladak (Jammu & Kashmir), Spiti (Himachal Pradesh), Kumaon (Uttar Pradesh), and Sikkim. Also found in Bhutan, Nepal and Tibet (China).

Habitat and ecology : The nayan occurs in herds of 3-15 individuals at elevations of 3,700 m or above. Typical habitat presents a wilderness of desolate plains and low undulating sand hills. In summer, it moves to higher levels, and descends to lower valleys during winter. Feeds on grasses, flowers, young plants and leaves (Walker 1964). It ruts during the late autumn and the young is born in May or June. No exact record of its longevity is available, but there is a photograph of 10 years old animal killed in Ladakh (Walker 1922).

Population : Wild : Nothing is known about its exact population-size, but it has greatly reduced in number as compared to the beginning of the

present century. Fragmentation into small, hardly viable units is becoming increasingly common as has happened to a population of seven nayan in Hemis National Park, Jammu & Kashmir (Anon 1988).

In captivity : No data available.

Scientific interest and potential value : Origin of domestic sheep is still unknown, and perhaps they have derived from one or more species of *Ovis* (Walker 1964). Thus, nayan may be one of the ancestors of the domestic sheep. Flesh of nayan is excellent, and its coat is most effective against cold. It also serves as food to the snow leopard. Hence, decline in its population will automatically effect the population of the snow leopard.

Threats to survival : The nayan is much sought after for its flesh, pelt and horns. Unrestricted use of guns by villagers for crop protection is also responsible for its decline. Further, increased military activities in its range are continuous threats to its survival. Diseases transmitted from the domestic stock add fuel to the fire.

Conservation measures taken : Legally protected from killing by inclusion in Schedule I of the Wild Life (Protection) Act, and from trade by inclusion in appendix I of CITES. It also gets protection in some of the conservation areas which fall under its distributional range.

Conservation measures suggested : Hunting of the Nayan is legally banned, but forest and game guards have no jurisdiction over the interference by military personnel. Withdrawal of crop protection guns from the villagers and herdsmen may bring good result. Regular vigilance on the curio shops in hill stations will reduce the business in trophies and fancy articles made out of this species.

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Urial or Shapu
Ovis vignei Blyth, 1841

Order ARTIODACTYLA
Family BOVIDAE

Common local names : Urial (Punjabi), Sha, Shapo or Shamo (Ladakhi).

Diagnostic characters : A medium-sized true sheep, with preorbital glands present; males with massive, cylindrical, widely divergent and strongly wrinkled horns, set close together and curve round in circular sweep; horns slender in females. Body above rufous grey, belly creamy white. Adult ram possesses a conspicuous chest ruff of long coarse hairs, white on throat and black on sternum; older ram develop greyish white saddle mark in winter. Tail lacking long hairs or tuft (Blanford 1888-91, Prater 1980, Tikader 1983).

Measurements : Height at the shoulder about 90 cm; average horns measure 50-75 cm.

Intraspecific variations : Ellerman & Morrison-Scott (1966) treated *vignei* as a subspecies of *Ovis orientalis*, but Honacki *et al.* (1982) consider it as a full species.

Distribution : Occurs in India in Gilgit and Ladak region of Jammu & Kashmir. Extralimittally, found in Tibet, Uzbekistan, NE Iran through Afghanistan to Pakistan (Honacki *et al.* 1982).

Habitat and ecology : Adapted to most varied conditions of life ; inhabits grassy hill slopes, rocky scrub covered hills, barren stony ranges, avoiding steep precipitous cliffs, between 800 and 2750 m alt., below tree-line. Chiefly gregarious but rams keep in separate groups outside rutting season. Feeds on grass but also browses on leaves, fruits and pods. Breeds during September or October; one or two young are born in a litter (Prater 1980, Walker 1968).

Population : Mallon (1984) estimates a total population of 400-500 individuals.

In captivity : Animals in captivity are not known.

Scientific interest and potential value : Urial is a prey species for wolves, leopards, etc. Also persecuted by man for its flesh.

Commercial use : Not known.

Trade data : Not known.

Threats to survival : Destruction of habitat, its persecution for flesh and competition with domestic grazing stock are some of the threats to its survival. At a number of places it is probable that the total numbers are approaching the minimum viable population.

Conservation measures taken : Protected in India by inclusion in Schedule I of the Indian Wildlife (Protection) Act, and Appendix I of CITES. About 20 sq. km. area in Hemis National Park not only protect the animal but also its habitat.

Conservation measures suggested : Study on the population status of this species is desirable to chalk out the future strategy for its conservation.

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Blue Sheep or Bharal

Order ARTIODACTYLA

Pseudois nayaur (Hodgson, 1833)

Family BOVIDAE

Common local names : Nao or Knao (Bhutanese), Bharal (Hindi), Nervati (Nepali).

Diagnostic characters : Stockily built, short-legged wild sheep, with smooth, cylindrical, backwardly curved horns. Mature rams possess a slaty blue coat in winter, offset by white legs and belly. A conspicuous blue black stripe runs down the forepart of the shank and another horizontal stripe divides the white belly from grey flanks; chest, forepart of neck and face bluish black. No trace of chest ruff or beard. Supraorbital glands absent. Fur becomes reddish grey and underwool shed in rugged patches. Females smaller than rams and never develop the black pattern in chest and flank (Blanford 1888-91, Tikader 1983).

Measurements : Height at the shoulder about 90 cm; length of horns 58-61 cm (Prater 1980).

Intraspecific variations : Two subspecies are known, of which the nominate subspecies occurs in the Himalayas.

Distribution : Throughout the Himalayas between 4000 and 6500 m altitude Extralimittally, found in Tibet and SW China (Honacki *et al.* 1982).

Habitat and ecology : Higher mountain steppe in the Himalayas, associated with broad stony valleys and shale ridge at the base of high peaks. Never enters the forest or scrub. Highly gregarious. Mature rams keep to themselves and rejoin females in September when the rutting season commences. Herd prefers to graze on open slopes, also browses on twigs; lichens and mosses form part of its diet particularly during winter (Blanford 1888-91, Prater 1980).

Population : Wild population is said to be good in number but the exact number not known.

Scientific interest and potential value : Bharal is of academic interest for its overlapping characters of both sheep and goat. Its meat is much

esteemed by hill-tribes who hunt it for meat, skin and horns.

Commercial use : No specific commercial uses known.

Trade data : Not known.

Threats to survival : Disturbance in its habitat due to the presence of defence personnel, localised hunting pressure and diseases from domestic stock are the main threats to its survival.

Conservation measures taken : The species is legally protected from hunting by inclusion in Schedule I of the Wildlife (Protection) Act. Many of the conservation areas where this species occurs like the Nanda Devi Biosphere Reserve in Uttar Pradesh, and Kanchendzengh a National Park in Sikkim, help to conserve the habitat and protect the animal.

Conservation measures suggested : Study on the status of this species is desirable to chalk out the future strategy for its conservation.

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Indian Pangolin

Manis crassicaudata Gray, 1827

Order PHOLIDOTA

Family MANIDAE

Common local names : Bajrakit (Sanskrit) ; Suraj Mukhi, Silu, Sal (Hindi) ; Banrui (Bengali) ; Alanga (Malayalam & Tamil) ; Thirya, Mah, Manjar, Kassoli Manjar (Marathi).

Diagnostic characters : Similar to chinese Pangolin, but slightly larger. Body covered with an armour of 11 to 13 rows of protecting scales. Eyes small and ear conch rudimentary. Feet having curved blunt claws which are used for digging.

Measurements : Head and body length 60-75 cm; tail 38-45 cm.

Intraspecific variation : No subspecies.

Distribution : Throughout the plains and lower slopes of hills from south of the Himalayas to Kanya Kumari, in India. Also occurs in Pakistan, Sri Lanka and probably China (Roberts and Vielliard 1971).

Habitat and ecology : Lives in forests, open or grass land and also near villages (Saxena 1985, 86). Spends the day curled up in a burrow dug by itself or shelters among rocks and boulders. Climbs well on trees in quest of tree ants. Feeds on ants, termites, cockroaches, grubs, worms and beetles (Hutton 1949). Little is known about its breeding habits. One or two young are delivered from January to March; also in July.

Population : Wild : Nothing is known about its exact population size. However, it is said to be not so rare (Himmatsinhji 1985, Saxena 1986).

In captivity : Most of the zoos in India have one or two pairs of Indian Pangolin.

Threats to survival : The Indian Pangolin is under considerable pressure from hunters because of its delicious meat and supposed medicinal value of its scales. Scales are made into finger rings and buckles (Roy 1949). Destruction of habitat and use of insecticides may also play an important role in the decline of its population.

Conservation measures taken : The Indian Pangolin is included in

Schedule I of the Wild Life (Protection) Act and appendix II of CITES. Many areas within its range of distribution have been declared as conservation areas, where it gets protection.

Conservation measures suggested : Surveys to be carried out to find out its exact distribution, areas of concentration, and the population size, if possible, to suggest ways for its conservation. Captive breeding may be tried.

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Chinese Pangolin

Order ARTIODACTYLA

Manis pentadactyla Linnaeus, 1758

Family MANIDAE

Common local names : Salek (Khasi) ; Hochik (Adi) ; Kwenegnya (Newari).

Diagnostic characters : Elongated and tapering body, covered with 15-18 longitudinal rows of overlapping scales; underside clothed with coarse, bristly hairs. Ear conch well developed; tail-tip naked. Teeth in jaws absent.

Measurements : Head and body length 48-58 cm; tail 33-38 cm.

Intraspecific variations : Out of three subspecies, only one, namely, *M. p. aurita* occurs within the Indian limits. It is considerably smaller than the nominate subspecies (Lekagul & McNeely 1977).

Distribution : From Nepal to Arunachal Pradesh, and north eastern India. Also found in Bangladesh, Burma east to Vietnam, and southern China.

Habitat and ecology : The Chinese Pangolin inhabits tropical Asian forests and hilly countries. Nocturnal, spends most of the day sleeping in a burrow. Food consists of eggs and adults of termites and ants. One or two young are born at a birth in spring or early summer (Lekagul & McNeely 1977). A young born in captivity weighed 200 g after 16 days and 2 kg after 150 days (Mausi 1967).

Population : Wild : Nothing is known about its population status. However, it appears to be common in the undisturbed hill forests of Arunachal Pradesh (Ghosh 1987; Chakraborty & Sen 1991).

In captivity : No information.

Scientific interest and potential value : It is one of the few mammalian species in which teeth are entirely absent and the body covered with scales. Because of highly specialised feeding habit, it helps to keep the number of termites and ants under control. Its meat is delicious and scales are supposed to have medicinal value.

Threats to survival : Destruction of habitat, poaching and use of

insecticides are responsible for the decline in its population. Harrison and Loh (1965) reported that over 60 tons of pangolin scales were legally exported between 1958 and 1964 from Sarawak, representing over 50,000 animals.

Conservation measures taken : The Chinese Pangolin is included in Schedule I of the Wild Life (Protection) Act, and Appendix II of CITES. Many areas within its range of distribution have been declared as conservation areas, where it gets protection.

Conservation measures suggested : Surveys to be carried out to have an authentic idea about its population size and areas of concentration. Captive breeding may also be tried.

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Small Travancore Flying Squirrel

Order RODENTIA

Petinomys fuscocapillus (Jerdon, 1847)

Family SCIURIDAE

Common local names : Parravanil (Tamil); Hambawa (Sinhalese).

Diagnostic characters : A medium-sized flying squirrel, with thick fur, a long bushy tail and a pencil of soft hairs at the base of ear conch, greatly exceeding the ear in length. Body above reddish brown, sides darker than back; cheeks and sides of belly white or grey. Tail with a central line of blackish hairs. Molars, in skull, not excessively wrinkled and the bullae peculiarly flattened (Blanford 1888-91, Ellerman 1961).

Measurements : Head and body length 296-322 mm; tail 244-310 cm; hindfoot 52 mm. (Ellerman 1961 ; Phillips 1935).

Intraspecific variations : Out of two subspecies, the nominate subspecies occurs in India and the other, namely, *layardi* in Sri Lanka. Former is characterised by the cheeks and sides of belly white as against grey in the latter (Ellerman 1961).

Distribution : Found in the hills of Kerala and Sri Lanka at moderate elevations.

Habitat and ecology : Inhabits tropical forests upto 1210 m elevation. The recently collected specimen is from a village having Coconut, arecanuls, Sugarcane, paddy and cocoa plantations. Nothing is known about its habits, etc. It is nocturnal, passing the day in holes in trees in the hilly forests of Sri Lanka. Female gives two young at a birth (Phillips 1935). Feeds on fruits, shoots, leaves and bark of certain trees (Nowak & Paradiso 1983).

Population : Wild : No specific data on the population estimate of this species is available. However, it is very rare. The nominate subspecies is represented in the British Museum by a mutilated flat skin. Recently, this squirrel has been rediscovered after a gap of 140 years in Venniculam village of Pathanamthitta dist. of central Travancore of Kerala. In Sri Lanka also, this squirrel was supposed to be rare and its distribution was limited to hills of medium altitude and extremely localised (Phillips 1935).

Captive population : Not known.

Trade data : Not known.

Threats to survival : In India, the loss of habitat viz. forests is the main threat to its survival.

Conservation measures taken : The species is enlisted in Schedule I of the the Indian Wildlife (Protection) Act., Also, finds protection in the Nilgiri Biosphere Reserve.

Conservation measures suggested : Detailed work on the biology, ecology and population-status of this species is needed to formulate the future conservation strategy.

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Grizzled Giant Squirrel
Ratufa macroura (Pennant, 1769)

Order RODENTIA
Family SCIURIDAE

Common local names : Perianathan (Tamil), Rukiya, Dandolena (Sinhalese).

Diagnostic characters : Smallest of the giant squirrels ; ears hairy but not tufted. Dorsum and tail brownish grey, grizzled with white; head blackish; neck patch white; undersurface and outer side of hind limbs buff. Upper cheekteeth 4 in number (Blanford 1888-91, Ellerman 1961).

Measurements : Head and body length 286-410 mm; tail 309-415 mm; hindfoot 61-78 mm.

Intraspecific variations : All the three subspecies namely, *macroura*, *dandolena* and *melanochra* occur in Sri Lanka. Of these, the distribution of only *dandolena* has spilled over to southern India. *R. m. dandolena* differs in the general colour, being light and grizzled as against blackish in *R. m. macroura*.

Distribution : India : Tamil Nadu (Palni, Shevroy and Nilgiri Hills) ; also Sri Lanka (Ellerman 1961).

Habitat and ecology : Lives on tall trees in hilly forests (alt. 200-2300 m), rarely coming to the ground. Diurnal and arboreal. Food consists of fruits, nuts, leaves, bark, young twigs, rarely insects and birds' eggs. Young are born in a globular nest of twigs and leaves, constructed in trees. Gestation period is about 28 days, and litter size one or two (Nowak & Paradiso 1983, Tikader 1983).

Wild population : About 300 Grizzled Giant squirrels are reported to be present in the entire range by the Wildlife Institute of India.

Captive population : The International Zoo Year Book (1980) reports the birth of one litter. It has lived as long as 16 years in captivity (Phillips 1935).

Trade data : Six live specimens were recorded by CITES parties during the period 1972 - 1982. The main exporting country is Sri Lanka.

Threats to survival : In India, the loss of habitat viz. forest is the main threat to its survival. Other minor factor is its persecution by man for flesh. Its flesh is considered excellent in taste and, hence, is shot when opportunity permits to do so.

Conservation measures taken : The species is enlisted in Schedule I of the Indian Wildlife (Protection) Act, and Appendix II of CITES as *Ratufa* sp. One of its habitat viz. Nilgiris has been declared as a Biosphere Reserve.

Conservation measures suggested : It has been suggested by the Wild Life Institute of India that 40 sq. km. area in Algarkoil Valley within the present Grizzled Giant Squirrel Sanctuary may be declared as a National Park in order to enhance protection to the valley which has about 40% of the total 300 squirrels in southern India.

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Hispid Hare

Order LAGOMORPHA

***Caprolagus hispidus* (Pearson, 1839)**

Family LEPORIDAE

Diagnostic characters : Similar to Rufous-naped hare in body size but having a much shorter tail and ears. Pelage above coarse and bristly. Body colour dark brown above and brownish white below, with thorax darker than abdomen. Tail brown above and paler below. Hindlegs shorter and stout, claws straight and strong. (Blanford 1888-91, Ghose 1981, Nowak and Paradiso 1983).

Measurements : Head and body length about 47 cm; tail 2.5 – 2.8 cm; ears about 5 cm; height at the shoulder about 5 cm.

Intraspecific variations : No subspecies.

Distribution : Northeastern India (Ellerman and Morrison-Scott 1966). Earlier distribution was along the southern Himalayan foothills from Uttar Pradesh to Assam (Prater 1980). Between 1951 and 1972, the species was recorded from Dudwa and Kheri (Uttar Pradesh), Chuka Dhaya, Pilibhit (Uttar Pradesh), Goalpara (Assam), Baranadi Reserve Forest (Assam) and Manas Wildlife Sanctuary (Assam) (Santapau and Humayun 1960, Mallinson 1971, Ghose 1978, Oliver 1981, 1985, D'Souza 1985). Also found in Nepal and Bangladesh (Oliver 1985). Reports of its doubtful occurrence in Jaldapara Sanctuary, West Bengal (Ghose & Ghosal 1984) and Kanha N. P. (Madhya Pradesh) (Oliver 1984, 1985) are also available.

Population : Wild : No estimate has been made about its number in the wild but undoubtedly the species is in a precarious state because of burning of its habitat during dry season (Oliver 1979).

In captivity : Not known.

Habitat and ecology : Well drained savannahs or thatch scrub jungle, interspersed with tracts of dense forest predominated with Sal is the usual habitat of the Hispid. It is solitary in habit. Its diet consists of shoots and roots of grass, including thatch-species (Ghose 1978, Oliver 1979) and bark of trees (Hodgson 1847). Breeds between January and March ; litter size 2-5.

Threats to survival : Loss of habitat due to an expanding human population and industrial development is the main threat to its survival. Burning of thatch grass is almost universally practiced either by the Forest department (controlled burning) or accidental (uncontrolled). The effect is total destruction due to temporary but complete loss of cover and forage, the extreme shortage of spillover habitat for animals displaced by burning, and a long term selective changes in plant and associated animal-species due to differential resistance to fire. Casual hunting by local villagers has also contributed to the rabbit's decline (Oliver 1979, 1980, 1985, Tessier-Yandell 1972).

Conservation measures taken : The species is listed in Schedule I of Wildlife (Protection) Act and Appendix I of CITES. It further gets protection in Manas Biosphere Reserve, Jaldapara Sanctuary (Assam), Balmiki Reserve in Bihar, and Dudwa National Park (Uttar Pradesh).

Conservation measures suggested : Rotational burning of tall grass habitat instead of dry season burning of the thatch, would provide suitable cover, food and protection to the species (Oliver 1985). Effective fire control and long term management of habitat are needed in various conservation areas where these are supposed to occur. Efforts to maintain the species in captivity have been unsuccessful in the past. However, a long-term study on the behaviour and ecology is needed to formulate the conservation measures in future.

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Dalmatian Pelican

Order PELECANIFORMES

Pelecanus Philippensis crispus Bruch

Family PELECANIDAE

Diagnostic characters : Size of a vulture, with the typical long tail and a large pouch underneath the lower mandibles. A white bird, with black legs and feet; bill plumbeous, edge yellow on the apical half. Feathers of forehead ending in a concave transverse line.

Distribution : A winter migrant in the north Indian plains. Breeding range includes large waterbodies of Europe and Central Asia.

Habitat and ecology : Frequents large waterbodies, estuaries, lagoons, rivers, deltas, lakes, etc., preferably with reed beds. Keeps in parties of 7 - 30 birds. Prefers secluded areas free from human disturbance or terrestrial predators. Feeds on fish. Often soaring in high sky along with other birds.

Population : Serious decline in number since the last century. World population has been estimated to be about 1000 pairs. Nesting sites in many localities destroyed.

Threats to survival : Persecution specially by fishermen, disturbed habitat, scarcity of food or its contamination with poisonous pesticides are the main threats to its survival.

Conservation measures taken : Legally not protected in India. However conservation areas falling within the range of distribution of this species protect its habitat as well as the birds.

Conservation measures proposed : Extension of suitable pelican habitat in the wetlands of the country is recommended.

Remarks : Dalmatian Pelican, *Pelecanus crispus* Bruch has been referred to as a subspecies of *Pelecanus phitoppinsis* Gmelin by many authors.

References

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Ripley, S. D. 1982. *A synopsis of the Birds of India and Pakistan*. Bombay Natural History Society, Bombay.

Christmas Island Frigatebird
***Fregeta andrewsi* Mathews**

Order PELECANIFORMES
 Family FREGATIDAE

Diagnostic characters : Large, gregarious, dark coloured or black and white oceanic bird, with long, pointed stream-lined wings and deeply forked tail. Bill long, strongly hooked; throat bare. Feet small and webbed at base.

Distribution : Found in the Indian ocean and South China sea. Known to breed only on Christmas Island in Indian Ocean. Stray birds have been reported from Cocos Keeling Island. Also found in Sri Lanka.

Habitat and ecology : It disperses widely at sea for feeding; lives singly or in pairs. Nesting in tall trees along the shore. Usually feeds by pirating food obtained by other birds.

Population : Less than 1000 pairs are present in Christmas Island. Its potential for recouping population-losses is very poor.

Threats to survival : Mining and other activities in Christmas Island are the main threats to the survival of this species. Young-mortality is considerable.

Conservation measures taken : Legally protected from trade by inclusion in the Appendix I of CITES.

Conservation measures proposed : It should be included in Schedule I of the Indian Wildlife (Protection) Act. Quest for nesting ground may be made throughout the tropical islands for suggesting measures for its conservation.

References

- Ali, S. and Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan*. (Compact edition). Oxford University Press, Delhi.
- Ripley, S. D. 1982. *A synopsis of the Birds of India and Pakistan*. Bombay Natural History Society, Bombay.

Giant Heron
***Ardea goliath* Cretzchman**

Order CICONIIFORMES
 Family ARDEIDAE

Diagnostic characters : A chestnut and slaty grey coloured, long legged and long necked heron, size about 145 in length and similar to Purple Heron. Crown and crest vinous chestnut; neck rufous cinnamon; back, wing and tail slaty grey; chin, cheeks and throat white; elongated breast plumes streaked white and slaty black; lower parts including wing-lining deep chestnut or maroon.

Distribution : Essentially an African species. Recorded sporadically from wider areas of the Indian territory but authentic records are all from Ganga-Bhrahmaputra valley. The bird had a stronghold in the vicinity of Calcutta and Sunderbans; recently found in Arunachal Pradesh also. Although thought to be a vagrant, but now in eastern India the population appears to be resident.

Habitat and ecology : Like other members of the family, affecting larger marshes, tidal creeks, estuaries and river banks. Feeds on fish and frogs. Unduly solitary and a very shy bird.

Population : Exceedingly rare. Always found in singleton sporadically. During 1845 to 1879, Blyth found them fairly common in the vicinity of Calcutta; also was common in Sundarbans during 1925. Now it has become exceedingly rare.

Threats to survival : Disturbance in its foraging ground, and persecution are main reasons for its decline.

Conservation measures taken : Herons (family : Ardeidae) are included in Schedule IV. No particular protection is extended to this bird in India.

Conservation measures proposed : It should be included in Schedule I of the Wildlife (Protection) Act which will extend legal protection to this species. That will ultimately check its persecution. Status survey & servilence are required in the Ganga Delta region to monitor its population.

References

- Ali, S. and Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan* (Compact edition). Vol. 2. Oxford University Press, Delhi.
- Ripley, S. D. 1982. *A synopsis of the Birds of India and Pakistan*. Bombay Natural History Society, Bombay.

Great Whitebellied Heron
***Ardea insignis* Hume**

Order CICONIIFORMES
 Family ARDEIDAE

Diagnostic characters : A grey and white, long legged, long necked heron, with slaty black crown and black occipital crest tipped grey. Upper parts grey; underparts all white except lower throat. Tail and primaries slaty black. Similar to Grey Heron but larger in size and with black crown and tarsus against white crown and brownish tarsus in the latter.

Distribution : Ganga and Brahmaputra valley of eastern India, especially the swampy terai and swamps of Sundarbans. Extralimittally, occurs in Bangladesh and Myanmar.

Habitat and ecology : Like other members of the family, affecting marshy swamps, tidal creeks, estuaries, river banks, etc., foraging singly. Feeding on fish, frogs, molluscs, crustaceans, aquatic insects, etc. No breeding is recorded in Indian territory. Once recorded from Arakan, a huge nest of sticks placed on a lofty tree, containing four eggs, larger than those of Grey Heron.

Population : Exceedingly rare. Sporadic record of one or two in a wide area. In recent times, several sight records have been made in Bihar, West Bengal and Arunachal Pradesh.

Threats to survival : Habitat shrinkage, persecution, competition with other fellow species of the family seem to be the reasons for its decline, although it has been taken as a rare bird in India since its description in 1870.

Conservation measures taken : Herons (family Ardeidae) are included in Schedule IV. No particular protection is extended in India.

Conservation measures proposed : The species should be included in Schedule I of the Wildlife (Protection) Act, as it is an endangered species. Legal protection will check its persecution. Thorough field surveys are required to locate this bird as well as its nesting sites to suggest future course of action for its conservation.

References

- Ali, S. and Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan* (Compact edition). Vol. 2. Oxford University Press, Delhi.
- Ripley, S. D. 1982. *A synopsis of the Birds of India and Pakistan*. Bombay Natural History Society, Bombay.

Adjutant Stork
***Leptoptilos dubius* (Gmelin)**

Order CICONIIFORMES
Family CICONIIDAE

Diagnostic characters : Size larger than a vulture. The largest Indian stork, standing 130 to 150 cm. An enormous, thick, wedge-shaped bill, rectangular in cross section and a huge pendant ruddy pouch. A slaty grey and dirty white bird, with head and neck naked, upper plumage largely grey, wing quills black and a conspicuous pale grey greater coverts forming a band on the wing; underparts dirty white which extends to throat and lower neck. Bill pale yellowish brown; legs and feet brownish; naked skin of head and neck brown and yellow.

Distribution : Principally, a bird of Southeast Asian countries including Myanmar, spilling over to Eastern and Northeastern States of India. Presently, restricted to Brahmaputra valley and Gangetic plains of central part of West Bengal.

Habitat and ecology : Essentially a bird of the marshy land but has been taking refuge near the outskirts of towns and cities. Feeds mainly on fish, frogs, reptiles, crustaceans and large insects but fond of carrion and offal, hence, scavenging along the garbage dumps. Nests on lofty trees in company of smaller Adjutants and Pelicans.

Population : Exceedingly rare; total population in the Indian territory seems to be below 500 pairs. Some strongholds are in Assam flood plains including the conservation areas like Manas and Kaziranga.

Threats to survival : Poisoned rodent pests, which are carelessly disposed off, when consumed by the Adjutant, poisons the bird. Electricution by the overhead naked wires in and around the towns and cities have taken a big toll of this bird. Large scale persecution near the military depots have annihilated a very large number during II World War time. Big garbage dumps near the towns and cities, though offer food but nesting sites near about are unavailable.

Conservation measures taken : Since this bird is exceedingly rare in

India, probably it has not been included in Schedules of the Wildlife (Protection) Act. However, it gets protection in some of the conservation areas in Northeastern India.

Conservation measures suggested : This species should be included in Schedule I of the Wildlife (Protection) Act, in India.

References

Ali, S. and Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan* (Compact edition). Oxford University Press, Delhi.

Ripley, S. D. 1982. *A synopsis of the Birds of India and Pakistan*. Bombay Natural History Society, Bombay.

Lesser or Haircrested Adjutant
Leptoptilos javanicus (Horsfield)

Order CICONIIFORMES
 Family CICONIIDAE

Diagnostic characters : A very large stork, of the size of a vulture but smaller than Adjutant. Very similar to the latter except the plumage above being black instead of slaty grey, and white below; absence of neck pouch and sparse hairy plumes on almost naked, reddish yellow head and neck. Bill massive, wedge-shaped and dirty yellow. Youngs have less gloss on plumage, and head and neck more feathered.

Distribution : Mainly bird of the Southeast Asian countries. Distribution extends to India in its eastern part.

Habitat and ecology : Affects well watered tracts, in swamps, forest pools, jheels and flooded land. Feeds on fish, frogs, reptiles, crustaceans, locusts, etc. Nests in tall trees.

Population : Exceedingly rare.

Threats to survival : The Lesser Adjutant has become exceedingly rare over the last few decades due to its killing, as well as damage to its foraging and breeding ground. Pollution of the wetlands has caused further damage.

Conservation measures taken : This species is not protected in India in spite of its being so rare.

Conservation measures suggested : Lesser Adjutant should be included in Schedule I of the Wildlife (Protection) Act. Further, status survey of this species be undertaken throughout its distributional range to suggest measures for its protection.

References

- Ali, S. and Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan* (Compact edition). Oxford University Press, Delhi.
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Compiled by S. Chattopadhyay, S. S. Saha and J. M. Dasgupta

Eastern White Stork

Ciconia ciconia boyciana (Swinhoe)

Order CICONIIFORMES

Family CICONIIDAE

Diagnostic characters : A large, long-legged egret-like bird. Except for the black wing quills and scapulars, this is an entirely white bird, with long lanceolate feathers on head, neck and breast. Neck long. Legs bright red and bill large and black, tinged purple at the base in comparison to the red bill in case of the nominate subspecies. Naked skin around eyes and throat red.

Distribution : It is a rare winter visitor to Northeastern States of India (Assam, Manipur) and Bangladesh. It breeds from the lower Ussuri and Amur rivers in China to Korea and Japan.

Intraspecific variation : The subspecies, *Ciconia ciconia boyciana* occurs in India during winter.

Habitat and ecology : Affects water meadow, marshy areas and grassy plains. Quite wary and difficult to approach during winter. Frogs form one of its staple diet, which also includes large insects, crustaceans, reptiles, young rodents and occasionally fish.

Population : There is very little information available on the population of this species. In fact, there is no recent sighting.

Threats to survival : Disturbances and hunting pressure along its migratory route to wintering habitat may be attributed to its decline.

Conservation measures taken : The bird is included in the Schedule I of the Indian Wildlife (Protection) Act, 1972 and its subsequent amendments, hence, any form of exploitation of this bird is prohibited.

References

- Ali, S. and Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan* (Compact edition). Oxford University Press, Delhi.
- Soothill, E. and Soothill, R. 1989. *Wading Birds of the World*. London.

Tikader, B. K. 1983. *Threatened Animals of India*. Zoological Survey of India, Calcutta.

White Spoonbill

Order CICONIIFORMES

Platalea leucorodia major Temminck & Schlegel Family THRESKIORNITHIDAE

Diagnostic characters : Plumage entirely white but for a yellow patch on lower part of foreneck. During breeding, a nuchal erectile crest of long and bushy feathers develops. Neck and bill long, latter flat and spatuated. Bare skin on face and throat yellow. Legs and feet black.

Distribution : Partly resident and nomadic and partly a winter visiter practically all over india. Extralimittally, occurs in Central Asia from China, Santhis Transbaikalia, Ussuri land and Japan, south to Syria Egypt. and Formosa.

Intraspecific variation : None.

Habitat and ecology : Frequents marshland, rivers especially lagoons, with dense marginal vegetation like reeds. Occasionally visits mangrove swamps and tidal creeks. Crepuscular and diurnal. Diet consists of fish, tadpoles, frogs, aquatic insects, and molluscs.

Population : No specific data is available on its population in India.

Threats to survival : Occasional hunting and shrinkage of its habitat pose potential threats to the survival of this bird.

Conservation measures taken : The bird is included in Schedule 1 of the Wildlife (Protection) Act, 1972 and its subsequent amendments. Hence, any from of exploitation of this bird is prohibited in India.

Conservation measures suggested : Stringent measures to be taken to enforce its legal status and to protect its habitat.

References

Ali, S. and Ripley, S. D. 1924. *Handbook of the Birds of India and Pakistan* (Compact edition). Oxford University Press, Delhi.

Large Whistling Teal
***Dendrocygna bicolor* (Vieillot)**

Order ANSERIFORMES
Family ANATIDAE

Diagnostic characters : A pale brown, maroon chestnut duck, slightly smaller than the domestic duck. Upper tail coverts creamy white; a distinct black line down the back of neck, and a broad diffused rusty-whitish collar round the middle of fore neck. Otherwise similar to Lesser Whistling Teal though much larger. Sexes alike.

Distribution : Disjunct but far flung distribution in Tropical South Asia. It was once widely distributed in British India and was common in Nadia, Jessore and Khulna districts, but now rare and confined to Eastern India (West Bengal, Assam, Tripura and Manipur).

Habitat and ecology : It frequents jeels and tanks of plains that are well covered with reeds and aquatic vegetation, and also in mangroves. Keeps in small parties of ten to fifteen, usually in association with Lesser Whistling teal, but much wilder and faster on wing and rather more secluded. Mainly a nocturnal feeder, seeking safety during daytime amidst undisturbed lily-covered jheels or perching on surrounding trees.

Population : Population-size unknown but recent sample surveys could locate handfull of birds in wide areas of West Bengal and Assam. Several pairs are maintained in captivity in Calcutta and Gauhati zoos.

Threats to survival : Habitat shrinkage specially declining nesting grounds and stiff competition from the Lesser Whistling Teal, together with hunting and predation are principal causes of its decline in the wild.

Conservation measures taken : Legally protected. Included in Schedule 1 of the Indian Wildlife (Protection) Act.

Conservation measures suggested : Steps to conserve wetlands besides several sanctuaries that protect water fowls may help in its conservation.

References

Ali, S. and Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan* (Compact edition), Oxford University Press, New Delhi.

- Mukherjee, A.K. and Saha, S.S. 1976. Status survey of the large whistling Teal. *Newsl. zool. Surv. India*, 2(2) : 2-3
- Tikader, B. K. 1983. *Threatened Animals of India*. Zoological Survey of India, Calcutta.

Andaman Teal

Order ANSERIFORMES

Anas gibberifrons albogularis (Hume)Family ANATIDAE

Diagnostic characters : Slightly larger than the Common Teal. Plumage above dark chocolate brown, scalloped with greyish; throat, foreneck, and a varying area around the eyes white; wings brown with a green and black speculum, bordered in front and behind by whitish band; underparts buffy grey, spotted with dark brown. White around eyes sometimes extending to entire face. females similar but slightly duller, with the green on the speculum more coppery. Broad white wing-bar is most conspicuous in flight.

Distribution : Endemic to Andaman group of islands, ranging from Rutland in the south up to Great Coco in the north.

Habitat and ecology : Affects tidal creeks, salt water and outlying freshwater jheels and swamps. Generally keeps in small flocks but larger flocks of twenty or thirty may be seen during non-breeding seasons. Nomadic, and on many islands apparently only a winter visitor. Feeds normally during night hours and spends much of the day roosting perched upon trees or on banks of tidal creeks. Foraging like that of a common teal.

Population : Population size not known, but rare. It was quite common in most of the islands of Andaman group during the middle of the last century. Since then its population has dwindled much due to disturbance in and destruction of its habitat and large scale hunting. About 200-300 birds are estimated to be present in the Middle Andaman Island.

Captive population : Several pairs are kept in Port Blair Zoo and are replaced from time to time.

Threats to survival : Deforestation has been the principal cause of decline although hunting and predation by feral cats and mongrels take a good toll. Contamination of diseases through domestic ducks can not be ruled out.

Conservation measures taken : Legally protected in India. included in

Schedule 1 of the Wildlife (Protection) Act.

Conservation measures suggested : Thorough surveys in the range of Andaman Teal is essential to ascertain its ecology, distribution, population, etc. to suggest for establishment of proper reserves and sanctuaries or other actions to ensure its survival. Captive breeding and releasing in ideal habitats in its range will augment its survival.

References

Ali, S. and Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan* (Compact edition). Oxford University Press, New Delhi.

Tikader, B. K. 1983. *Threatened Animals of India*. Zoological survey of India, Calcutta.

Pinkheaded Duck

Order ANSERIFORMES

Rhodonessa caryophyllacea (Latham)

Family ANATIDAE

Diagnostic characters : Size of a domestic duck; head and neck carriage like those of whistling teal. Longer and thinner neck, high position of eyes and very gradual sloping of forehead, together with unique plumage pattern distinguishes it from other teals. Males brownish black above and below but head, hindneck, and bill bright pink. Speculum pinkish buff and underwing pale shellpink. Females similar but paler and more brownish; pink areas less bright and not so demarkated as in male. Young ones have whole plumage lighter brown, underparts pale dull brown with the edges of feathers whitish; head and neck pale rose whitish, with top of head, nape and hindneck brown.

Distribution : Eastern India and Burma; stragglers recorded in winter sporadically from Uttar Pradesh, Punjab, Madhya Pradesh, Maharashtra, Andhra Pradesh and Tamil Nadu. A Mediterranean relict in the Himalayan Terai and Duars.

Habitat and ecology : Affects bheels in the Himalayan Terai and duars. Small parties of six to eight in non-breeding season used to forage in pools usually under cover of tall grass. Very shy and secretive and seldom seen unless flushed by chance in a consorted drive through thick and tall grass jungle. Nests on ground amidst thick grass generally not far from water. Clutch size from five to ten; ivory white, spherical-shaped eggs.

Population : Probably extinct since last authentic record was made in 1935 from Darbhanga, Bihar within the Indian territory. An unconfirmed report was made in 1955 from Burma. A total of eighty skins are present in different museums of the world.

Threats to survival : This relictual monotypic species was exceedingly rare over the last two centuries. Hunting and habitat destruction were the principal causes of its extermination.

Conservation measures taken : Legally protected from killing by in-

clusion in Schedule 1 of the Wildlife (Protection) Act, in India.

Conservation measures proposed : Thorough surveys in its range of distribution particularly in the eastern states of India and Burma are essential to know the exact status of this species. There are hopes of rediscovering the species in the secluded areas of Indo-Burmese frontiers.

References

Ali, S. and Ripley, S.D. 1983. *Handbook of the Birds of India and Pakistan* (compact edition). Oxford University Press, Delhi.

Baker, E. C. S. 1930. *The Fauna of British India, Birds*. 2nd ed. vol. 6. Taylor and Francis, London.

Whitewinged Wood Duck

Cairina scutulata (Muller)

Order ANSERIFORMES

Family ANATIDAE

Diagnostic characters : Size larger than the domestic duck. Plumage above and below largely glistening chestnut-brown and black except head and neck which are white, variably speckled with black; a bluish grey speculum bordered anteriorly by a broad black band and a conspicuous white patch on wing shoulder. Females slightly smaller. Young ones duller and browner.

Distribution : Northern India particularly in Assam, Manipur and Arunachal Pradesh. Extralimittally, found in Bangladesh, Myanmar, Thailand, Viet Nam, Malaysia and Indonesia.

Habitat and ecology : Affects secluded water pools in rain forests and bheels, amidst crane brakes and tall grasses. Keeps in small parties of five or six in secluded jungle pools but larger flocks of twelve or more birds could be seen on flight.

Population : Population size unknown but during recent surveys many birds were seen at different locations. Unusual gathering of about two hundred birds were noticed in inundated paddy fields after inclement weather that lasted for three days in the Upper Noa Dihing Valley in February, 1988. Flocks of birds were seen in sand banks of upper Brahmaputra river close to Dibrugarh. Several pairs are maintained in captivity in zoos of Assam and Arunachal Pradesh as also abroad. A comfortable population exists in Indo-Burma frontier.

Threats to survival : Hunting and habitat destruction are principal threats to its survival.

Conservation measures taken : Legally protected. Included in Schedule 1 of the Indian Wildlife (Protection) Act. Captive breeding programme by Slimbridge and its collaborators in Gauhati zoo and Miao zoo became successful and several individuals have been raised. Now it seems that a viable population in the wild as well as in captivity are secured.

Conservation measures proposed : Proper rehabilitation of captive breed individuals should be ensured.

Consorted programme of conservation has successfully arrested the decline of the species. Protection of the species and its habitat during last two decades have salvaged it from extermination in india. However, protection should continue untill a proper assessment is made after thorough survey.

References

- Ali, S. and Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan* (Compact edition). Oxford University Press, Delhi.
- Baker, E. C. S. 1930. *The Fauna of British India. Birds.* 2nd edition. Vol. 6. Taylor and Francis, London.
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- Gee, E.P. 1958. The recent status of the White winged Wood-Duck, *Cairina scutulata* (S. Muller) *J. Bombay nat. Hist. Soc.*, 55(3) : 569-575.
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- Ripley, S. D., Saha, S. S. & Beehler. 1989. Notes on birds from upper Noa Dihing, Arunachal Pradesh, Northeastern India. *J. Bombay nat. Hist. Soc.*

Brown Baza or Lizard Hawk***Aviceda jerdoni* (Blyth)**

Order FALCONIFORMES

Family ACCIPITRIDAE

Diagnostic characters : Size that of a Jungle Crow. A brown hawk, with rufous and black head and an upstanding black crest; breast rufous-brown. Female paler, with breast fulvous white and crest longer.

Distribution : Resident but scattered in suitable pockets of evergreen forest biotope, from foothills to about 1800 m altitude. Occurs in Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, West Bengal, Assam and adjacent states in India; also found in Sri Lanka, Myanmar Thailand, Malaysia and Indonesia.

Intraspecific variation : Birds in the southern India, south of 12°N latitude including those in Sri Lanka are recognized as Legge's Baza, *Aviceda jerdoni ceylonensis* (Legge) while the rest are recognized as the nominate subspecies.

Habitat and ecology : Confined to evergreen forest biotope close to montane terrain. Keeps in pairs but family parties of 3 to 5 birds occasionally seen in flight. Feeds on large insects and lizards. Nests on stout branches of forest trees. Clutch-size is usually of two eggs.

Population : Exact population is not known of this crepuscular species but everywhere it is believed to be exceedingly rare.

Conservation measures taken : This rare species is protected fully in India from killing and trade, being included in the Schedule 1 of the Wildlife (Protection) Act, and Appendix 1 of the CITES. The species gets protection in conservation areas falling within the range of its distribution.

Conservation measures proposed : Stringent measures to protect the evergreen forest biotope and extention of such habitats forming corridors between scattered patches are recommended. The protection specially of the breeding birds and care of the nests, clutch of eggs and young might help in augmenting its conservation.

References

- Ali, S. & Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan*, (Compact edition). Oxford University Press, Delhi.
- Baker, E. C. S. 1928. *The Fauna of British India, Birds*. Vol. 5. 2nd. edition. Taylor & Francis, London.
- Ripley, S. D. 1982. *A Synopsis of Birds of India and Pakistan*. Bombay National History Society, Bombay.

Black-crested Baza

Order FALCONIFORMES

***Aviceda leuphotes* (Dumont)**Family ACCIPITRIDAE

Diagnostic characters : Size that of a Rock Pigeon. A handsome, black and white hawk, with a long, prominent black crest, and barred underparts. Sexes similar.

Distribution : Resident in Kerala and Karnataka, and in eastern Himalaya from Nepal east through Sikkim and West Bengal to Assam and adjacent states, thence to Bay Islands, Myanmar and northern Thailand. Birds found in Sri Lanka and also in Madhya Pradesh are probably migrants from eastern Himalaya.

Intraspecific variations : Birds found south of 15°N latitude are recognized as the nominate subspecies, those found north of 15°N latitude are recognized as *Aviceda leuphotes syama* (Hodgson) and those found in the Bay Islands as *Aviceda leuphotes andamanica* Abdulali & Grubb.

Habitat and ecology : Confined to evergreen biotope in the neighbourhood of clearings and wide streams, chiefly in foothills. Keeps in pairs but large gatherings of 20 birds or so were recorded probably during migration. This crepuscular species feeds on frogs, lizards and large insects. Nests in summer; clutch of 2 or 3 eggs are laid and cared by both the parents.

Population : Exact population size not known, but, everywhere it is believed to be exceedingly rare.

Conservation measures taken : This species is legally protected in India being included in the Schedule I of the Wildlife (Protection) Act and Appendix 1 of CITES. The species gets protection in conservation areas falling within the range of its distribution.

Conservation measures suggested : Stringent measures to protect the evergreen biotope and extension of such habitat forming corridors between scattered patches are recommended. The protection specially of the nests, eggs and young might help in further conservation.

References

- Ali, S. and Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan*. (Compact edition). Oxford University Press, Delhi.**
- Ripley, S. D. 1982. *A synopsis of the Birds of India and Pakistan*. Bombay Natural History Society, Bombay.**

White bellied Sea Eagle
***Haliaeetus leucogaster* (Gmelin)**

Order FALCONIFORMES
Family ACCIPITRIDAE

Diagnostic characters : A large, ashy brown eagle, with white head, neck, underparts and terminal third of tail. No sexual dimorphism present.

Distribution : A widely distributed species, extending from coasts of India to Australia and SW. Pacific. In India, occurs from Bombay down to the west coast and up the east coast to Sundarbans. Also distributed in Laccadive, Andaman & Nicobar Islands. Occasionally visits Gujarat.

Intraspecific variation : No intraspecific variation.

Habitat and ecology : Occurs singly or in pairs. Found along the sea-coasts and lagoons. Gliding and soaring or perched upright on some trees or rocks, overlooking water. Feeds mostly on sea snakes, fish and disabled birds. Performs roller-coaster courtship display during breeding season in which male passes the food to female in the midair.

Population : No specific data is available on its population, in India but is common in Sundarbans, West Bengal, Chilka Lagoon in Orissa and Andaman and Nicobar Group of Islands. Population estimate of this bird in Chilka Lagoon during 1987-88 expedition conducted by ZSI was around 50-60 individuals. A number of nests were also located during that period.

Threats to survival : Coastal pollution and disturbance of habitat are the main reasons for its decline. The bird is also being hunted occasionally in Orissa for its flesh.

Conservation measures taken : The bird is protected by law as it is included in Schedule I of the Wildlife (Protection) Act and its subsequent amendments. The species gets protection in conservation areas.

Conservation measures suggested : Control of pollution in coastal areas and minimizing the disturbance in coastal habitat are suggested.

References

Ali, S. and Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan*.

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Baker, E. C. s. 1928. *The Fauna of British India. Birds.* 2nd ed. Vol. 5. Taylor & Francis, London.

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Himalayan Bearded Vulture
Gypaetus barbatus aureus (Hablizl)

Order FALCONIFORMES
Family ACCIPITRIDAE

Diagnostic characters : A massive, eagle-like bird, with large wing span (extending upto 270 cm in length), brownish-golden head and whitish body. Underparts rusty white. Tail wedge-shaped. A tuft of bristle-like feathers present under chin which is conspicuous in flight and appears like a beard, hence the name. Legs are fully feathered.

Distribution : Confined to Himalayas between 1200 and 4200 m altitude, soaring over up to 7500 m.

Intraspecific variations : Only one subspecies occurs in India viz. *Gypaetus barbatus aureus* Hablizl. Extralimittally, the bird is known to occur in the mountains of SE. Europe, islands in the Mediterranean Sea, east to N. China and South to S. Arabia, also in the mountains of Pakistan and the Himalayas including Nepal and Bhutan.

Habitat and ecology : Occurs mostly solitary or in pairs. Soars in mountain slopes and valleys, hugging the contours and cliff face; also observed to follow river tracts from great heights to almost lowest level with ease. Mostly scavenging but known to drop bones from a height to a particular stone for breaking it to open the marrow. Majestic roller-coaster displays performed during the breeding season.

Population : No precise data is available regarding its population, in India. The wildlife survey conducted during 1980-81 in Himachal Pradesh recorded only 23 birds in winter between 1600 and 3200 m alt., 38 birds in spring between 1800 and 3600 m alt., and 31 birds in Autumn between 1100 and 3700 m alt.

Threats to survival : Disturbance as well as shrinkage of habitat of this species may be attributed to be threats to its survival.

Conservation measures taken : The bird is included in Schedule 1 of the Wildlife (Protection) Act, 1972 and its subsequent amendments, hence, any form of its exploitation is strictly banned.

References

- Ali, S. & Ripley, 1983. *Handbook of the Birds of India and Pakistan*. (Compact Edition). Oxford University Press, Delhi.
- Baker, E. C. S. 1924. *The Fauna of British India. Birds*. Vol. 5 (2nd edition). Taylor & Francis, London.

Osprey***Pandion haliaetus*** (Linnaeus)

Order FALCONIFORMES

Family ACCIPITRIDAE

Diagnostic characters : Size smaller than the Pariah kite. A large, dark brown, fish-eating hawk, with a brown and white head; underparts snow-white, with dusky band. Sexes similar except that females are larger.

Distribution : A cosmopolitan species. It is represented by five subspecies. The nominate subspecies belongs to the Palaearctic region. It migrates south of its breeding range, wintering throughout the Indian region including its subcontinent.

Habitat & ecology : Keeps singly or in pairs, Almost invariably associated with water, either a river, a lake or the sea-coast. Feeds mainly on fish but also consumes frogs and chicken of water birds.

Population : Exact population not known but it is exceedingly scarce in India.

Threats to survival : The population of Osprey is becoming rare day by day due mainly to reclamation of wetlands for human settlement, as also the young do not survive to fledgling stage – an aftereffect of feeding on fishes of pesticide-contaminated water.

Conservation measures taken : The species is protected in India, being included in Schedule I of the Wildlife (Protection) Act, and Appendix II of CITES.

References

- Ali, S. & Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan*. (Compact Edition). Oxford University Press, Delhi.
- Baker, E. C. S. 1928. *The Fauna of British India. Birds*. 2nd ed. Vol. 5. Taylor & Francis, London.
- Ripley, S. d. 1982. *A Synopsis of the Birds of India and Pakistan*. Bombay Natural History Society, Bombay.

Tikader, B. K. 1983. *Threatened Animals of India*. Zoological Survey of India, Calcutta.

Compiled by S. Chattopadhyay, S. S. Saha and J. M. Dasgupta

Laggar falcon
***Falco biarmicus* Temminck**

Order FALCONIFORMES
Family FALCONIDAE

Diagnostic characters : A large falcon, with ashy brown back, pale forehead and crown, prominent black gular stripes and white underparts; spotted on abdomen and flanks. Sexes similar except that the females are larger than males.

Distribution : The species is distributed widely from southern Europe east across Central Asia, south to Africa, India and China. Found throughout the Indian region excepting Andaman & Nicobar Islands.

Intraspecific variation : The species is represented by three distinct subspecies in India.

(1) *F.b. cherrug* J. E. Gray (Saker Falcon) is a winter visitor in northwestern India in Haryana and Rajasthan. Also recorded in Delhi.

(2) *F. b. milvipes* Jerdon (Shangar Falcon) is also a rare winter visitor in the dryer parts of northwestern India.

(3) *F. b. jugger* J. E. Gray (Laggar Falcon) is a resident bird, found throughout India.

Habitat and ecology : Occurs singly or in pairs. Prefers open country, edges of forests and plantation and also along the water bodies where aquatic birds prevail. Dives on the prey in the air with tremendous speed, sometimes a pair hunt in coordination.

Population : No precise data on the population is available, but it is believed to be rare.

Threats to survival : All the three subspecies are excellent hunters, therefore considered a prized possession by Falconers and this is one of the reasons for its decline. Shrinkage and disturbance in its habitat are also attributed to be other threats.

Conservation measures taken : The bird is included in the Schedule 1 of the Wildlife (Protection) Act, 1972 and its subsequent amendments.

Hence, it is protected by law. It is also included in Appendix II of CITES.

References

Ali, S. & Ripley, S.D. 1983. *Handbook of the birds of India and Pakistan* (Compact Edition). Oxford University Press, Delhi.

Baker, E. C. S. 1928. *The Fauna of British India. Birds*. 2nd ed. Vol. 5. Taylor & Francis, London.

Ripley, S.D. 1982. *A Synopsis of the Birds of India and Pakistan*. Bombay Natural History Society, Bombay.

Tikader, B. K. 1983. *Threatened Animals of India*, Zoological Survey of India, Calcutta.

Saheen Falcon

Order FALCONIFORMES

Falco peregrinus peregrinator Sundevall

Family FALCONIDAE

Diagnostic characters : Size that of a Jungle Crow. A streamlined, broad-shouldered, dark falcon, with orange-yellow legs. Head black with moustachial stripes broad and prominent, rest of upper parts slaty black; lowerparts buff or rusty reddish brown; breast deeply rufous; abdomen to under tail feathers heavily cross-barred with black. sexes alike except that the female is larger than male.

Distribution : Oriental, found throughout the Indian region, extending as far east as Myanmar and south China. Also found in Pakistan, Bangladesh and Sri Lanka. The allied subspecies *babylonicus* and *japonensis* are winter migrants in India. The subspecies *babylonicus* differs from *peregrinator* in having a buff nuchal collar as against absent in the latter. The subspecies *japonicus* is paler in lower plumage.

Habitat and ecology : Uncommon in plains but common in forested hills. Resident. Keeps in pairs. Affects dry open country, thin jungle and cultivation. Flight swift and powerful. Regarded as a successful hunting bird for its skill in flight. Employed to hunt medium-sized game birds; forages mostly at dusk and dawn. Food comprises mostly birds as parakeets, nightjars, pigeons and doves, partridges, floricans, waterbirds, sometimes bats. Breeding season extends from March to May. Nests on the ledge of cliff-face. Clutch-size 2-3.

Population : Exact population is not known.

Threats to survival : Regarded as endangered. Random hunting by man under the mistaken notion that it is a notorious poultry lifter, and deforestation resulting in non-availability of suitable nesting trees appear to be reasons for their scarce population; hence, its survival is doubtful.

Conservation measures taken : It is fully protected in India by inclusion in Schedule I of the Wildlife (Protection) Act, and Appendix I of CITES. The species gets protection in conservation areas falling within the range of its

distribution.

References

- Ali, S. & Ripley, S. D. (1983) *Handbook of the Birds of India and Pakistan*. (Compact Edition). Oxford University Press, Delhi.
- Baker, E. C. S. (1928). *The Fauna of British India. Birds*. 2nd ed. Vol. 5. Taylor & Francis, London.
- Ripley, S.D. (1982). *A synopsis of the Birds of India and Pakistan*. Bombay Natural History Society, Bombay.
- Tikader, B.K. (1983). *Threatened Animals of India*. Zoological Survey of India, Calcutta.

Nicobar Megapode

Order GALLIFORMES

Megapodius freycinet GaimardFamily MEGAPODIDAE

Diagnostic characters : A rotund, drab coloured bird resembling a Jungle hen, with conspicuous large feet and claws. Upper parts including tail brown; underparts greyish brown, with pale grey chin and throat. Sexes alike.

Distribution : Formerly known to occur in the Nicobar Group of Islands lying north of the Sombbrero Channel except Chowra and Car Nicobar Islands. But during the status survey conducted by the Zoological Survey of India, in 1985, this bird was only encountered in the Great Nicobar, Megapode and Pigeon islands.

Intraspecific variations : The megapode, *Megapodius freycinet* has two distinct subspecies in India (i) The North Nicobar Megapode, *M. f. nicobariensis* Blyth which was known to occur in Nicobar Group of Islands lying north to Sombereo channel except Chowra, Car Nicobar, Little and Great Nicobar Islands. (ii) The South Nicobar Megapode, *M. f. abbotti oberholster* occurring in Great Nicobar, Megapode and Pigeon Islands.

Habitat and ecology : The bird is basically terrestrial confined to the coastal forest and mangroves. But during 1985, ZSI team has encountered megapodes at Shompen hut area which is near the central part of the Great Nicobar Island. A number of mounds were located in the lower ranges of mount Thuliar at an estimated height of c 90 m. The bird is famous for its reptilian habit of making mounds for incubation of its eggs.

Population : Wild : according to the status survey conducted by ZSI during 1985-86, the population of this bird was estimated to be from 375 to 400 pairs. The survey team could not locate any bird or its nesting mound anywhere else other than the Great Nicobar and Pigeon Islands. Even, the Kondul island closest northern entity of the Great Nicobar was devoid of this species.

Captive : Only known captive population are 8 birds in Andaman

Islands but unfortunately, the mortality rate, in captivity, is said to be very high and the mound building trait among captive birds is yet to be recorded.

Threats to survival : It may be attributed primarily to the loss and shrinkage of habitat, along with severe hunting Pressure for flesh and its eggs. In Great nicobar, shompen tribe use to sell its eggs in Campbell Bay. The exploitation is enhanced by the mainland Work Force (Ranchi tribes) which had been employed by Nicobarese or Holchus to exploit this bird. Birds are mainly caught by snares.

Conservation measures taken : The bird is legally protected in India from killing by inclusion in schedule I of the Wildlife (Protection) Act.

Conservation measures proposed : The bird's habitat especially coastal forests should be protected and stringent measures taken to ensure that absolutely no exploitation of this bird is done. Captive breeding programme may be undertaken but such programme should be undertaken in the Great Nicobar itself. Later, reintroduction of this form in its earlier range is suggested.

References

- Ali, S. and Ripley, S. D. 1983. *Handbook of the birds of India and Pakistan* (Compact edition). Oxford University Press, Delhi.
- Chattopadhyay, S. 1988. A report on the status of megapode, *Megapodius freycinet*. ZSI, Technical Report, Calcutta.
- Ripley, S. D. 1982, *A synopsis of the Birds of India and Pakistan*. Bombay Natural History Society, Bombay.
- Tikader, B. K. 1983. *Threatened Animals of India*. Zoological Survey of India, Calcutta.

Tibetan Snowcock
***Tetraogallus tibetanus* Gould**

Order GALLIFORMES
Family PHASIANIDAE

Diagnostic characters : A large, stout, high altitude partridge like bird. Head and neck dark grey; sides of forehead, earcoverts and throat white; rest of upper parts sandy grey to black grey, with fine buff vermiculation; rump, uppertail coverts and central rectrices rufous, rest blackish brown with rufous tip; underparts mostly white, with black streaks and a grey band between upper and lower breast. Legs reddish. Sexes similar.

Distribution : The species is distributed from the Pamirs through Tibet and western China to Sikkim. Subject to altitudinal movement in western Himalaya, up to c 5800 m in summer and c 3000 m during winter.

Intraspecific variation : It is represented by three subspecies, of which the paler form *T. t. tibetanus* occurs in Ladakh and the darker form *T. t. aquilonifer* in Sikkim, in India.

Habitat and ecology : Affects alpine meadow or thatches above the tree line. Occurs in small coveys. Diet consists of vegetable matter, also insects and their larvae.

Population : No information is available, but is believed to be exceedingly rare.

Threats to survival : Hunting pressure as well as disturbance in its habitat due to increased human activities are the cause of its decline.

Conservation measures taken : The bird is included in the Schedule I of the Wildlife (Protection) Act, 1972 and its subsequent amendments. Hence, it is legally protected. In addition, a number of conservation areas have been declared in the range of its distribution to protect this bird along with other denizens.

References

Ali, S. & Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan* (Compact Edition). Oxford University Press, Delhi.

- Baker, E. C. S. 1928. *The Fauna of British India. Birds*. 2nd ed. Vol. 5. Taylor & Francis, London.
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- Tikader, B. K. 1983. *Threatened Animals of India*. Zoological Survey of India, Calcutta.

Bamboo Partridge***Bambusicola fytchii* Anderson**

Order GALLIFORMES

Family PHASIANIDAE

Diagnostic characters : A rufous brown, long tailed, medium-sized partridge, with a broad, rufescent white supercillium extending to nape. Upper parts rufous brown, with chestnut streaks. Chin and throat rufous buff; breast chestnut, spotted with white and grey; rest of underparts buff. No sexual dimorphism.

Distribution : Found in the hills of northeastern India, south of Brahmaputra river; also occurs in Bangladesh and northern Burma.

Intraspecific variation : Only one subspecies *B. f. hopkinsoni* Godwin-Austen (Assam Bamboo partridge) occurs in India.

Habitat and ecology : Affects scrub jungle, low oak and willow scrubs and tall grass near the foothills along the banks of streams. Moves about in small family parties of 5-6 during morning and evening. It feeds on vegetable matter but also takes insects. Breeds from March to May.

Population : No precise data is available. But during the Blue Mountain survey of Mizoram in 1986-87, about 20 birds were encountered in Chimtupui district.

Threats to survival : Wanton destruction of habitat mainly due to the practice of "Jhum" or shifting cultivation is primarily responsible for the decline in population of this bird. The bird is also hunted for its palatable flesh.

Conservation measures taken : The bird is included in Schedule I of the Wildlife (Protection) Act and its subsequent amendments.

Conservation measures suggested : Protection of the habitat is of utmost importance. Measures should be taken to stop the shifting cultivation and reforestation of already denuded areas in the northeastern India.

References

Ali, S. & Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan*

(Compact Edition). Oxford University Press, Delhi.

Baker, E. C. S. 1928. *The Fauna of British India, Birds*. 2nd ed. Vol. 5 Taylor & Francis, London.

Ripley, S. D. 1982. *A Synopsis of the Birds of India and Pakistan*. Bombay Natural History Society, Bombay.

Tikader, B. K. 1983. *Threatened Animals of India*. Zoological Survey of India, Calcutta.

Mountain Quail***Ophrysia superciliosa*** (J.E. Gray)

Order GALLIFORMES

Family PHASIANIDAE

Diagnostic characters : A small, slaty brown partridge, with red tail and feet. Male with black face, and white patches in front and back of eyes. Forehead and supercilium white. Upper parts dark slaty brown, streaked with black. Underparts black, with barred white under-tail coverts. Female with pink-grey face, a small white eyebrow, and crown bordered by two black bands. Rest of upperparts cinnamon brown, with triangular black spots on back. Underparts pale vinaceous-brown, streaked with chestnut and black from lower throat down. Flank and vent vermiculated with brown and black.

Distribution : Present distribution is not known. Last specimen was collected in 1876 from Sher-Ka-Danda near Nainital in northern Uttar Pradesh.

Intraspecific variation : No intraspecific variation.

Habitat and ecology : Known to occur in parties of 5 to 6 birds in grassland and bushes on steep hillsides between 1650 and 2100 m altitude.

Population : No data is available. Probably the bird is extinct. It was last recorded in 1876 and subsequent surveys did not reveal any bird in its known range.

Threats to survival : Hunting pressure and shrinkage of habitat are the probable causes of its extinction.

Conservation measures taken : The bird is included in the Schedule 1 of the Wildlife (Protection) Act, 1972 and its subsequent amendments and, hence, is protected by law.

Conservation measures suggested : Intense survey be undertaken to relocate the bird and its changed habitat.

References

Ali, S. and Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan*

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Baker, E. C. S. 1928. *The Fauna of British India, Birds* .2nd ed. Vol. 5. Taylor and Francis, London.

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Tibetan Blood Pheasant
Ithaginis cruentus tibetanus (Baker)

Order GALLIFORMES
 Family PHASIANIDAE

Diagnostic characters : A large partridge like bird. male having grey upper parts and applegreen underparts, with yellow streaks. Forehead crimson. A bright red naked orbital patch. Upper breast with the characteristic blood coloured plumage. Female overall rufous brown with fine darker vermiculation. Crest and nape ashy grey. Both sexes have coral red legs and feet.

Distribution : Resident. Occurs in the Kameng and Subansiri districts of Arunachal Pradesh upto c 2750m altitudes.

Intraspecific variation : The nominate subspecies *I. c. cruentus* occurs in central and eastern Nepal. The Sikkim Blood Pheasant *I. c. affinis*. Beebe occurs in Sikkim and Bhutan while the Mishmi Blood pheasant *I. cruentus kuseri* Beebe occurs in Arunachal Pradesh (Abor and Mishmi Hills).

Habitat and ecology : Affects dwarf rhododendron forests near the snowline. Descends down to temperate forest during winter. Gregarious, usually in coveys of 5 to 10 birds, tame and inquisitive. Chiefly vegetarian, diet consists of moss, ferns, lichens etc.

Population : No information is available.

Threats to survival : Hunting pressure seems to be the main reason of its depletion in number. The entire flock can easily be killed by hunters as these birds come near them due to their tame and inquisitive nature.

Conservation measures taken : The bird is included in Schedule I of the Indian Wildlife (Protection) Act and its subsequent amendments. Therefore, it is legally protected from killing.

Conservation measures suggested : Captive breeding programme is suggested for its future propagation.

References

Ali, s. & Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan*.

(Compact edition). Oxford University Press, Delhi.

Baker, E. C. S. 1928. *The Fauna of British India. Birds.* 2nd ed. Vol. 5. Taylor & Francis, London.

Ripley, S. D. 1982. *A Synopsis of the Birds of India and Pakistan.* Bombay Natural History Society, Bombay.

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Western Tragopan***Tragopan melanocephalus*** (J.E. Gray)

Order GALLIFORMES

Family PHASIANIDAE

Diagnostic characters : Male having dark white spotted back and magnificent brilliant crimson white spotted underparts. Facial skin blue. Female dull brown, flanked with fulvous spots.

Distribution : Resident. In India, once occurred from Jammu & Kashmir through Himachal Pradesh to Garhwal and Kumaon in Uttar Pradesh between 1350 and 3600 m altitude.

Intraspecific variation : There is no intraspecific variation.

Habitat and ecology : Resident, subject to altitudinal migration. Forage in association with other pheasants. Affects open glades, thick undergrowth of rhododendron and other trees. Feeds on fresh leaves, berries, seeds, acorns and occasionally on insects. Known to breed during June.

Population : No precise information is available regarding its population in India. But the world population is estimated to be between 1600 and 4800 individuals (Gaston *et al.*, 1983).

Threats to survival : This bird is hunted for its flesh and is also subject to exploitation as it is a prized possession for aviculturist. Therefore, the hunting pressure and the destruction of habitat are the principal factors of its decimation.

Conservation measures taken : The bird is included in the Schedule I of the Wildlife (Protection) Act, 1972 and its subsequent amendments, hence, it is legally protected. In addition, a number of areas have been declared in the Himalayas as protected for ensuring its survival.

References

- Ali, S. and Ripley, S. d. 1983. *Handbook of the Birds of India and Pakistan*. (Compact edition). Oxford University Press, Delhi.
- Baker, E. C. S. 1930. *Game Birds of India Burma and Ceylon*. Vol. 3, Bombay Natural History Society, Bombay.

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- Lamba, B. S., Narang, M. L. Tyagi, A. K., Kumar P. C. and Baeha, M. S. 1982. Pheasant census of Kashmir valley - a report. 2nd Intn. Symp. Pheasants in Asia, Srinagar, 1982.

Crimson Horned Tragopan
***Tragopan satyra* (Linnaeus)**

Order GALLIFORMES
 Family PHASIANIDAE

Diagnostic characters : A brilliantly coloured pheasant, of the size of a domestic hen. Male with a recumbent crest, and a black loop round the deep blue, seminaked throat-patch. Predominantly rich orange crimson plumage on upper and lower parts. Rump and lower back olive brown, sprinkled all over with black bordered white spots. Female having rufous brown upper parts, with black and buff barrings. Chin and throat whitish , breast and abdomen pale black. Tail irregularly barred with black and buff.

Distribution : Resident. In India, found in Garhwal, Sikkim, Nagaland, Manipur, Arunachal Pradesh and Assam. Occurs between 1800 and 4,250 m elevations.

Intraspecific variation : None present.

Habitat and ecology : Affects oak, deodar and rhododendron forests in steep hillside, with dense undergrowth of ringal bamboos. It moves about in forests digging for bulbs and roots which are its favourite food; also takes leaves, roots, tendrils, seeds, etc. Breeds during summer months.

Population : No precise information is available, but supposed to be rare.

Threats to survival : Subject to severe hunting pressure in the Northeastern States of India. The birds are also being collected for avicultural purposes. Its decimation is also partly due to the destruction of its habitat.

Conservation measures taken : It is included in the Schedule I of the Wildlife Protection Act, 1972 and its subsequent amendments. Captive breeding programme of this species has been currently undertaken in Nagaland for future release in potential habitats.

References

Ali, S. & Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan*. (Compact edition). Oxford University Press, Delhi.

Tikader, B. K. 1983. *Threatened Animals of India*. Zoological Survey of India, Calcutta.

Blyth's Tragopan
***Tragopan blythii* (Jerdon)**

Order GALLIFORMES
 Family PHASIANIDAE

Diagnostic characters : A large partridge like pheasant. Male having brilliant red plumage, with white ocelli on back. Female similar to the Crimson horned Tragopan but paler.

Distribution : Found in northeastern India, Bhutan, and SE Tibet.

Intraspecific variations : Two distinct subspecies occur in the Indian territory. The nominate one, *Tragopan b. blythii* (Jerdon) occurs in Assam, south of Brahmaputra river in the Patkai, Naga and Barail hill ranges, Manipur and Mizoram, above 1800 m altitude. The Tibetan Grey billed Tragopan, *J. b. molesworthi* Baker occurs in eastern Bhutan, Arunachal Pradesh and southeastern Tibet from 1800 to 3000 altitudes.

Habitat and ecology : An inhabitant of evergreen forest with thick undergrowth. Moves in small parties of 4 or 5, Food consists of vegetable matter. Breeds generally during April-May.

Population : Both the subspecies are reported to be very rare. At present, no data is available on the population of this species. During Blue mountain expedition in Saiha district of Mizoram, about 20 odd birds of the nominate subspecies were encountered by a Z. S. I. team in Phwangpui Bird Sanctuary.

Threats to survival : The bird is subject to severe hunting pressure in whole of the Northeastern State of India especially in Nagaland and Mizoram. Its habitat is also drastically reduced due to jhum or shifting cultivation.

Conservation measures taken : Both the subspecies are included in Schedule I of the Wildlife (Protection) Act, 1972 and its subsequent amendments.

Conservation measures suggested : Thorough surveys are required to know the areas of concentration of this bird to suggest future course of action for its conservation.

References

- Ali, S. Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan* (Compact edition). Oxford University Press, Delhi.
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Temminck's Tragopan

Tragopan temmincki (J.E. Gray)

Order GALLIFORMES

Family PHASIANIDAE

Diagnostic characters : A bright crimson coloured Tragopan, with circular, black bordered, pearly grey spots on the upper parts; bare skin of face and throat cobalt blue; head, borders of face and a loop round the throat black. Underparts having large triangular grey spots. Tail black. Female greyish brown, with pale buff arrow-shaped markings; chin and throat whitish, marked with some black lines; underparts brownish, with white spots.

Distribution : Eastern Arunachal Pradesh (Lohit, Mishmi Hills and Upper Dibang); also found in N. Myanmar, SE Tibet, Yunnan, and Vietnam.

Intraspecific variation : None

Habitat and ecology : Similar to other species of tragopans. Affects thick undergrowth in evergreen forests, generally between 2100 and 3500 m elevation. Its food consists of vegetable matter.

Population : No data is available on its population-size.

Threats to survival : It is subject to severe hunting pressure. Shrinkage and destruction of habitat have also contributed much to its decimation.

Conservation measures taken : The bird is included in Schedule I of the Wildlife (Protection) Act and its subsequent amendments.

Conservation measures suggested : Thorough surveys are needed to know the areas of concentration of this bird for suggesting the future course of management.

References

Ali, S. and Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan* (Compact edition). Oxford University Press, New Delhi.

Tikader, B. K. 1983. *Threatened Animals of India*. Zoological Survey of India, Calcutta.

Compiled by S. Chattopadhyay, S. S. Saha and J. M. Dasgupta

Elwes's Eared Pheasant***Crossoptilon crossoptilon harmani* Elwes**

Order GALLIFORMES

Family PHASIANIDAE

Diagnostic Characters : Size that of a monal pheasant. A large, dumpy pheasant with long ear-tufts projecting like the small horns behind the head. Sexes alike. Head velvety black, with deep scarlet bare sides; chin, throat and nape white; upperparts ashy-grey almost black on the neck, rump grey; tail metallic blue-black, glossed with green and blue; underparts ashy blue-grey, with white abdomen.

Distribution : A resident of southeastern Tibet extending to the northern fringes of Arunachal Pradesh in India.

Habitat and ecology : Resident. Inhabits grassy hill slopes and dwarf rhododendron thickets between 3000 and 5000 altitudes; keeps in small flocks of five to ten individuals; moves in grassy clearing; noisy; food comprises of seeds, tubers and arthropods; breeds during May-June; clutch-size four.

Population : Exact population is not known. Occasionally seen wherever religiously protected; maximum concentration near the monasteries, otherwise scarce.

Threats to survival : Endangered due to disturbances in the Indian part of its distributional range; encroachment of its habitat, deforestation and random killing for its flesh are other threats to its survival.

Conservation measures taken : This bird is legally protected in India by inclusion in schedule I of the Wildlife (Protection) Act and Appendix I of CITES.

References

- Ali, S. & Ripley, S.D. 1983 *Handbook of the Birds of India and Pakistan*. (Compact Edition). Oxford University Press, Delhi.
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Impeyan or Himalayan Monal Pheasant
***Lophophorus impejanus* (Latham)**

Order GALLIFORMES
 Family PHASIANIDAE

Diagnostic characters : a large pheasant of the size of a domestic hen. Male with brilliant metallic plumage; bronze green, puple and blue upper parts, with a large white rump patch and a crest of wire-like shafts and spatula-tipped metallic green feathers; underparts black; tail and wings chestnut. Female dark brown, mottled with paler brown.

Distribution : resident, subject to altitudinal movements, between 2800 and 5000 m. altitudes. Occurs in the Himalaya from Jammu & Kashmir to Sikkim.

Intraspecific variation : None.

Habitat and ecology : Found in small flocks; affects oak, rhododendron and deodar forests, having undergrowth; also glades on steep hill slopes. Forages on seeds, shoots, berries and insects.

Population : No precise data is available.

Threats to survival : The bird is famous for the excellent quality of its flesh. The ornamental plumage is also a reason for the extreme hunting pressure, it faces. The crest of monal is considered a prized possession in many parts of India especially in Himachal Pradesh, where crest along with scalp of this bird is adorned on caps. Destruction of habitat is also another factor in its decimation.

Conservation measures taken : The bird is included in Schedule 1 of the Wildlife (Protection) Act, 1972 and its subsequent amendments. Captive breeding of this species is being undertaken in Himachal Pradesh and Uttar Pradesh for its future release in probable habitats.

Conservation measures suggested : Status survey should be undertaken to ascertain the exact population and the area of its concentration to chalk out the future management plan for the species.

References

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edition). Oxford University Press Delhi.

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Tikader, B. K. 1983. *Threatened Animals of India*. Zoological survey of India, Calcutta.

Sclater's or Mishmi Monal Pheasant
***Lophophorus sclateri* Jerdon**

Order GALLIFORMES
 Family PHASIANIDAE

Diagnostic characters : Male similar to the Himalayan Monal, *L. impejanus* but duller and without a crest. Top of head covered with curly, metallic bluegreen feathers. A broad white band at tip and cinnamon at base of tail. Female also similar to the Himalayan monal except that rump and upper tail coverts greyish white. Tail black, with white terminal band.

Distribution : Resident. Arunachal Pradesh east of 92° - 93°E longitude through Kameng, Subansiri, Siang and Lohit districts. Also found in Tibet, Yunnan in China, and N. Myanmar.

Intraspecific variation : None.

Habitat and ecology : Affects silver-fir and rhododendron forests between 3000 and 4000 m. altitude. Occurs in small groups and tends to stay in the same locality. Food habit is similar to the Himalayan monal.

Population : Very little is known about the population of this species. In fact no information is available of this bird in recent times.

Threats to survival : Hunting pressure and destruction of habitat are the reasons of its decline.

Conservation measures taken : The bird is included in Schedule 1 of the Wildlife (Protection) Act, 1972 and its subsequent amendments. Areas like Namdapha has been declared as a National Park for the protection of this species along with other denizens.

Conservation measures suggested : Status survey should be undertaken of this species to ascertain the exact population size and areas of concentration. Captive breeding programme to be encouraged for future release into probable habitats.

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Koklass Pheasant
Pucrasia macrolopha (Lesson)

Order GALLIFORMES
 Family PHASIANIDAE

Diagnostic characters : Size that of a domestic fowl; Male with a metallic green head, long, rufous brown crest and a white ear patch; underparts chestnut; females light brown, streaked and having a short crest and no ear patch.

Distribution : The species is distributed from Afghanistan and Pakistan east along the Himalaya to southeastern Tibet, western China and south-eastern Mongolia.

Intraspecific variation : It is represented by four subspecies of which *p. m. biddulphi* Marshall and *p. m. macrolopha* (Lesson) occur in India. The former differs from the latter in having a red nuchal collar in males.

Habitat and ecology : Forages among heavy scrubs and ringal bamboo undergrowth; generally seen singly or in pairs; feeds on shoots tubers, leaves, buds, berries, seeds and insects; breeds from April to June; nest a scrape in the ground lined with sticks, leaves and grass; lays eggs from 5 to 7 in number.

Population : The exact population is not known but it is not commonly seen.

Threats to survival : Scarce due to habitat destruction and exploitation by man.

Conservation measures taken : This species is legally protected in India by inclusion in Schedule I of the Wildlife (Protection) Act. The species further gets protection in conservation areas falling within the range of its distribution.

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Cheer Pheasant
Catreus wallichii (Hardwicke)

Order GALLIFORMES
 Family PHASIANIDAE

Diagnostic characters : A long tailed pheasant of Western Himalaya. Male with blackish brown head and backward projecting crest; orbital patch naked and bright crimson; rest of upper parts buffy white, barred with black. Tail pointed, buffy grey and chestnut, broadly barred with black and ashy grey. Underparts buffy white, and barred over abdomen. Female smaller and its underparts more chestnut and orbital patch brick red.

Distribution : Resident, subject to altitudinal movement from Jammu & Kashmir through Himachal Pradesh to Kumaun and Garhwal (U.P.) between 1400 and 3500 m. altitude; also found in NW Pakistan.

Intraspecific variation : None.

Habitat and ecology : Inhabiting steep rugged hillsides in evergreen forests, predominated with oak, dense grass and scrubs. Keeps in groups of 5-6 birds. Feeds on roots, shoots, berries and grains. Breeding season is from April to June.

Population : No detail data is available on its population size, in India. But during the Himachal Pradesh Wildlife Survey from 1979 to 1983, 15-22 pairs were recorded in Chail Sanctuary, 19 pairs in Majathal Sanctuary, and 6-9 pairs in Nadar Sanctuary, Upper Beas (Gaston *et al.*, 1983).

Threats to survival : Destruction of habitat and hunting pressure are the main threats to its survival. The bird is also caught for keeping in captivity by aviculturist, hence, is much sought after.

Conservation measures taken : This bird is included in Schedule 1 of the Wildlife (Protection) Act, 1972 and its subsequent amendments. It is further protected in conservation areas falling within the range of its distribution. Captive breeding have also been undertaken in Himachal Pradesh and Uttar Pradesh for future release in the wild.

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Mrs Hume's Barredback Pheasant
***Syrmaticus humiae humiae* (Hume)**

Order GALLIFORMES
 Family PHASIANIDAE

Diagnostic characters : A long-tailed, crestless pheasant. Male larger, with metallic steel blue head, chin, throat and neck. Bare facial skin crimson. Back golden yellow, with scalloping. Two white bands on wings and two on scapulars. Rump and lower back metallic blue, with white markings. Tail grey, with narrow black and chestnut transverse barrings. Underparts reddish brown, with indistinct golden yellow bar on the upper breast. Female reddish brown above, with black crown. Underparts sandy brown, streaked, barred and mottled with black. Tail short and pointed, chestnut-coloured, broadly barred with black and tipped white.

Distribution : It occurs in the northeastern hill states of India in Nagaland, Manipur and Mizoram.

Intraspecific variation : None.

Habitat and ecology : Affects mixed pine and oak forests, with adequate ground covers between 900 and 2000 m altitude. Occurs in pairs or in small groups. Feeds mainly on vegetable matter, insects and their larvae.

Population : No information on exact population-size is available but it has become much reduced.

Threats to survival : Hunting pressure and loss of habitat are the main causes of its depletion.

Conservation measures taken : The bird is included in the Schedule I of the Wildlife (Protection) Act, 1972 and its subsequent amendments.

Conservation measures suggested : Protection of its habitat along with captive breeding programme are suggested for its conservation.

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Peacock - Pheasant

Order GALLIFORMES

Polyplectron bicalcaratum bakeri Lowe

Family PHASIANIDAE

Diagnostic characters : A heavy bodied pheasant. Male having greyish buff upper parts and brownish buff head and back, with a crest of hair-like feathers. Wing feathers, mantle and tail feathers having violet and gree blue eye spots, with white rims. Under parts black, with whitish barrings; chin and neck white. Female similar to male but smaller having duller plumage and shorter tail.

Distribution : Resident. Reported to occur in Duars, c 1200 m altitude in Sikkim, northern West Bengal, Meghalaya, Assam (Lakhimpur district) and Arunachal pradesh (Kameng and Subansiri districts).

Intraspecific variation : The nominate subspecies does not occur in the Indian territory. It is distributed in Chittagang hill tracts in Bangladesh, Myanmar, Thailand and central Laos.

Habitat and ecology : Occurs singly or in pairs. Affects dense ever-green forests. Very shy. Often heard rather than seen. Diet consists of berries, fruits, seeds, insects and their larvae, snails, crabs, etc.

Population : No data is available, but the population is dwindling in most of its earlier distributional areas, especially in West Bengal and Sikkim. During intensive survey of Sikkim by ZSI not even a single encounter was made.

Threats to survival : Like most of the pheasants and rather related game birds, the major cause of its depletion is due to excessive hunting and poaching, and also the destruction of its habitat. The species also is considered to be a prized possession by the aviculturists. During late 60's and early 70's, this bird was regularly sold in Calcutta bird market and majority of these birds were collected in Maghalaya. But, with the advent of the Wildlife (Protection) Act, this practice is now stopped. The Jhum cultivation in the northeast is also another cause against its well being.

Conservation measures taken : As mentioned earlier, the bird is in-

cluded in Schedule I of the Wildlife (Protection) Act. Measures have also been undertaken to protect its habitat by declaring different conservation areas like Namdapha Biosphere Reserve in Arunachal Pradesh and Balphakram N. P. and Nokrek Biosphere Reserve in Meghalaya, within the range of its distribution.

Conservation measures suggested : Captive breeding programme of this species should be taken up immediately to reintroduce it in its past distributional range.

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Indian Peafowl
***Pavo cristatus* Linnaeus**

Order GALLIFORMES
Family PHASIANIDAE

Diagnostic characters : A large rotund-shaped pheasant. Male with metallic blue head and fan shaped crest; a white patch below eyes; neck and upper breast metallic blue, back metallic green, lower breast, abdomen and flanks black and green; wings brownish black with blue tinge. Train, formed by the upper tail coverts, metallic green with bronze and purple, subterminal ocellus formed by a blue patch surrounded by green and another of purple. *Female and subadult young* : Crest, lores and upperneck chestnut brown, each feather bordered bronze green; sides of head and throat white; lower neck, upper breast and upper back metallic green, lower breast dark green, abdomen pale buff; wings blackish brown with spots.

Distribution : Resident. Formerly widely distributed in India. At present, found in parts of West Bengal, Bihar, Orissa, and peninsular India but abundant in Gujarat and Rajasthan.

Intraspecific variation : None.

Habitat and ecology : Keeps in small groups, usually family parties. Affects open areas adjacent to the forest, dense scrub jungles and deciduous forests for foraging. Omnivorous; diet consists of vegetable matter and small animals like lizards, snakes and invertebrates.

Population : Exact population size is not known but in certain parts of Rajasthan, this species is considered to be a pest due to the devastating nature of their depredation to the crops. It is neither rare nor threatened.

Threats to survival : Presently, there is no severe threat to this species, primarily for its status as a National bird and secondarily due to religious belief this species is protected. But its train feathers are in great demand for commercial puposes and is the main threat to its survival.

Conservation measures taken : The bird is included in the Schedule I of the Wildlife (Protection) Act, 1972 and its subsequent amendments and

Appendix I of CITES, The bird also enjoys special status being the National Bird of India. Hence, any form of exploitation of this bird is totally prohibited.

Conservation measures suggested : Captive breeding of this species is fairly uncomplicated. Hence, this measure is suggested for reintroduction of this form into its former range.

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Green or Burmese Peafowl
Pavo muticus spicifar Shaw & Nodder

Order GALLIFORMES
 Family PHASIANIDAE

Diagnostic features : A peafowl, with upstanding pointed crest, consisting of lanceolate short blue-green feathers. Overall green plumage, neck and breast glistening bronze-green and purple, finely scalloped with black. Bare facial skin blue and yellow. Train tinged with copper-bronze-violet. Females do not have the train. Upper tail coverts golden green, cross-barred with pale rufous mottling, and as long as the tail feathers.

Distribution : Mizoram, Manipur and North Cachar district of Assam spilling over to Chittagong Hill Tracts of Bangladesh and east of Lushai Hills into Burma. Some found in Jalpaiguri district of West Bengal are probably feral birds escaped from captive stock.

Habitat and ecology : Affects dense forests in neighbourhood of streams, also near shifting cultivation. Keeps in small flocks consisting of an adult cock, a harem of 3 to 5 hens and young of all ages. Prefers to trust to their legs for escape, running one behind the other but capable of strong flight across the vines and trees. Feeds on seeds, fruits, shoots, insects, grubs, centipedes, scorpions, snakes, lizards, etc. taken from the forest floor or cultivated fields.

Population : Exceedingly rare in the wild. Exterminated from North Cachar and very rare in Manipur, Mizoram and elsewhere. Some birds are kept in captivity, thriving well in zoos and menageries.

Conservation measures taken : Not included specifically in the protection list.

Conservation measures suggested : Should be included in the Schedule I of the Wild Life (Protection) Act, in India. Reintroduction in its previous range of distribution, initially in the conservation areas within the range will augment its population in the wild.

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Blacknecked Crane
***Grus nigricollis* Przevalski**

Order GRUIFORMES
Family GRUIDAE

Diagnostic characters : Size of a vulture. A pale ashy-grey crane, with black head, neck and drooping plumes of tail. Lores and crown naked and of dull red hue. A patch of white feathers present behind and below each eye. Sexes alike.

Distribution : Very restricted. Breeds about the lakes of high altitude Tibetan Plateau, from Ladakh in the west to Koko-nor in the east; wintering in lower regions of Ladakh, North-central Bhutan, presumably in Arunachal Pradesh and Yangtse Valley in China.

Intraspecific variation : None.

Habitat and ecology : Affect high altitude lake region in Tibetan Plateau facies between 4000 and 4600 m altitude, may descend down as low as 1500 m altitude during winter when they venture open cultivated fields and swamps. Keeps in pairs, and with youngsters not exceeding four in total; foraging amidst bogs and marshes, also in ploughed fields. Feeds mainly on vegetable matter, but also on animal diet. Breeds chiefly during May-July in swamps and bogs; nest is a huge, deep pad of vegetation on marshy ground.

Population : Total population estimated to be not exceeding 300 birds, of which, 25 to 30 birds in Ladakh region, 60 to 80 birds in Bhutan, 10 to 20 (doubtfully) in Arunachal Pradesh, and the rest in Yangtse Valley in China (Anon 1983).

Conservation measures taken : Legally protected, being included in Schedule 1 of the Wildlife (Protection) Act, and Appendix 1 of CITES.

Conservation measures suggested : Stringent protection of breeding sites and the wintering grounds together with captive breeding programme, particularly salvaging eggs and breeding in incubators may help in raising young crops. More surveys specially in Tibetan Plateau facies in Arunachal Pradesh may discover newer crane locations.

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Hooded Crane
Grus monacha Temminck

Order GRUIFORMES
 Family GRUIDAE

Diagnostic characters : A medium sized, dark slaty grey crane, the 'hood' refers to its white head and three quarters of neck. Tail with long drooping plumage hanging over it. Areas of naked skin on forehead and lores red; naked skin of forecrown also red but with red bristles. Bill greenish, with reddish tinge on the base. Legs and feet dull reddish. Sexes similar.

Distribution : Breeding range not definitely known. Recorded with uncertainty from southeast Siberia in restricted pockets. Winters in China, Korea and Japan; vagrants were recorded from north-eastern part of India.

Habitat and ecology : Affects open plains, marshes, in rice field, and estuaries. Diet consists of vegetable matter including grass, shoots, grains, tubers, also insects, crustaceans and small reptiles.

Population : Number unknown but believed to be exceedingly scarce for a long time. There is one authentic record of its occurrence within the Indian limits i.e. North Cachar in Assam in December, 1899. There are also two sight records from Subansiri river in Arunachal Pradesh. In India, no confirmative report of its occurrence in recent times. According to an estimate of International Crane Foundation, it's number in the wild is about 5,500, and, in captivity, around 80 individuals.

Threats to survival : Probable disturbances in the migration route and loss and shrinkage of the wintering ground may be attributed to its decline. Population of this species was extremely low during post World War II period, due to hunting. Its number now increasing due to artificial feeding programme. 75% of world population now winters at feeding station near Izumi, Japan. This may lead to potential disease risks due to excessive concentration of birds.

Conservation measures taken : This species is included in the Schedule 1 of the Wildlife (Protection) Act, 1972 and its subsequent amendments,

hence, it is legally protected.

Conservation measures suggested : Intensive surveys are recommended to locate and estimate the wintering birds in India and probable wintering grounds so that those may be protected.

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Siberian or Great White Crane
***Grus leucogeranus* Pallas**

Order GRUIFORMES
 Family GRUIDAE

Diagnostic characters : An elegant snow white crane of the size of a common crane, with naked red face; some feathers of the wings black. Sexes alike.

Distribution : Breeds in restricted localities of SE Russia and Siberia; migrates by end of autumn for the wintering grounds in NW. Pakistan, Northern Indian plains, and also in eastern China. In India, the haunts include open jheels in Bharatpur, Pyagpur jheel in Uttar Pradesh, and others jheels around Delhi-Haryana region. Stragglers were recorded from Bihar in the east and Nagpur in the south, and Sind in Pakistan.

Habitat and ecology : Open jheels with profuse aquatic vegetation providing bulbs, corns, shoots and seeds for its food are its favourite wintering place. Rather wild and wary and keeps in small family parties of three or four while foraging, but small flocks of 12 to 16 birds sometime gather in a particular jheel. Fond of wading and resting in shallow waters.

Population : Very sparse, about 100 birds regularly visit the Indian territory, of them about 70 are confined to Bharatpur and the rest scattered elsewhere.

Conservation measures taken : Legally protected, being included in the Schedule I of the Wildlife (Protection) Act and Appendix I of CITES. Habitat management in Keoladeo-Ghana Sanctuary, Bharatpur has direct bearing on the welfare of the cranes.

Conservation measures proposed : Upcoming of waterbodies around Delhi and Haryana where Siberian Cranes occasionally visit, together with the old favourite grounds of Bharatpur should be carefully managed to ensure alternative foraging ground for the cranes specially when unprecedented droughts or accidents in established haunts might disturb them.

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Masked Finfoot***Heliopais personata*** (Gray)

Order GRUIFORMES

Family HELIORNITHINDAE

Diagnostic characters : Size of a domestic duck; a cormorant-shaped, olive brown and white waterbird, a velvety-black facial mask and throat, bordered by a narrow white line. Bill stout, orange or yellow in colour; breast abdomen white and tail-tip whitish. Females have chin, throat and foreneck white; forehead narrower and black.

Distribution : Tropical forest tracts of Northeastern States of India; also occurs in Myanmar, Bangladesh, Thailand, Malay Peninsula and Sumatra.

Habitat and ecology : Affects swamps in dense jungle. Runs like a rail, swims like a coot and sinks like a darter. Feeds on small fish, crustaceans, molluscs, insects and vegetable matter. Breeds during July-August; nests in dense forest swamps.

Population : Exceedingly rare. There is no authentic records of its occurrence in India for more than 50 years.

Threats to survival : Distruction of habitat in Northeastern States of India is the main threat to its survival. Further, it is hunted by natives for its flesh and eggs.

Conservation measures taken : Since this bird is exceedingly rare in India, it has probably not been included in schedules of the Wildlife (Protection) Act.

Conservation measures suggested : The Masked Finfoot should be included in Schedule I of the Wildlife (Protection) Act.

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Compiled by S. Chattopadhyay, S. S. Saha and J. M. Dasgupta

Great Indian Bustard
Ardeotis nigriceps (Vigors)

Order GRUIFORMES
Family OTIDIDAE

Diagnostic characters : A huge, ground bird, with a long neck and long bare legs, looking like a young ostrich. Upper plumage pale buff, finely pencilled with black; crown black and crested; neck, long, broad, laterally compressed, white in colour with a black band on lower breast; lower plumage white. Female smaller, lacks black band on breast. In flight, white patches near wing tips are pointers.

Distribution : Greater parts of dry plains viz., Rajasthan, Gujarat, Madhya Pradesh and Deccan as far south as Karnataka; seasonally nomadic. Also found in Pakistan.

Habitat and ecology : Resident, seasonally nomadic; infrequently met with; keeps singly or in flocks of three or four, sometimes more; affects open desert, semi-desert scrubby country and dry scattered grassland flats; very shy and wary, when alarmed runs at a great speed to hide under a bush cover. Food comprises of insects, other arthropods, lizards, snakes, grass seeds, wild berries, oil seeds and cultivated grains. Breeds from March to September; cock acquires a harem consisting of four to a dozen females; nests on the ground; clutch consists of a single egg, sometimes two; only the female incubates.

Population : Estimated number of the bird in Rajasthan which is the real home of Great Indian Bustard is about 1200. Dharma Kumar Singhji (1980), however, has given a figure of 745 for the entire country.

Threats to survival : Greatly endangered, except in protected areas of Wildlife sanctuaries and National Parks. About a century ago it was common in the greater parts of India except the wet regions. But increased activities of hunters, opening of remote areas by improved road communication, growth of new settlements, cultivation in its habitat, hunting for its flesh etc., have adversely affected the population of this large, elegant bird.

Conservation measures taken : This bird is fully protected by inclusion

in Schedule I of the Wildlife (Protection) Act, and Appendix I of CITES. This species gets protection in the Desert National Park in Rajasthan.

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Houbara Bustard

Order GRUIFORMES

Chlamydotis undulata macqueenii (J.E.Gray)

Family OTIDIDAE

Diagnostic characters : Similar to the Great Indian Bustard but smaller. Upper plumage pale buff, finely pencilled and irregularly marked with black; crown white, crested with short black and white plumes; neck bears a black and white ruff; throat buff and has a tuft of longish grey feathers overhanging the breast; lower plumage white; flanks barred black. Female smaller than the male and with less-developed ruff.

Distribution : Palaearctic. Winters in northwest Indian desert areas.

Habitat and ecology : Common. A regular migrant, occurs during winter; keeps in small parties; affects flat country, with scattered grass patches and scrub-bush; fairly shy, much wary when it scents danger; runs fast to hide behind a bush to squat, when hard pressed takes to wings. Food comprises largely of insects, lizards and snakes, also vegetable matter such as shoots, grains, wild seeds, fruits and leaves of shrubby trees.

Population : Exact population not known. Rarely seen in Wildlife Sanctuaries and National Parks falling within its range.

Threats to survival : Greatly endangered. Due to encroachment of its habitat for human use and hunting for flesh its number has been alarmingly dwindled. It is fast becoming rare with the advancement of time and its survival is doubtful.

Conservation measures taken : This bird is fully protected in India by inclusion in the Schedule 1 of the Wildlife (Protection) Act, and Appendix I of CITES.

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Bengal Florican***Eupodotis bengalensis* Gmelin**

Order GRUIFORMES

Family OTIDIDAE

Diagnostic characters : A peahen-sized bird, with long leg, a moppy crest and long horizontal carriage. Male with velvety jet black head, neck and underparts. Dorsal parts black, vermiculated with buff. Exposed part of closed wing white. Female buffy overall; crest and white patch on the wing lacking. Neck slender and long.

Distribution : The Bengal Florican was formerly distributed along the alluvial grasslands of the Himalayan Terai/duar and the Brahmaputra valley. Extralimitally, it was found in Bangladesh, Nepal and Kampuchea. In India, it survives in many disjunct pockets in Assam, West Bengal and Uttar Pradesh. There is no viable population left in Bihar.

Intraspecific variations : None.

Habitat and ecology : Affects grass-covered flat lands. Generally solitary, also occurs in very loose flocks. Restricted to the favourite foraging and rut area. Diet omnivorous, consists of berries, grass seeds, insects, occasionally frogs, lizards and small snakes. Breeds in summer, which may extend to rainy season.

Population : As per the census conducted by the Bombay Natural History Society, the total population was estimated to be 289 individuals. The Manas Tiger reserve harbours the maximum population : 178 individuals followed by Orang (Assam) : 40 birds; Dudwa (U.P.) : 38 Birds; Kaziranga (Assam) : 16 birds; Jaldapara (W.B.) : 10 birds; Pabitra 4 and Bornadi 3 birds.

Threats to survival : Hunting pressure along with the destruction of habitat are the main reasons for its decline. Except the protected areas, the bird appears to be totally exterminated (Bombay natural History Society's Annual report, 1988).

Conservation measures taken : The Bengal florican is included in the Schedule I of the Wildlife (Protection) Act, 1972 and its subsequent amendments, thereby any form of exploitation of this species is prohibited.

To ensure its future propagation, a number of conservation areas have been established.

Conservation measures suggested : The florican habitat-grassland should be managed and plantation of trees in such areas should be minimised. Reclamation of lost habitat is also essential to recolonise the species. Captive breeding programme may also be taken up. An extensive survey of the terai grassland in the Ganga-Bhahmaputra valley may discover new locations.

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Lesser Florican

Order GRUIFORMES

Sypheotides indica (J. F. Miller)Family OTIDIDAE

Diagnostic characters : Lesser Florican being much like the Bengal Florican but smaller. Head, most parts of neck and underparts, in male, black; chin, throat and a broad band running down the sides white; upper plumage sandy buff, mottled with blackish. Three pairs of tufts of black, spatulate feathers project behind the head. Females longer than males, sandy buff in colour; forehead and crown black, with a pale median stripe; no head plumes.

Distribution : Found practically throughout the Indian Union excepting very humid areas; also occurs in Pakistan.

Habitat and ecology : Lesser Florican is inhabitant of tall grass patches, scattered bushes and cultivated tracts. Frequents standing crops of cotton and millet. Feeds on insects, centipedes, lizards, frogs and also vegetable matter. Breeds from July to Sept. Clutch-size 4. The Nest is a simple depression in the ground.

Population : Nothing is known about the exact population-size.

Threats to survival : Destruction of habitat and hunting for its flesh are the main threats to its survival.

Conservation measures taken : Not legally protected in India.

Conservation measures suggested : The species should be included in Schedule I of the Wildlife (Protection) Act. Surveys be conducted to study the status and concentration of the species to suggest measures for its conservation.

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Compiled by S. Chattopadhyay, S. S. Saha and J. M. Dasgupta

Jerdon's or Double-banded Courser Order CHARADRIIFORMES
***Cursorius bitorquatus* (Blyth) Family GLAREOLIDAE**

Diagnostic Characters : Size that of a partridge. A compact little brown bird, with chestnut breast and two transverse white bands over it. Upper plumage pinkish sandy brown; crown and hindneck dark brown; a broad white supercilium extends from lores to nape; legs long and pale yellowish white. In flight, a white wing-bar and the black and white tail are pointers. Sexes similar.

Distribution : Endemic to India. It occupies the pennar and Godavari valleys in Andhra Pradesh.

Habitat and ecology : It occurred in thinly forested areas, scrubs and deciduous bush jungles, spread over the rocky ground in the river valleys. It was found either in small groups or in pairs throughout the year; sought to run to safety into thick cover or took to wings while alarmed. It was reported to lay a pair of eggs on the ground in thin scrub jungles.

Population : Exact population is not known.

Threats to survival : Since its discovery in 1848, it was rarely recorded. Last authentic sight record was in the year 1900, since then several thorough searches by competent ornithologists failed to rediscover it. It was believed to be extinct but again reported from Cuddapah district in Andhra Pradesh in January 1986 (Bharat Bhushan, 1986).

Conservation measures taken : It is protected in India by inclusion in Schedule 1 of Wildlife (Protection) Act.

Conservation measures suggested : The area in Cuddapah district where this bird has been resighted should be declared as a National Park so as to protect its habitat.

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Indian Skimmer

Order CHARADRIIFORMES

Rynchops albicollis Swainson

Family LARIDAE

Diagnostic characters : A crow sized, tern-like bird, blackish brown above and glistening white below; a broad white forehead, sides of face and a collar, contrasting with the black head and nape; a dark stripe down the middle of the white rump and forked tail. A typical knife-like compressed bill, with longer lower mandible, orange yellow in colour; legs bright red. Immatures lighter brown above, scalloped with fulvous white; forehead with brown streaks; tail-feathers tipped brown.

Distribution : Along the placid expanses of major river systems of India, north of 16°N latitude; also found in Bangladesh, Myanmar and Indo-chinese countries.

Habitat and ecology : Hunts singly or in small parties; typical graceful skimming over placid waters immersing the lower mandible into water. Roosts or congregates on sandbanks of rivers in close-packed flocks. Feeds exclusively on small fish, almost of the same size.

Population : Became scarcer in recent times.

Threats to survival : Increased disturbances in the breeding ground along the sandy banks of major rivers due to fishing activities, probable shortage of food (of appropriate size) and increased pollution of river waters in recent times are probable causes of depletion of the species.

Conservation measures taken : Included in Schedule I of the Wildlife (Protection) Act.

Conservation measures suggested : Protection of nests, eggs and chicks are vital for their survival.

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Nicobar Pigeon
***Caloenas nicobarica* (Linn.)**

Order COLUMBIFORMES
 Family COLUMBIDAE

Diagnostic characters : Similar in size of a Wood Pigeon but very differently shaped. Feathers of hind neck elongated and form glistening heckles. Flight feathers blue, with green and purple metallic sheen. Heavy bill and vulture like stance and carriage characteristic. Head, neck and upper breast feathers dark slaty grey, with a metallic blue green shade. Tail white. Underparts dark green. Feet purplish or purplish red. Female slightly smaller, with smaller neck heckles.

Distribution : Resident. In the Indian territory, it occurs in Nicobar group of islands and also likely in South Sentinel and Cocos islands.

Habitat and ecology : Occurs in small wooded islands in small groups. Feeds entirely on forest floor on seeds and fruits and sometimes invertebrates also. Seen singly or in small parties of 20-30.

Population : No precise information is available at present regarding its population-size. But in the Islands like Car Nicobar, Little Nicobar, etc. where the coastal forests are destroyed, the condition of this species appears to be precarious. But Great Nicobar Island still retains a viable population except its south eastern part.

Threats to survival : Hunting pressure along with the shrinkage of habitat are the main reasons of its depletion. The bird is also considered prized possession by aviculturists. Hence, also caught live for this purpose.

Conservation measures taken : The bird is included in the Schedule I of the Wildlife (Protection) Act, 1972 and its subsequent amendments. It is also included in the Appendix I of CITES. Therefore any form of exploitation of this bird is legally banned. The Great Nicobar Island has been declared as a Biosphere Reserve for total protection of its habitat.

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Forest Spotted Owlet***Athene blewitti***

Order STRIGIFORMES

Family STRIGIDAE

Diagnostic Characters : A small, squat, round-headed owl. Upper parts including head, neck, scapular and interscapular region dark earthy brown; hind collar of white spots indistinctive; underparts more brown and less white; a strongly marked dark brown bar present across the throat. Breast brown, with white fringes to the feathers. Sexes similar.

Distribution : Formerly, this species used to occur in the peninsular India, ranging from Dangs District of Gujarat in the west to eastern Madhya Pradesh and Sambalpur district in Orissa in the east. But there is no present record.

Intraspecific variation : None.

Habitat and ecology : The owlet is a resident of the moist deciduous forest and groves of wild mango. Evidently a diurnal bird. Very little is known about its ecology and habitat requirement.

Population : No information is available on this species. Despite many endeavours, not a single specimen could be seen in recent times except a photograph of this bird taken in 1968. This species is known by only half a dozen specimens preserved in different collections, the last being collected at Mandvi, Surat Dist., Gujarat in 1914.

Threats to survival : No probable threat can be identified. Senility may be attributed to lead it to extinction.

Conservation measures taken : This bird is included in the Schedule I of the Wildlife (Protection) Act, 1972 and its subsequent amendments, hence it is legally protected.

Conservation measures suggested : Extensive surveys are recommended to locate this bird.

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Brownbacked Hornbill
***Ptilolaemus tickelli austeni* (Jerdon)**

Order CORACIIFORMES
Family BUCEROTIDAE

Diagnostic characters : Size of a kite. Males dark brown above and bright rufous below; cheeks, throat and sides of neck white; central tail feathers brown but rest black. Bill surmounted by a small sharp edged casque. Females smaller, with sides of neck of same colour as of crown; underparts more brown, less rufous.

Distribution : Northeastern States of India from south of Lohit in Arunachal Pradesh to Nagaland, Manipur, Mizoram and adjoining Assam.

Habitat and ecology : Frequents tropical evergreen biotope; keeps in small to medium-sized flocks of 4 to 20 birds; feeds on fruits like wild figs, drupes, berries, etc. but also takes insects, lizards and small animals. Keeps in company of other feeding birds including hornbills. Breeds mainly during April-June. The nest is a hollow in a tree.

Population : Not uncommon but patchy.

Threats to survival : Deforestation and hunting pressure are main threats. Limited range of the species in the Northeastern India inhabited by tribals makes it vulnerable. Further, development work renders loss of potential habitats.

Conservation measures taken : Legally protected. Included in Schedule I of Indian Wildlife (Protection) Act. Wildlife sanctuaries, National Parks and other conservation areas within its range help in the restoration of its habitat.

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Compiled by S. Chattopadhyay, S. S. Saha and J. M. Dasgupta

Rufousnecked Hornbill
Aceros nipalensis (Hodgson)

Order CORACIIFORMES
Family BUCEROTIDAE

Diagnostic characters : Size of a vulture. Head, neck and breast in males rufous and abdomen maroon. Upper plumage black, glossed with green. Bill horn-shaped, black and yellow, with blackish ridges on sides of upper mandible. Naked patches on cheeks, chin and throat scarlet, and around eyes blue. Females slightly smaller and black but with white wing and tail-tips.

Distribution : Distributed in the Himalaya from Nepal east through Sikkim and Bhutan to Arunachal Pradesh, thence south to Assam, Nagaland, Mainpur, Tripura and Mizoram. Also found in Bangladesh, Myanmar, northern Thailand and Indochinese countries.

Habitat and ecology : Frequents tropical evergreen and mixed forests. Keeps in pairs or small and medium-sized flocks of 5-20; fly long distances everyday for foraging. Frugivorous and takes large drupes and berries as food.

Population : Not uncommon but patchy; now disappearing rapidly from many areas.

Threats to survival : Rapid destruction of primeval forest render loss of nesting trees, vegetable food stuff and roosting sites. Disturbances in the habitat, and hunting and trapping pressure make them wary specially in those tribal belts where its flesh and feathers are much sought after.

Conservation measures taken : Legally protected. Included in Schedule 1 of the Indian Wildlife (Protection) Act. Sanctuaries, National Parks and other conservation areas help to protect their habitat.

Conservation measures proposed : Stringent regulation on hunting and trapping especially control of poaching is urgently required. Besides, suitable habitats with ample of fruit trees (food for the hornbills) as well as nesting trees with natural holes are to be made available either by existing ones or to be developed through proper management at least in the

Conservation areas within the range of the Rufous necked Hornbill.

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Assam Wreathed Hornbill

Order CORACIIFORMES

Rhyticeros undulatus ticehursti Deignan

Family BUCEROTIDAE

Diagnostic characters : Size of a vulture. Males glossy black but forehead, crown and nape deep chestnut, sides of head and neck white. Tail white. Bill horn-shaped, yellow and provided with transverse ridges at base of both mandibles. Females smaller and black except a white tail.

Distribution : Found in the Duars and foothills of eastern India, hills south of Brahmaputra river, extending to Bangladesh, Myanmar, Thailand, erstwhile Indo-China and Malaysia.

Habitat and ecology : Frequents tropical evergreen biotope from plains to 2400m altitude in the hills. Keeps in pairs or small to large flocks from 4 to 30 birds. Feeds on large drupes and berries, wild figs, lizards and other small animals. Breeds during April-May.

Population : No precise data is available.

Threats to survival : Deforestation resulting in nonavailability of suitable nesting trees, hunting for its flesh and feathers for the tribal headgear are threats to its survival.

Conservation measures taken : Legally protected. Included in Schedule 1 of Indian Wildlife (Protection) Act. Sanctuaries, National Parks and other conservation areas offer it suitable habitat and help in its protection.

Conservation measures proposed : Stringent measures to prevent hunting and trapping are urgently needed.

References

- Ali, S. & Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan* (Compact edition). Oxford University Press, Delhi.
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Compiled by S. Chattopadhyay, S. S. Saha and J. M. Dasgupta

Narcondam Hornbill

Order CORACIIFORMES

Rhyticeros (Plicatus) narcondami Hume

Family BUCEROTIDAE

Diagnostic characters : Size, slightly larger than a Pariah kite. A medium sized, black hornbill, with an elongated cream-yellow bill, bearing a light brown casque, pink at base; tail white; head and neck rufous. Females all black; tail as in male. Iris orange-red in male, dark olive-brown in female.

Distribution : Restricted to the Narcondam Island in the Andamans.

Population : The population of Narcondam Hornbill was estimated to be around 200 individuals in 1905 (Osmaston 1905) and confined to an area of less than 5 sq. km. A survey in 1969 reported its position better.

Habitat & ecology : Very common. Resident. Inhabits the tropical rain forest; keeps in small flocks of three or four; roosts on taller trees; noisy; food comprises wild figs; nests in natural tree-hollows.

Conservation measures taken : This bird is protected in India by including in Schedule I of the Wildlife (Protection) Act and Appendix II of CITES.

Threats to survival : Destruction of habitat and its hunting for the alleged medicinal value of its flesh, bones and casque are the main threats. However, in view of its endemic nature and limited distribution its status is vulnerable.

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Compiled by S. Chattopadhyay, S. S. Saha and J. M. Dasgupta

Great Pied Hornbill
***Buceros bicornis homrai* Hodgson**

Order CORACIIFORMES
Family BUCEROTIDAE

Diagnostic characters : A huge, heavy-bodied hornbill, of the size of an eagle, with black and white plumage. Males having black face, back and underparts; neck, lower abdomen, undertail coverts and terminal band on tail white. Tail has a broad black subterminal band. Bill horn-shaped, juxtaposed with a large casque which is concave on top. No apparent sexual dimorphism except that the female is smaller.

Distribution : The species is discontinuously distributed. It occurs in the Western Ghats from Khandala in Maharashtra south to Kerala, and the other distinct population occurs in the lower Himalaya from Nepal east to Arunachal Pradesh and other Northeastern States. Also found in Indo-Chinese and Malayan region.

Habitat and ecology : Rain forests that can persistently supply its food, for example wild figs, nutmegs and drupes of various species and miscellaneous animal items like lizards, snakes, rats and nestlings of birds, and lofty and mature trees with suitable holes to make its nest are its preferred habitat. Largely arboreal and frugivorous but descending down to the ground and hopping about to pick fallen fruits or animal preys. Usually keeps in pairs or small family parties of three to five but gathering of thirty or more birds may be found on lavishly fruiting food trees or at roosting sites. Covers enormous feeding circuits in its daily course and very punctual in its visit to various trees. Breeds during spring. Nest is a natural hollow in a giant forest tree. Male takes care of the consort who keeps herself confined into the nest till the chicks are grown to the age of about a fortnight when she moults her wing and tail feathers. Usually two eggs are laid and incubated for about a month.

Population : Scarce in Western Ghats, fairly comfortable in the Himalaya, specially in the Northeastern States of India, but rapidly losing its previous abundance.

Conservation measures taken : Legally protected in India; included in the Schedule 1 of the Wildlife (Protection) Act.

Conservation measures proposed : Habitat restoration, specially stringent protection of climax forest tracts in the rain forest zones including preservation of giant forest trees suitable for nesting sites, trade restrictions by inclusion of the species in the Appendix I of CITES, and mass education, particularly in the tribal belts about preserving this species, might help in its conservation.

Remarks : The Indian proposal for inclusion of the Great Pied Hornbill in the Appendix 1 of the CITES received some objections on the basis of some minor taxonomic technicality. But the fact is that its population elsewhere in the extralimital range as well as in the South East Asia are equally vulnerable, if not endangered. And it is very important to plug the loophole, particularly in international trade in order to help the conservation of this grotesque species of bird.

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Malabar Pied Hornbill

Order CORACIIFORMES

Anthracoceros malabaricus (Gmelin)Family BUCEROTIDAE

Diagnostic characters : Of the size of a kite. A large, black and white hornbill, with outer tail feathers black but tipped white. Bill large, wax yellow, surmounted by a high ridge-like casque anteriorly pointed. Casque convex on sides and has a black patch. Females smaller.

Distribution : From plains to about 350 m altitude in the North-eastern States of India thence along the foot-hills of the Himalayas westward to Kumaon and Siwalik Hills, south to Madhya Pradesh and Andhra Pradesh including Orissa, Bihar and West Bengal in the forested tracts. Extralimittally, found in Bangladesh, Myanmar, Thailand, Malaysia, Indonesia, earstwhile Indo-China and southern China.

Habitat and ecology : Affects various forest habitats. Keeps in small flocks of 4 to 10 birds.

Population : Exact population size not known. Fairly common but dwindling.

Conservation measures taken : Legally protected. Included in Schedule I of the Indian Wildlife (Protection) Act.

Conservation measures proposed : Monitoring of the species may help in its conservation. This widely distributed species has many conservation areas within its range which protect its habitat. Control on poaching will further strengthen its cause.

References

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Gharial
Gavialis gangeticus (Gmelin, 1789)

Order CROCODYLIA
 Family GAVIALIDAE

Common local names : Gharial (Hindi), Mechho Kumir (Bengali).

Measurements : Total length : ♂ 6.5 m; ♀ 4.5 m.

Diagnostic characters : A very large fish-eating, armoured, amphibious crocodile, with a long and very slender parallel-sided muzzle, studded with a large number of teeth. More than two dozen pointed, sharp teeth present on each side of upper and lower jaws. Adult males bear a tough and bulbous excrescence at the tip of muzzle resembling an earthen pitcher or ghara, hence the name. Adults olive in colour and young lighter, spotted or barred with dark brown (Tikader 1983).

Intraspecific variation : None.

Distribution : In India, the Gharial is largely restricted to the Himalayan fed Ganga and Brahmaputra rivers and their tributaries, and further south in the Mahanadi river in the Satkosia Gorge in Orissa (Smith 1931, Biswas 1970, 1976, Bustard 1979, 1980 a,b,c, Whitaker and Daniel 1978, 1980, Maskey and Mishra 1980, Singh and Bustard 1982a, 1982b, Venkateswarlu *et al.* 1972 and Rao 1988).

Extralimittally, the Gharial is known to occur in the rivers of Nepal, Bangladesh and Pakistan, but the population is critically endangered everywhere.

Habitat and ecology : Optimum habitat of gharial includes deep fast flowing sinuous rivers, with relatively clear water, high banks, deep pools and undisturbed sand banks at the river edge. The Chambal river in which the Gharial inhabits in depleted population has high-banks and numerous bends where the water depth exceeds 30 m (Singh, 1978), while the remnant population in the Mahanadi river is concentrated in the Satkosia gorge (Singh, 1978).

Gharial is perfectly adapted to lead an aquatic life. It is an expert swimmer and an excellent diver too. It prefers large rivers with extensive

sand and gravel banks and islets for basking in the sun. Kumar (1988) reports that the basking of the gharial reared in the Madras Crocodile Bank was high during January and low during March. He further reports that there is significant difference between time spent for basking by adults and juveniles. It is a fish-eater. Sexual maturity is attained between 8 and 12 years when the animal attains a length of about 3 m. (Maskey, 1981). Nesting of gharial takes place between late March and April (Acharjyo *et al.*, 1975; Bustard, 1980). The depth of the nest is such that temperature within the nest remains constant, between 32 and 34°C (Max. range 25-37°C) (Groomridge and Wright, 1982). There is significant variation in clutch size. In the river Narayani, mean clutch size in 1976 was 28.6 (range 18-40), and in 1977, 36.9 (range 16-91) (Bustard, 1980). The mean clutch size was, however, recorded 43 (Bustard, 1979) in the Chambal.

It breeds during May - June, lays cluster of about 50 eggs in sand, young hatch shortly before the outbreak of monsoon and migrate to large rivers. The oldest female gharial reared in Madras Crocodile Bank extruded its oviduct in a nesting attempt on March 29, 1988, the first one being in 1986 (Andrews & Whitaker, 1988). Andrews (1989) reports that adult females were observed to have dug trial nests over the years since 1975 in the Madras Crocodile Bank and laid fertile eggs. A maximum of 19 viable eggs were found from the nest. Eggs of gharial are elliptical, 85-90 mm long by 65-70 mm broad. The young hatchlings after incubation period of 83-94 days (data from Nepal, Bustard, 1980) measures 375 mm in length.

Observations on the breeding biology of gharial in the National Chambal Sanctuary revealed a high rate of hatching success (Singh, 1978; Rao, 1988). The female gharial usually guards the nest and also closely attends the hatchlings for several months (Bustard, 1980).

Population in the wild/captivity : Extensive surveys during the nineteenth and early twentieth century in the major north Indian rivers and its principal tributaries reveal that gharials were fairly predominant, for example it was rightly remarked in 1867 that the species "abounds in all the great rivers of Northern India" (Adams, 1867). Until recently the gharial was thought to be either extinct or extremely depleted throughout its former range (Bustard, 1979; Whitaker, 1975; and Whitaker and Daniel, 1978). According to a recent estimate the gharial population is thought to be

around 4,000 because of captive breeding and releasing programme of this endangered species in five major sanctuaries, and national and biological parks since 1976 onwards. In Nepal, a recent estimate suggests 65-70 adult gharials (50-55 in Narayani and 10-15 in Karnali rivers). In Bangladesh, it was thought to be extinct until very recently fewer than 20 individuals were reported to exist in the rivers Padma and Jamuna (Khan 1980). In Pakistan, the gharial population is critically endangered and on the verge of extinction (Bustard 1979). No precise figures are available but the total population has been estimated to be less than 20 (Whitaker and Daniel 1980).

Scientific interest and potential value : All India co-ordinated and comprehensive research on the breeding biology, commercial farming, ecology, and present status of this endangered species will generate considerable scientific interest in regard to its effective conservation and management. The gharial and its products are of significant commercial importance in the international market.

Commercial use : The skin of gharial, *Gavialis gangeticus* is highly prized and largely used in the manufacture of leather goods including articles of apparel and household use, viz. hand bags, wallets, shoes, watch-straps etc., fat in the pharmaceutical industry, bones as fertilizer, meat and eggs by the tribal and poorer sections of the communities, and the upper leather (skin) for display.

Trade data : Since 1952, the business in the reptilian skins in the international market took an appreciable turn owing to immense variety of colour and patterns. Traders experiencing their commodities fetching a good return, turned their attention to this new line of trade and established a fairly good market overseas. Bhanotar *et al.* (1974) remarked "Although no correct statistical record of production of fancy reptilian skins in different states of India is available but it is estimated that in 1932 approximately 12,000,000 animals including reptiles were killed for the sake of their highly prized hides and skins, and India exported 2.5 million reptile skins in 1932, and about 2.75 million in 1933. In 1955, the export figure of reptilian skins both raw and tanned to overseas market namely, Europe and U.S.A. reached an enormous figure. In that year, an estimated number of 12,71,000 skins were exported to France; Holland imported 5,19,000, New York 14,38,000 and U.K. 6,63,000 skins mostly of crocodilians and monitor

lizards. The export value of this trade is fairly high and India earned foreign exchange to the tune of two crores"

Threats to survival : The major factors that have contributed to the extreme depletion of its population, are extensive hunting and trapping for commercial utilization of its skin which is in great commercial demand in the international market, and of its flesh for medicinal use. The increasing human population has resulted an indirect effect on the natural ecosystem of the species by rapid urbanisation, construction of dams and hydroelectric projects, etc. In addition, both eggs and hatchlings of the species are heavily predated by a number of animal species namely fish, Jackal, monitor lizard, otter, birds of prey or even larger gharial. Eggs are also collected by some tribal communities. A sizeable number of nests are also known to be destroyed by flood (FAO, 1974; Singh, 1978).

Conservation measures taken : In order to protect and conserve this endangered crocodilian, effective conservation measures have been adopted by the Government of India. It initiated a crocodile Breeding and Management Project in 1975. The project was sanctioned on the advice of the Chief Technical Advisor, Food and Agricultural organisation (FAO), and financed by U. N. Development Programme (UNDP). The species has already been declared endangered and listed in Schedule I of the Indian Wildlife (Protection) Act 1972, with rigid execution of laws. Adequate measures have been taken up for its captive breeding in recently established national parks, and sanctuaries throughout India. As a result, 22,000 crocodilians existed today, of which around 4,000 are gharials, mostly produced from artificial hatching of eggs collected from nature (Singh *et al.*, 1984). Five major sanctuaries have recently been established in which a total of over 500 hatchlings and young are being reared, in captivity. The largest sanctuary is in Girwa, Baharich district, U.P., which has an area of 400 km. where 345 hatchlings and 20 adults are being maintained, since 1976 (Mukherjee, 1982). In Orissa, in the "Satkosia gorge" of the river Mahanadi, 142 hatchlings are being reared in 7962 km area. A crocodile bank has been established by Mr. Romulus Whitaker at Vadenemally in Mahabalipuram District, Madras, in 1976. A breeding enclosure in the Nandankanan Biological Park, Cuttack district, Orissa has been established, in 1974. A few gharials are also being reared in the Nehru Zoological Park at Hyderabad

and Indira Gandhi Zoological Park, at Visakhapatnam (Subba Rao, 1986). Gharials are also reared in the National Chambal Sanctuary, wherein the nesting ecology of the species has indicated a fairly significant conservation status (Rao, 1988). Occurrence of Mahaseer (*Tor* sp.) in the pools and in the Ramganga river causes much disturbance to the depleted gharial population (Singh, 1978).

Conservation measures proposed : Sustained efforts should invariably be made to re-establish the gharial population in the excellent habitat provided by the Manas River in Bhutan, in view of protection and conservation of the species afforded by the Manas Biosphere Reserve (Bustard, 1980). The breeding, rearing and releasing programmes in India and in Nepal should invariably be extensive to ensure the survival of the gharial, provided that adequate management plans and protective legislation continue to be very rigidly implemented within the released areas. Breeding and rearing procedures where operating, should be investigated periodically to ensure that the sex-ratio among the hatchlings produced is not unduly biased.

Captive breeding : Breeding of gharial in captivity occurred for the first time at the Nandankanan Biological Park, Orissa where a female mated with a male on loan from the Frankfurt Zoo and laid 25 viable eggs in March, 1980 from which 24 hatchlings emerged on May 7, 1980 (Acharjyo, *et al.* 1975.). Naturally laid eggs are used for hatching and rearing in the Madras Crocodile Bank, Nandankanan Biological Park, Orissa and Chambal National Sanctuary at Bhopal, Madhya Pradesh.

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Estuarine or Saltwater Crocodile
***Crocodylus porosus* Schneider**

Order CROCODYLIA
 Family CROCODYLIDAE

Common local names : Mugger (Hindi), Nonar Jaler Kumir (Beng.), Sagara Kumbhira (Oriya).

Measurements : Total length 7.0-8.0 m, maximum length recorded 10 m.

Diagnostic characters : Largest of all the existing crocodiles, body covered with closely-set, horny -sheathed bony plates, having saw-toothed fringe along upper side of tail. Adults dark olive in colour and young paler, with large black spots; muzzle about twice as long as its breadth at the base and tapers to a point; jaws bear formidable pivoted teeth, less than 20 on each side that remain exposed even when mouth is closed. Teeth of lower jaws strongly enlarged, fitted into a notch on the outside of upper jaw.

Intraspecific variation : None.

Distribution : Zoogeographically the species is distributed in the tropical and subtropical seas of the world.

In India, the species is largely confined, in depleted populations, to the Bhitarkanika Wildlife Sanctuary and its environs in Orissa, the coasts of the Indian part of the sundarbans in West Bengal and the Andaman and Nicobar group of Islands. Stray reports of occurrence of the species are sometimes available from the coasts of Andhra Pradesh and Tamilnadu (Anon, 1982; Krishnan, 1971; Rao, 1991; Subramani and Dhanraj, 1982).

Extraliminally, the species is widely distributed along the coastal belts of Sri Lanka, Malaysia, China, Australia and Solomon Islands (Ahmed, 1988; Groomridge and Wright, 1982).

Habits and habitat : The Estuarine Crocodile is basically a sluggish and lethargic creature, typically associated with brackish water such as coastal mangrove swamps, estuaries, etc., but is also a casual visitor to fresh water rivers and grassy swamps, adjusted to a semiaquatic mode of life. This is the only crocodilian species that enters the seas for long oceanic journeys. It

inhabits the tidal rivers and prefers to stay in the estuaries and for this the species is popularly known as the Estuarine Crocodile.

It is carnivorous in habit and feeds largely on a variety of aquatic animals including mammals, fishes, crustaceans, lobsters, etc. that come across its way. In water, it is an expert fisher. In captivity, the hatchlings are fed with a mixture of fish (*Bolaeophthalmus* sp.), insects and crustaceans, especially smaller prawns and crabs.

Sexual maturity is attained, in males, at the age of 16 years and, in females, at the age of 10 years (Webb, 1978 and Whitaker, *et al.*, 1981). Pairing occurs in the winter months. Eggs are laid during the rainy season in a depression made in the sand of bars and beaches or at some place in massive mound of rotting litters, carefully prepared by the breeding females (Chakraborty 1980). Clutch size varies from 40 to 120 (Chowdhury and Bustard 1979). Incubation takes place for 80-90 days, although the period of incubation may be greatly extended in different weather conditions (Acharjyo and Misra 1983, Biswas 1979, Webb 1978, Groomridge and Wright 1982, Whitaker & Whitaker 1979, Murthy and Menon 1977, Tikader 1983, Sagar and Singh 1992). Egg size is variable, length 7.2- 8.1 cm, width 4.7- 5.4 cm and weight 91-132 g (Webb 1978). The mother crocodile remains near the nest for much of the incubation period. After hatch, she leads the young hatchlings to nearby water bodies. The eggs of this crocodile are highly vulnerable to human hunters and other animal predators (Chowdhury and Bustard, 1979; Acharjyo, 1985; Banerjee, 1985; Banerjee, *et al.* 1984; Chakraborty, 1980; and Sagar and Singh, 1992).

Population in the wild or captivity : Status surveys of the species in recent years in the major areas of its distribution, particularly in the national parks, sanctuaries, biosphere reserves, and breeding and rearing centres all over India reveal that approximately 3000 Estuarine Crocodiles exist to-day.

Scientific interest and potential value : The species and its products are of significant commercial importance in the International market. Hence, an all India co-ordinated and comprehensive research on the breeding biology, ecology, commercial farming and the present status of this threatened species will generate considerable scientific interest in regard to its effective conservation and management.

Commercial use : Like other crocodilians, the skin of the estuarine crocodile, is largely used in the manufacture of bags, wallets, perches, shoes, artifacts, etc., its fat for pharmaceutical purposes, bones for fertilizer, and the dermal skin for display as household apparel. The meat is consumed by tribal communities in some parts. The stuffed crocodiles are also used as exhibits in different musea and live specimens are kept in various Indian zoos for educative values. The species, thus, comes under both internal and external commercialisation.

Trade data : Since 1925 onwards, the business in the crocodilian skins took an appreciable turn in the international market. Bhanotar *et al.*, (1974) remarked "Although no correct and precise statistical data of production of fancy reptilian skins in different states of India is available, it is estimated that in 1932 approximately 12,000,000 animals including the Indian crocodilians were slaughtered for the sake of their hides and skins, and India exported 2.5 million reptile skins in 1932 and 2.75 million in 1933. In 1955, about 12,71,000 skins were exported to France; Holland imported 5,19,000 skins, U. S. A. 14,38,000 skins and U. K. 6,63,000 skins mostly of crocodilians, pythons and monitor lizards. The export value of this trade was fairly high in the recent past and India earned foreign exchange to the tune of 2 crores"

Threats to survival : Major threats to survival of the species can be summarised into five broad categories, namely, 1) extensive commercial hunting for its hide for luxury leather trade, 2) the introduction of nylon grill netting for fishing practices, 3) extensive destruction of its natural and riverine ecosystem by taming rivers for construction of dams and barrages, irrigation projects, agricultural developments and urbanisation etc., 4) predation of its hatchlings and eggs and consumption of its flesh and eggs by human beings and other carnivorous animals and 5) medicinal value of its body parts.

Conservation measures taken : With a view to protect and conserve this endangered crocodilian, the Government of India has formulated certain rigid legislations. It considered the species as endangered by enlisting it in Schedule I of the Indian Wildlife (Protection) Act, 1972. With rigid execution of the laws, the species is now largely protected and conserved in recently established wildlife sanctuaries, national parks and biosphere reserves, in addition to different successful breeding and rearing

centres throughout India, viz. Madras Crocodile Bank at Vedenewelly in Tamil Nadu, Crocodile conservation and rearing Centre at Dangmol in the vicinity of the Bhitarkanika Wildlife Sanctuary and Nandankanan Biological Park at Barang in Orissa; Bhagabatpur Crocodile Breeding and Rearing Centre in the Gangetic delta of the Sundarbans in West Bengal; Nehru Zoological Park at Hyderabad, Andhra Pradesh; and Crocodile Islands (Anon; 1982, 1988; Blake and Loveridge, 1975; Bustard and Chowdhury, 1980, 1981; Chakraborty, 1991; De Ward 1975; Ghosh and Saha, 1987; Kar and Bustard, 1989, 1990; Kanungo, 1974; Mukherjee, 1982, Murthy and Menon, 1977; Talukdar, 1981, 1992; Talukdar (In press); Tikader, 1983; and Whitaker, 1976, 1982. 180 hatchlings of this crocodilian have so far been successfully reared at the Bhagabatpur Crocodile Breeding and Rearing Centre in West Bengal and subsequently released into the wild.

Commercial Trading of the Estuarine Crocodile and its products have been banned by listing in Appendix I of the Convention on International Trade in Endangered species of Wild Fauna and Flora (CITES) (Bustard, 1974, 1982; Bustard and Chowdhury, 1981; Daniel, 1980, 1983; Deward, 1975; Groomridge and Wright, 1982; Kar, 1979; Kar and Bustard, 1990; Kanungo, 1974; Murthy, 1979; Murthy and Menon, 1977; Rao, 1985, 1987, 1989; Saharia, 1981; Singh, *et al.*, 1984; Singh, 1985; Talukdar, 1992, and In Press; Tikader, 1983; Whitaker and Daniel, 1978; Whitaker and Whitaker, 1979). Various State Governments in collaboration with the Government of India are doing commendable jobs in successful breeding and rearing programmes and releasing the captive-bred hatchlings into the wild and as a result an estimated 3000 Saltwater crocodilians are in existence, at present. (Chakraborty, 1991). Monitoring programmes conducted in the released areas revealed an encouraging survival status of the species (Kar and Bustard, 1989).

Conservation measures suggested : Execution of laws are to be very rigidly followed for effective conservation of this dwindled population of crocodilians. The coastal mangrove swamps, the original and ideal habitat of this endangered species, must be protected at any cost. The skin traders and the conservationists stand to gain by the captive breeding of crocodiles. The crocodile farming is to be commercialised and the crocodilians and their products be utilized on a sustained yield basis, otherwise in the long

run prolific breeding of these crocodiles may cause considerable managerial problems in feeding them. It is worthwhile to mention that the Union Government has sanctioned Rs. 2. 5. lacs for captive breeding programmes to be undertaken by the various State Governments and non-Government organisations.

Conservation status of this crocodile should invariably be determined and adaptive measures taken accordingly. Conservation awareness in the form of public education is absolutely necessary for suitable conservation of the species.

Adequate knowledge as to the identity and natural history of the species is to be developed amongst the concerned authorities and staff members whom so ever should be deputed for conservation and management purposes.

Captive breeding : In captivity, successful breeding and rearing of hatchlings of the species have been pursued unabated in different crocodile breeding and rearing centres in India, already mentioned above.

Since the establishment of the Bhagabatpur Crocodile Farm in the Sundarbans in West Bengal, approximately 180 hatchlings of these crocodiles have so far been released into the wild.

Studies on different aspects pertaining to ecology, behaviour, feeding, breeding and developmental biology of the species have so far been pursued, in captivity, by a number of workers (Acharjyo and Misra, 1983; Acharjyo 1985; Banerjee, *et al.*, 1984, 1987; Banerjee, 1985; Chakraborty, 1980; Biswas, 1979; Bustard and Chowdhury, 1980; Bustard and Kar, 1980; Bustard, 1982; 1991 and Whitaker, *et al.*, 1981).

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Marsh Crocodile or Mugger

Order CROCODYLIA

Crocodylus palustris Lesson, 1834

Family CROCODYLIDAE

Common local names : Mugger (Hindi), Misti Jaler Kumir (Beng.).*Measurements* : Total length 3.0–5.0 m.*Diagnostic characters* : Smallest of the Indian crocodiles, having moderately broad snout and short and broad muzzle. Adults dark olive in colour, and young paler, with black spots throughout dorsal aspect.*Intraspecific variation* : None.*Distribution* : Widely distributed in freshwaters of the Indian subcontinent, in scattered populations, except in Jammu and Kashmir, Himachal Pradesh, Punjab and the northwest desert. The eastern limit of distribution extends beyond Darrang district (Smith 1931) into Arunachal Pradesh (Choudhury, pers. Comm.). There are however, no recent records of its occurrence in Assam (Whitaker and Daniel 1980). The Moyar River and its tributaries in Madumalai sanctuary to Bhabani Sagar is one of the last remaining original habitats of this species in southern India (Whitaker 1977). In 1975, largest single population of this crocodile was noticed in the Amaravathi Dam in Tamil Nadu during summer months (Whitaker & Whitaker 1975, Inger *et al.* 1987).Mugger is also found in depleted numbers in the freshwaters of Iran, Pakistan, Nepal, Bangladesh, Sri Lanka and Myanmar (Choudhury, pers. Comm., Ahmed 1981, Ghalib *et al.* 1977, Khan and Mirza 1976, Anderson 1979, Whitaker & Whitaker 1979).*Population* : The population density of this endangered crocodile has been considerably depleted throughout its distributional range and the present population size is estimated to be around 2000 in India (Mukherjee 1982). The largest captive population of this species is in the Madras Crocodile Bank at Vedenmelly in Tamil Nadu (around 10000) and the second largest in the Ahmedabad Zoo, Gujarat (around 1000). More than 3000 eggs are collected annually by different State Crocodile Breeding and Rearing Centres in India for captive hatching and rearing and eventual release in the

natural habitat. About 20 muggers are reported from the Corbett National Park, Uttar Pradesh. In Rajasthan, the species get protection in many temple tanks and is worshipped (F. A. O. 1974).

Habitat and ecology : Ecologically, the Mugger is the most successful Indian crocodilian, adapting to a wide range of habitat (Whitaker & Daniel, 1980). Although it is known as Marsh Crocodile, it is not only confined to marshes but also frequents any kind of freshwater habitat namely, rivers, streams, pools, lakes, manmade ponds and irrigation reservoirs, preferring channels, coursing through dense and sheddy forests. The adaptability to man-made water bodies appears to be a significant factor in the wide spread persistence of the Mugger populations. It is occasionally reported from brackish water, well within tidal limits. It prefers slow flowing freshwater habitat having a depth of 3.5 m. Marsh crocodile ventures out on the ground in dry weather in search of pools and under extreme draught conditions it aestivates in the mud. Like other crocodilians, Marsh Crocodile is also carnivorous in habit. It feeds on fishes, crabs, shrimps, molluscs and also birds and mammals. Hatchlings predominantly feed on water insects and young fishes. With the advance of age the dietary habits of the hatchlings shift to larger preys that include frogs, smaller mammals and water birds (Groomridge & Wright 1982, Tikader 1983). In captivity, the juvenile marsh crocodiles are seen to capture squirrels, mongoose, kites, crows, monkeys and birds. The Mugger is also cannibalistic in habit and rarely becomes a man-eater unless provoked.

The breeding season of the Marsh Crocodile commences from November to February in India (Chowdhury, pers. comm.). Sexes mature at the age of six; mating starts in December and takes place in water in early morning or late evening hours. Except males, the Marsh Crocodile, of all sizes, prefer to remain in groups in their reproductive size class. Male exhibits a strong dominance hierarchy and the dominant males live with several females (Chowdhury pers. comm.). Eggs are generally laid at night in spring (late February – March). Nests which are 8–10 cm deep, are made by scooping out earth, in which 40-50 eggs are usually laid in a clutch. The nest is made inside a burrow. The nest chamber is a wide-mouthed pitcher shaped structure, dug quite away from the water body in a high sloping bank. Mother crocodile guards her nests, sometimes lying to protect the eggs and

control the humidity and heat. The incubation period varies from 50 to 65 days. Hatchlings when ready to emerge from eggs, produce short feeble grunts preceptable to the mother who exavates the hatchlings and transfer them to the nearby water bodies by jaws (Mukherjee, 1982). Hatchlings measure 25-30 cm in total length. The mother crocodile takes care of her hatchlings for at least a fortnight to three weeks to guard against predators. it is interesting that an albino female of *Crocodylus palustris* found within the vicinity of the Bhitarkanika National Park laid 67 eggs in 1987. Recent herpetological researches in india have revealed considerable informations on the natural history of the species. (Acharjyo and Mohapatra 1977, Biswas 1979, Bustard 1974, Gupta and Srihari 1989, Inger *et al.* 1987, Josep *et al.* 1975, Mahendra 1971, 1975, Singh *et al.* 1984, Singh 1979, Sahi 1973, Whitaker 1974, 1977, 1978, 1979, Whitaker and Whitaker 1975, 1978).

Scientific interest and potential value : Handsome return by skin trading has ultimately subjected the Marsh Crocodile to great repression, depleting the population every where. it is, therefore, of significant scientific interest in studying extensively the natural history, breeding biology, bio-ecology and status of this much threatened crocodilian.

Commercial use : The skin of the Marsh Crocodile is largely used in the manufacture of bags, wallets, perches, shoes, etc. Fat is used in the pharmaceutical industry, and bones for fertilizer; also used for display as household apparel.

Trade data : The business in the reptilian skins took an appreciable turn in the international market owing to immense variety of colour and pattern, since 1925. Bhanotar *et al.* (1974) remarked "Although no correct statistical data of production of fancy reptilian skins in different states of India is available, it is estimated that in 1932 approximately 12,000,000 animals including reptiles namely, crocodiles, pythons and monitor lizards were killed for the sake of their hides and skins and India exported 2.5 million reptile skins in 1932 and about 2.75 million in 1933. In 1955, the export figure of the reptilian skins including those of the marsh crocodiles both raw and tanned to overseas market namely, Europe and U. S. A. reached an enormous figure. In 1955, an estimated number of 12,71,000 skins were exported to France; Holland imported 5,19,000 skins, New York 14,38,000 skins and U. K. 6,63,000 skins, mostly of crocodilians, pythons

and monitor lizards. The export value of this trade was fairly high in the recent past and India earned foreign exchange to the tune of two crores. The crocodile skin is one of the costliest in the international market and at present a 20 years old crocodile easily fetches Rs. 1 lakh, even a 5 year old individual has a value of nearly Rs. 30,000.

In India, the major threats to survival of the Marsh Crocodile in the wild can be summarised into five broad categories. These are 1) extensive commercial hunting of its hide for luxury leather trade, 2) the introduction of nylon gill netting, 3) extensive destruction of its natural, riverine ecosystem, by taming rivers in the form of construction of dams and barrages, irrigation projects, draining of marshes for agricultural developments and urbanisation etc., 4) medicinal value of its body parts 5) predation of its hatchlings and eggs and consumption of its flesh and eggs by human beings and other carnivores. (Groomridge & Wright 1982, Mukherjee 1982, Chowdhury (pers. comm.), Tikader 1983, Singh *et al.* 1984).

Record of infestation by nematodes in this species has recently been reported which is a serious threat to the captive population.

Conservation measures taken : With a view to protecting and conserving the endangered crocodilians including the marsh crocodile the Government of India has promulgated certain legislations and enlisted this crocodilian in Schedule 1 of the Wildlife (Protection) Act, 1972. With rigid execution of laws it is now largely protected and conserved in 13 successful breeding and rearing centres and 22 forest pockets established in recent years in different parts of India, viz. Crocodile Breeding and Rearing centre at Madras Crocodile Bank, Vadenemelly in Tamil Nadu, Peruvannamuzhi c. 60 km south of Kozhikode (Kerala), Nehru Zoological Park at Hyderabad (Andhra Pradesh), Ahmedabad Zoo (Gujarat), National Chambal Sanctuary at Deori, Crocodile Rehabilitation Centre at Lucknow (U. P.), Crocodile Breeding and Rearing centre in Delhi and Jaipur zoos, Keola Deo National Park at Bharatpur (Rajasthan) and Gir National Park, Gujarat (Bustard, 1974, 1984, 1985, Groomridge and Wright 1982, Singh *et al.* 1984, Talukdar 1981, 1992 and in press, Tikader 1983, Whiteker 1977, 1978.a, b, c, 1979, Whitaker and Whitaker, 1975, 1978, Whitaker and Daniel 1978). Commercial trading of the species and products thereof are largely restricted by listing in Appendix 1 of the convention on International Trade in Endangered species

of Wild Fauna and Flora (CITIES) (Mukherjee 1982, Murthy 1978, Murthy & Menon 1977, Singh *et al.* 1984, Tikader 1983, Groomridge & Wright 1982, Rao, 1985, 1989; and Whitaker and Daniel, 1978, 1980).

Madras Crocodile Bank (a WWF – India funded conservation agency), Wildlife Institute of India at Dehradun and various state governments in collaboration with the Government of India are doing a commendable job in successful breeding and releasing captive-bred hatchling into the wild and as a result nearly 15,000 marsh crocodiles (*Crocodylus palustris*) have so far been produced of which approximately 1000 have been released into suitable habitats (Chakraborty 1991). Monitoring programmes conducted in these released areas, revealed an encouraging survival status of the species (Rao 1985 and 1989).

As the crocodilian skins are the costliest in the international market and the meat of high nutritious value, the crocodile harvesting scheme was started as a Central government project in 1981 at Sathanur, Amaravati in Coimbatore and Hogenekal in Dharampuri district, South India, with a view to providing local employment opportunities.

Conservation measures suggested : It is highly essential to determine the present status of *Crocodylus palustris* in the range of its distribution. It is also urgently needed to clarify the policy of the Government of India about the wild breeding populations in its habitats and in the breeding and rearing centres, so also the various sanctuaries, national parks and biosphere reserves throughout the country for effective protection and conservation measures. It is highly essential to take suitable measures so that crocodile farming can be commercialised and the crocodilian and its products be utilized on a sustained yield basis on the lines adopted in Bangkok and Papua New Guinea, otherwise the marsh crocodile will increase beyond control.

Although commercial farming has been completely banned since 1978, the management will have to increase its vigil over illegal fishing which can quickly reverse the trend of recovery of the mugger populations. The staff members of the various state forest departments should be trained to have adequate knowledge as to the identity and natural history of the crocodilians. Conservation status of the Marsh Crocodile should be deter-

mined and effective measures to the adopted accordingly.

Captive breeding : Successful breeding of the Marsh Crocodile, *Crocodylus palustris*, is being practiced in several Indian zoos and in the recently established breeding and rearing centres throughout India since 1960. Amongst these, Jaipur Zoo and Ahmedabad Zoo (Yadav, 1969), Delhi Zoo (breeding since 1976), Visakhapatnam Zoo (breeding since 1978), Hyderabad Zoo (breeding since 1970). Bannerghatta National Park at Bangalore, Karnataka and Badodara Zoo (erstwhile Baroda) in Gujarat have also successfully bred Marsh Crocodiles. But Madras Crocodile Bank has so far achieved significant breeding results and approximately more than 1000 muggers of various age groups are presently being reared in captivity.

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Loggerhead Sea Turtle
Caretta caretta (Linnaeus, 1758)

Order TESTUDINES
 Family CHELONIIDAE

Measurements : Total length about 2.7 m weight 385 kg; length of carapace 1.14 m.

Diagnostic characters : A large circumglobal species, with elongate head, elongate carapace and one of the largest amongst all the hard-shelled turtles. Beak massive and eyes large. Carapace serrated posteriorly ; costals generally 5 on each side ; central scutes 5 or more ; marginal shields 27 and mid-marginals comparatively wide. Plastron consists of paired gulars, humeral, pectoral, abdominal, femoral and anal shields ; intergular variable, may be single, double or absent ; inframarginals 3 pairs, enlarged and devoid of pores on hinder margin. Dorsal shields juxtaposed. Maxillae in contact with each other. Head covered with symmetrical shields ; two pairs of prefrontals present. Two claws present on each flippers. Tail short. Body brown in colour, carapace brownish red with light spots, and flippers grey brown.

Intraspecific variation : *Caretta caretta gigas* Deraniyagala (Indian and Pacific Oceans) : marginal laminae averaging 13 on each side; limbs two clawed. *Caretta caretta caretta* (Linnaeus) (Atlantic and Mediterranean waters) : marginal laminae averaging 12 on each side ; limbs two or one clawed.

Distribution : The Loggerhead is a circumglobal species, found in all the temperate and subtropical waters, world-wide. (Smith 1931, Mc Diarmid 1978, Pritchard 1979, Tikader & Sharma 1985 and Tikader 1983). Generally almost all the nesting areas of the Loggerhead Sea Turtle, except the western Caribbean are either north of the Tropic of Cancer or south of the Tropic of Capricorn (Pritchard *loc. cit.*).

The turtle has been recorded from the Indian waters (Tikader and Sharma *loc. cit.*). It is caught in water off India and possibly nests in India (Frazier 1982) from where there are but a handful of authenticated records

(Frazier 1985). According to Murthy and Menon (1976) the Loggerhead (*Caretta caretta gigas* Deraniyagala) is distributed in the Pacific and Indian oceans and it is particularly abundant in the vicinity of Andaman Islands.

These turtles have also been recorded from Sri Lanka, Pakistan, Maldives, West coast Sumatra, coasts of southern China and Taiwan (Deraniyagala 1933, Frazier 1982, Polunin and Nuijta 1982, Chu-Chien Huang 1982, Sternberg 1981).

Habitat and ecology : Most nesting beaches of this cosmopolitan species are north or south of the tropics, in subtropical or temperate zones (Pritchard, *loc. cit.*). However, the species does not feed within the tropics. It is primarily a neritic species ; although long-distance journeys are known, these often appear to take place along coast lines, not in open sea (Hendrickson 1980). Nesting of the Loggerhead Sea Turtle is seasonal and generally occurring in late spring to summer ; for example, it takes place between November and January at Kwa-Zulu area on the Tongaland coast of South Africa while at Florida and South Carolina (USA), nests are made between May and August (Hirth 1980). The nests are generally constructed during the night and the nesting process conforms closely with the stereotyped pattern shared by all sea turtles of the world (Pritchard *loc. cit.* , Carr 1982 and Le Buff and Beatty 1971). When coming ashore to nest, female Loggerheads move magnificiently in slow strides by using their flippers in a typical four-legged manner. With the help of hind flippers she digs a ping-pong ball with a diameter between 40 and 42 mm. The eggs are deposited 12-56 cm. deep in the sand. (Tikader and Sharma *loc. cit.* and Prichard *loc. cit.*). Clutch-size ranges from 60 to 200. After egg-laying, the female covers the nest with sand and roughs up the surface of the beach over a wide area for hiding the exact spot of the nesting (Hirth, *loc. cit.* and Tikader and Sharma *loc. cit.*). The incubation periods recorded range from 55 to 66 days (Hirth *loc. cit.*). Female Loggerheads may nest 4-5 times in one season, but a maximum of 7 nests has been recorded for one female (Lenarz *et.al.* 1981). It has been recorded that hatchlings output per season per female is not more than 200 (Hirth *loc. cit.*). The turtle is reported to mature in 10-15 years, although growth rates are expected to vary geographically with differing water temperature and food sources. Female loggerheads can re-migrate at 2-3 years intervals, most females tagged on the nesting beach are

never seen nesting in another season (Hughes 1982). The young Loggerheads may spend the first several months of life hiding under the layer of *Sargassum* weeds (Carr loc. cit), and feed mainly on small fish, prawns and other crustaceans. The adult Loggerheads are entirely carnivorous, feeding mainly on benthic invertebrates, especially molluscs, crustaceans, sponges, jelly fish, crabs, sea urchins, and starfish (Mortimer 1982).

Population : Wild/Captivity : Population of the Loggerhead Sea Turtle either in the wild or in captivity is not exactly known. Sea Turtle populations are particularly difficult to census. Censusing populations at sea poses major logical problems. Migrating routes, the developmental habitats of juveniles and feeding grounds of the Loggerheads have not been identified sufficiently, to estimate the total population. Males never leave the water, juvenile numbers fluctuate greatly due to high hatchling mortality, and nesting populations vary strongly between years. (Meylon 1982). The world's largest population of this turtle is on Masirah Island (Oman) on the other scale of the Arabian Sea where about 30,000 turtles visit every year for nesting.

Scientific interest and potential value : All the marine turtle populations including the Loggerhead Sea Turtle are under heavy pressure, from exploitation, predation and habitat modifications, and most populations are known to have declined drastically. To prevent the further deterioration in numbers of these turtles and for taking suitable conservation steps, a very comprehensive programme of research on various aspects of biology and the behaviour of these turtles is highly essential (Rao 1985).

Commercial use : Though the flesh of this turtle is not much palatable, its eggs are much relished and sought after. The shells are put to good use in the preparation of crude ornaments (Murthy and Menon, loc. cit.) The turtle is commercially exploited for meat, eggs and for making local curios in many countries of the world including India (Tikader and Sharma loc. cit, Sternberg loc. cit., Groomridge and Wright 1982, and Murthy 1981).

Trade data : Exact trade data on the Loggerhead Sea Turtle is not available.

Threats to survival : The major threats to survival of the Loggerhead populations are incidental capture in trawls, loss of nesting habitat, owing

to the urbanisation of the coastal areas, tourist pressure and local exploitation (Ross 1982, Shabica 1982 and David and Whiting 1977). Artificial lights appear to cause dis-orientation of nesting females and hatchlings. Electric and other such lights attract them towards the inland roads and as such they are killed by traffic accidents and desiccation (Bjorndal *et. al.* in press, Frazier 1980 and Tikader and Sharma, *loc. cit*). Exploitation for meat, eggs and for making local curios is carried out in several countries like Mexico, Azores, Madeira, Canary Islands, Cuba, Mozambique, Dominican Republic, China, Japan, Columbia and India (Bjorndal 1982, Groomridge and Wright, *loc. cit* , Tikader & Sharma, *loc. cit*). At various industrially developed places of the world numerous hatchlings of the Loggerhead turtles are killed by chocking of jaws and throat by tar, mineral oil and various other chemicals which accumulate in sea water as industrial waste or by any other method (Carr 1982 and Tikader and Sharma, *loc. cit*). Racoons are said to be strong predators on Loggerhead eggs in North America (Bjorndal *et. al.* in press).

Conservation measures taken : The Loggerhead Turtle is nominally protected by legislation all over its range. Any type of commercial exploitation of turtles, hunting and egg collection is absolutely banned or allowed only on a subsistence basis (Anon *loc. cit.*). Several countries like USA, have established restricted fishery zones to minimise incidental catch of these turtles (Anon 1982). In view of conservation of the nesting or breeding Loggerheads various nesting beaches throughout the world have been declared protected (Anon *loc. cit* , Cornelius 1982 , Groomridge and Wright *loc. cit.*, Hughes 1974). The turtle is included in Appendix I of the convention on International Trade in Endangered species of Wild Fauna and Flora (CITES), according to which any international trade in this species or its products and any sort of commercial exploitation is strictly prohibited (Groomridge & Wright *loc. cit* and Tikader & Sharma *loc. cit.*). The species has been included in the IUCN Red Data Book as vulnerable. It has also been considered as endangered and included in Schedule I of the Indian Wildlife (Protection) Act, 1972. Under this Act, laws are legislated to save the endangered species from illegal poaching and give protection to its habitats.

Conservation measures suggested : It has been proposed world-wide

that the existing legislation should be enforced more rigidly and National Parks and Reserves should be protected adequately (Navid, 1982). Protective legislation and adequate enforcement is particularly important for the protection of these turtles at major nesting concentrations like those at Masirah Island, Oman, and Madagascar. Restricted fishing zones all over the world should be established in areas of high Loggerhead concentrations, particularly off major nesting beaches and top priority should be given to the development of fishing equipment which prevents incidental catch of these turtles. There should be international co-ordinated programmes for conservation of nesting, feeding and migratory zones of the Loggerhead Sea turtles (Anon *loc. cit*). The practice of incubating eggs of these turtles in seminatural or artificial nests, in the hope of decreasing egg and hatchling mortality, should be reviewed (Morreale *et. al.* 1982). Catching of the species during the nesting season should be totally banned to obtain more recruitment of young turtles which increase the population size. An awareness of the importance of wildlife conservation should be created among the public to gain more support for sanctuary management. High priority should be given to the interests and needs of the local people and measures to be taken to arrange alternative resources wherever possible (Rao *loc. cit*).

Captive breeding : Very little information on the captive breeding of the Loggerhead Sea Turtle is available. Such breeding has so far been reported at a few Seaquaria, including seafloor Aquarium at Nassau, where a full breeding cycle has occurred (Tikadar & Sharma *loc. cit*).

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Green Sea Turtle

Chelonia mydas (Linnaeus, 1758)

Order TESTUDINES

Family CHELONIIDAE

Measurements : Length of carapace 100-155 cm ; weight 135-175 kg.

Diagnostic characters : Largest of the hard-shelled species of marine turtles. Body flat, streamlined, heart-shaped and smooth. Head round and small as compared to body ; snout short and jaws not hooked. Carapace never completely ossified, arched in adults. Dorsal shields juxtaposed ; costal scutes 4 on each side ; central scutes 5, and marginal scutes 25. Plastron consists of paired gulars, humeral, pectoral, abdominal, femoral and anal shields ; single intergular and a series of inframarginal shields. Head covered with symmetrical shields and one pair of prefrontal shields. Neither its legs nor head can be pulled down under the shell. Flippers long and each provided with single claw. Tail short. Carapace green, olive, brown or black; colour of head and flippers like that of its shell ; limbs yellow with a dark patch ; underside white in young and pale yellow in adults (Tikader 1983).

Intraspecific variation : *Chelonia mydas agassizii* Bolourt (Pacific coast of America, throughout Indian and Indo-Chinese waters including Andaman and Nicobar groups of Islands) : Coloration above predominantly greenish or olive brown ; shell often markedly indented above hind limbs ; shell chunky and often with the laterals completely straight from the margin of centrals. *Chelonia mydas mydas* (Linn.) (Atlantic and Caribbean) : Coloration above predominantly brownish ; shell margin not markedly indented above hind limbs ; shell less chunky and deep especially from the middle of the laterals towards periphery.

Distribution : The Green Sea Turtle is a circumtropical species, nesting primarily in all the tropical and subtropical oceans of the world (Smith 1931, Groomridge & Wright 1982 and Tikader & Sharma 1985).

The species is generally distributed throughout Indian and Indo-Chinese waters (Smith 1931). It is abundant in and around the Krusadai Island, Palk Bay and Tuticorin (Murthy 1981) and cape comorin and Rameshwaram (Bhaskar 1982). Along the east coast these turtles are much

less common and approximately 40-50 Green Turtles are caught regularly along the Puri coast of Orissa (Bhaskar, 1982). There are instances of Green Sea Turtles being caught in the sea off Vishakhapatnam or coming for nesting occasionally on the shore (Biswas, 1984). On the west coast of India scattered nesting has been reported from Gorai (north of Bombay) to Morad (south of Calicut). Nesting has even been reported around Bombay, on the island of the Gulf of Kutch, especially Bhaidar and on the mainland between Okha and Okha Madhi, and probably further south (Bhaskar 1978, and Frazier 1985). Large feeding grounds of the Green Turtle have been recorded from the Gulf of Mannar and Palk Bay but no nesting has been reported from there (Bhaskar 1979a and Frazier 1985). The turtles are actively collected especially in the Gulf of Mannar and they were once fairly common all around the islands (Frazier, 1982). The Green Turtle is fairly common in the Lakshadweep Islands with most nesting on Suheli Valiyakara, Suheli Cheriyaakara, Tinnakara, Patti and Parali II (Bhaskar 1979 a, Frazier 1982, 1985, and Silas 1984). In the Andaman and Nicobar Islands nesting of these turtles occurs on Little Andaman, South Sentinal, Katchal, Middle Andaman and Rutland Islands (Bhaskar 1979 b, c, Sternberg 1981, and Frazier 1985). According to Murthy (1981) Green Turtles are plentiful in the Andamans, Nicobars and Lakshadweep.

150 separate nesting areas are known throughout the world but only 10-15 populations are of significant size where the number of nesting females exceeds 2000 annually (Groomridge & Wright 1982). These large populations have been reported from Ascension Islands, Northern and Western Australia, Costa Rica, Europa and Tromelin Islands (in Mozambique Channel), Mexico (Pacific coast), Oman, Pakistan, Philippines, Sabah, Sarawak and Surinam (Groomridge & Wright 1982, Tikader & Sharma 1985 and Pritchard 1979).

Habitat and ecology : The Green Sea Turtle is unique among all marine turtles in being mainly herbivorous, highly migratory, with well-developed homing abilities. It frequents inshore estuarine, coastal and reef-system habitats, less than 25 metres in depth. Remote islands are the most favoured nesting sites of this turtle, although mainland beaches are also used. It migrates to very long distances in search of food and for egg laying. Favourable sandy beaches are selected for breeding. Its mating season

occurs between May and July. Female Green Turtles usually congregate in large numbers on such suitable beaches mainly between June and November to lay eggs. Each breeding female turtle is known to lay between 350 and 600 eggs annually. The average clutch size is 110. Each female lays several clutches at an interval of 15 days, but will have another nesting season at an age of 15–20 years. The incubation period ranges between 40 and 91 days. The adult turtle is entirely herbivorous and feeds on submerged marine algae, sea weeds and grasses (Pritchard 1979). Hatchlings are mainly carnivorous and devour molluscs, crustaceans and fishes. (Carr *et al.* 1978, Carr 1980). Recent study (Davenport and Orford 1984) suggests that Green Turtle hatchlings are adapted to deal with a wider range of food organisms than previously realised. Although they prefer to eat fish and invertebrates, can even survive on a diet of jelly fish (Witham 1980). They take plant material readily.

Populations – wild/in captivity : The population of the Green Sea Turtle either in the wild or in captivity is not precisely known. According to Frazier (1985) the turtle is found in abundance in Indian waters, and approximately 40,000 female Green turtles nest annually in the Indian Ocean. Roughly between 3000–5000 sea turtles are caught annually from Pamban, Cape Comorin, Rameshwaram and Mismisal coasts of India and three quarters of these are Green turtles (Bhaskar, 1982).

Scientific interest and potential value : Extensive study on different aspects of bio-ecology and breeding biology of the Green Sea Turtle, is of considerable scientific interest from the point of its effective conservation and management. The turtle is considered one of the most valuable reptiles of the world because of its palatable, protein rich flesh. The shell, flippers, eggs, fat, and meat are sold out or the whole animal fetches a price of about Rs. 300 to Rs. 400 depending on the size (Murthy 1981).

Commercial use : The Green Turtle is one of the most valuable of all living marine reptiles of the world. It has great commercial importance from the economic point of view because of its meat and soup. The meat of this turtle is considered a great delicacy and is also the main source of the famous “turtle soup” on account of which the turtle is called by Germans as “Suppenchild Krote” (soup turtle). In addition to its flesh, the eggs of a Green Turtle are a staple diet for natives in several parts of the world. The

turtles are also sought for their oil which is used in the manufacture of cosmetics. Young turtles are killed, cured, stuffed and sold as ornaments and curios. The blood of this turtle is also in demand in Tuticorin where it is believed by the locals to be an elixir (Murthy & Menon 1976). The turtle is more useful to mankind by consuming a worthless resource to man like sea grasses and algae and converting these into a rich protein (Frazier 1985, Rao 1987, Groomridge & Wright 1982 and Tikader & Sharma 1985).

Trade data : No precise trade data on the green Sea Turtle is available. The turtle is overexploited and there is a large scale international trade in its flesh, cartilage, oil and eggs for food; stuffed adults, hatchlings and very young turtles, hide, skin and shell carvings are used for curios and for making various commercial products. (Tikader & Sharma 1985). The popularity of green Turtle meat and soup was so great that vast numbers of the helpless animals were exported to oriental and occidental centres all over the world, (Frazier 1985).

Threats to survival : The Green Sea Turtle has become extremely endangered and its population has alarmingly dwindled throughout the world. In India, the population has declined drastically during the last few decades as a result of direct and indirect human interventions. There is a large scale international trade in this species for its flesh, cartilage, oil and eggs for food. Stuffed adults, juveniles, very young turtles, hide, skin and shell carvings are sold as curios and for making commercial products. The turtle and its eggs are important food source for people inhabiting the sea-shores and islands. Its cartilage is processed for making turtle soup, which is regarded as a great delicacy. Loss of adult females and their eggs due to large scale predation by man and other predators during nesting and egg-laying, beach erosion, flood tides and other abiotic factors are among the main factors for the population decline of the Green Turtle. Killing of adult turtles and incidental catch of breeding adults in fishing trawls were also intense over the past few years. A considerable number of Green Turtle hatchlings perish due to different pollutants which accumulate in the Sargassum weed mats by the local water currents of the sea. These weed lines provide the main habitat to the hatchlings for the first year of their life. At this stage these turtles are voracious feeders and devour indiscriminately anything which comes across. As a result they also consume accumulated oil

products, styrofoam, tar and numerous such chemical by-products of the oil industry (Tikader & Sharma, 1985). Excessive egg harvest can cause Green Turtle populations to decline to a larger extent.

Conservations measures taken : The Green Turtle is partially or totally protected by legislation all over its range. Societies have been set up all over the world for protection of this species and its nesting grounds. These societies are also engaged in hatching the Green Turtle eggs by artificial incubation and finally releasing the hatchlings to its natural habitat. The Green turtles are totally or partially under protection at various nesting beaches which fall within the jurisdiction of National Parks and National Reserves. Status surveys on marine and freshwater turtles are being conducted in India to identify suitable habitats to protect them under sanctuary management. To avoid predation on turtles and their eggs, nesting beaches are patrolled by the law enforcing authorities. Egg hatcheries are set up and eggs are carefully hatched. In India, marine turtle rearing centres have been established in Orissa, West Bengal, Karnataka and Tamil Nadu (Rao 1987). Banning of inshore use of fishing nets during the mass emergence of marine turtles in nesting period reduces the incidental mortalities. More advanced techniques are developed in designing nets useful for commercial fishing and also to avoid the incidental catch of marine turtles. The institute has already identified major nesting beaches of the Green Turtles along with other marine turtles and it has been persuing research on nesting behaviour and hatching of eggs. (Rao 1987). The Green Turtle has been listed in Appendix 1 of the Convention on International trade in Endangered species of Wild Fauna and Flora (CITES). Countries like France, Italy, Japan and Surinam have, however, taken reservations and as such they are not covered by the provisions of this (CITES) listing. (Groomridge & Wright 1982 & Tikader and Sharma 1985). In India, the Green Turtle is considered as endangered and listed in Schedule 1 of the Indian Wildlife (Protection) Act, 1972. The species has also been included in IUCN Red Data Book as endangered (Groomridge & Wright *loc. cit*).

Conservation measures suggested : It is suggested that wherever possible existing legislation for protection of the Green Turtle populations should be enforced with more rigidity and National Parks and Reserves adequately protected. The states like France, Italy, Japan and Surinam must

be convinced to withdraw their reservations and allow their Green Turtle populations to be covered by Appendix 1 listing of the CITES. Wherever possible the nesting beaches, feeding grounds, interesting habitats, migration routes and hibernating sites must be protected strictly all over the world (Anon 1982). Restricted fishing zones should be established invariably in the areas of high turtle concentration, particularly off major nesting beaches and high priority should be given to the development of fishing equipments and methodology in order to prevent or reduce incidental catch of these turtles (Anon, 1982). People should be educated all over the world in conservation methods to create public awareness for protecting these endangered turtles (Rao, 1987). High priority should be given to the interest and needs of the local people and measures should be taken to arrange alternative resources (Morreale *et al.* 1982). Wherever possible turtle farming should be established. Stocks of breeding populations in specially constructed "Pens" on the coasts where turtles abound and to provide employment to the locals at the spot. Possibly a cottage industry for the culture of Green Turtles may be initially attempted in the Andamans and Lakshadweep which offer excellent breeding beaches and other congenial facilities for rearing the young turtles but we have to have perfect ways of rearing and feeding the baby turtles since survival of hatchlings is the vital factor in turtle farming (Murthy 1981).

Captive breeding : Numerous attempts for rearing the Green turtles in captivity has already been made world over, but large scale closed cycle captive breeding has not so far proved beneficial commercially anywhere. Captive breeding or rearing for commercial purposes has reportedly been attempted in several countries like Australia, Cayman Island, Indonesia, Malaysia, Mexico, Philippines, Seychelles and South Yemen (Dodd 1982). The economic and biological feasibility of turtle farming and its effects on wild turtle populations have been subjects of much controversy among sea turtle biologists and others (Bustard, 1981). The subject of sea turtle farming has been discussed most elaborately at the 1979 conference of the conservation of sea turtles, Washington D. C. (Bjorndal 1982). The most important conclusions adopted in that conference are, that prior to attempting such a programme, detailed studies on the biology and the implementation of economic factors concerning all the populations of the

species are required (Anon. 1982).

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Hawksbill Turtle

Order TESTUDINES

Eretmochelys imbricata (Linnaeus, 1757) Family CHELONIDAE

Measurements : Total length 60–100 cm; weight 60–140 kg.

Diagnostic characters : Smallest but the most colourful species of marine turtles. Beautiful yellow motteling on rich brown background distinguishes this turtle from other sea turtles. Head narrow, distinct scales over it, and snout tapers to a point. Its powerful ridgen jaws that resemble like a hawksbill, allow it to break open molluscs, crabs and other hard animals and to pull them out from the crevices of rocks and coral reefs. Premaxilla deeply exavated and not toothed terminally. Jaws strongly hooked. Carapace narrow and strongly serrated behind; general outline cordate which elongates with age. Scutes on its shell thicker and strongly overlapping in the young but later the edges come to lie side by side. Dorsal scutes horny and strongly imbricated; in very old individuals they are juxtaposed. Costal Scutes 4 on each side; central scutes 5, and marginal scutes 25. Plastron consists of paired gular, humeral pectoral, abdominal, femoral and anal shields, a single intergular and a series of inframarginal shields. Head covered with symmetrical shields and with two pairs of prefrontal shields. Flippers long, each provided with two claws. Tail short. Juveniles black above and blackish below. Carapace may be amber-coloured or greenish with violet markings or darkbrown to black with yellow mottlings, and in all cases with radiating brown or black streaks on the scutes. Plastron yellow, orange or reddish brown in colour. Skin of neck yellow or creamish. Shields of head and limbs dark brown, with yellow borders.

Intraspecific variations : The two subspecies, *Eretmochelys imbricata imbricata* Deraniyagala and *Eretmochelys imbricata squamata* Agassiz distributed in the Atlantic and Pacific Occeans respectively, can be separated by the shape of the carapace which is more straight tapering behind in *imbricata* than in *squamata*, and by coloration which is deeper and more black in the latter than in the former.

Distribution : The Hawksbill Sea turtle is a circumtropical species,

nesting primarily on beaches of tropical and subtropical seas of the Pacific, Atlantic and Indian Oceans. The species also occurs in the Mediterranean Sea but do not breed there (Groomridge and Wright 1982). Highest concentration has been reported from Long Island in Australia (Limpus 1982).

The Hawksbill Turtle is generally distributed in Indian and Indochinese waters (Smith 1931, Tikader & Sharma 1985, Tikader 1983, and Murthy 1981). In India, the species is reported to occur around mainland and make nests on various islands in the Gulf of Kutch and along the Gulf of Mannar, especially on offshore islands (Bhaskar, 1979 a, b, and Frazier, 1982). The Hawksbills are also reported to nest more commonly in the vicinity of Lakshadweep. Andaman and Nicobar Islands (Bhaskar, 1979 a, b, Biswas and Sanyal, 1980, Valliappan & Pusparaj 1973, Frazier 1982, and Silas 1984). In a survey of the South Andaman Islands in 1978, 23 sets of fresh Hawksbill tracks were found on The Twins and 10 fresh excavations on the southern coast of Rutland Island (Bhaskar 1979). There are instances of hawksbill turtle being caught in the sea, off Visakhapatnam or coming for nesting occasionally on the Waltair coast of Andhra Pradesh (Biswas, 1984).

Habitat and ecology : The hawksbill turtle is widespread in tropical waters but its nesting is sporadic and takes place during the night. It frequents shallow waters with rocky coastal embankments and coral reefs with shallow vegetated bottoms as well as bays and lagoons with muddy bottoms lacking extensive beds of submerged vegetation. The male turtles seldom emerge from water during the night and approach to the beaches for nesting. The Hawksbill is mainly a non-migratory species and covers short distances only in search of food. Long distance migration of the species is reported to be scanty. The hind flippers are primarily used for steering and for excavation of the nest. The breeding season extends from end of August to end of February, with peak from October to January and is correlated with the onset of the northwest monsoon. Age at sexual maturity is unknown. The flaskshaped nest cavity attains a depth of 45-50 cm. The female turtle lays 96-182 eggs per clutch at a depth of 12-20 cm in the nest pit during the day. The clutch-size varies between different populations and is strongly correlated with mean carapace length. Eggs are round with a diameter of 4 cm. Generally 2-4 clutches are laid in one season with a re-

nesting interval of around 15-19 days. Annual hatchling productivity per nesting female varies between 77 and 189. The fully grown adult Hawksbills are entirely omnivorous. The food comprises a great variety of items like sponges, ascidians, echinoderms, coelenterates, ectoprocts, bryozoans, gastropods and bivalve molluscs, barnacles crustaceans, soft corals and fishes. The vegetarian diet of the turtle includes *Sargassum* and other sea weeds, marine angiosperms and fruits of mangrove plants (Carr & Stancyk 1975).

Populations-wild/in captivity : The population of the Hawksbill Turtle either in the wild or in captivity is not exactly known.

Scientific interest and potential value : Extensive Research on the biology and ecology of the Hawksbill Turtle has got sufficient scientific interest and the commercial products made of the Keratin layer of its shell has got considerable potential value. The cost of tortoise shell of this endangered turtle ranges between Rs. 1100 and 2000 per kg. in the international market (Tikader & Sharma, 1985). The tortoise shell is extremely valuable and 1 kg. of unworked shell was selling at 100 US dollars in Japan only a few year back (Frazier 1985).

Commercial use : The Hawksbill Turtle is one of the most economically important sea turtles in India like in other countries where it is largely exploited for the horny shields or Keratin layer of its shell. The keratin layer is used for adornment and for making attractive toilet articles in the form of jewellery and expensive combs, furniture and curios. (Tikader & Sharma 1985 and Rao 1987). Stuffed juvenile hawksbills and polished shells are also largely used in luxury trade in the international market (Anon. 1982). It is said the best 'tortoise shell' comes from the species of the Indian Ocean (Murthy and Menon, 1976). A small-sized industry for the manufacture of ornamental articles like combs, buttons, small snuff boxes, cigar cases etc. has been developed on the coasts of Tamil Nadu, Kerala and Andhra Pradesh (Murthy 1981).

Trade data : No precise trade data on the Hawksbill Sea Turtle is available in India. However, according to the export figures rendered by the Marine Product Export Development Authority, Madras, tortoise shells valued Rs. 1,65,195.00 were exported to various countries between 1971

and 1974 (Murthy and Menon 1976). Continued commercial demand for 'tortoise shells' is sufficiently high and Indonesia, Thailand, Philippines, India and Fiji are the major exporting countries ; Malaysia and Singapore are major re-exporters of raw shells, whereas Japan, Taiwan and Hongkong are the major importers of raw shells (Mack *et al.* 1982). Japan alone consumes over 90% of the worlds supply (Groomridge & Wright 1982). The latest estimates indicate that at least 50,000 Hawk'sbill turtles are killed in Indonesia annually for the purpose. It was estimated in 1973 that about 5000 or more of these turtles were slaughtered annually for tortoise shell in the Philippines (Groomridge & Wright 1985).

Threats to survival : The Hawksbill Turtle has become extremely endangered and the nesting density is much low almost throughout the range. The turtle is indiscriminately exploited for the horny shields or keratin layer of its shell for making attractive articles like jewellery, furnitures and curios.

A second major threat to survival of the Hawksbills is the increasing tourist trade. The trade has added devastating effects on the various populations of the Hawksbill turtle throughout its range. The hatchlings and immature specimens are killed, stuffed, lacquered and sold in the tourist trade as curios (King 1982 & Mack *et al.* 1982), and there is heavy demand for the polished shells for decorating purpose.

The Hawksbill turtles and their eggs are frequently consumed in some countries like Indonesia, Caribbean, Papua New Guinea, the Solomons, Japan and India. Habitat destruction, notably loss of nesting beaches is a further threat to survival of the species in Malaysia, Srilanka and the eastern Caribbean (Groomridge & Wright 1982).

Conservation measures taken : The Hawksbill Turtle is generally protected by legislation in various countries.

The species is listed on Appendix I of the convention on International trade in Endangered Species of Wild Fauna and Flora (CITES). Japan and France have, however, kept their Hawksbill populations aside and these are not governed by the convention laid down by the CITES. In India, the species has also been considered endangered and placed in Schedule I of the Indian Wildlife (Protection) Act, 1972 as amended upto 1992. (Tikader 1983 and Tikader and Sharma *loc. cit*).

Conservation measures suggested : A total and effective ban on international trade in the species in any form is absolutely necessary for the survival and recovery of the existing populations of the Hawksbill Turtle (Carr, *et al* 1980). Countries like Japan and France that have taken reservations for Hawksbills should henceforth withdraw those reservations. Countries not yet party to the CITES should be encouraged to ratify the convention and the present CITES countries should, invariably, be encouraged to abide strictly by its terms and conditions. Completely unnecessary luxury trade in stuffed juvenile hawksbills and polished shells should be stopped forthwith. Existing legislation including that pertaining to protected areas (National Parks, Sanctuaries and Biosphere reserves) should be rigorously enforced. Suitable conservation measures be taken for protection of more known nesting beaches wherever it is likely to be effective. Habitat destruction or disturbance at the nesting sites in the form of tourist activity, lighting etc. should be stopped. The practice of incubating eggs in semi-natural and artificial nest, in the hope of decreasing egg and hatchling mortality, should be reviewed. A cottage industry of the culture of this turtle may be attempted initially in the Andamans and Lakshadweep which offer excellent breeding beaches and other favourable facilities for rearing the young turtles, but have to have perfect ways of rearing and feeding the baby turtles, since survival of hatchlings is the vital factor in turtle farming (Murthy, 1981).

Captive breeding : Informations on effective captive breeding of the Hawksbill Turtle are not so far available from anywhere in the world (Groomridge & Wright, 1982).

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Olive Ridley Turtle

Order TESTUDINES

Lepidochelys olivacea (Eschscholtz, 1829) Family CHELONIDAE

Measurements : Carapace length 56-75 cm ; weight 40-55 kg.

Diagnostic characters : A small, broad and flattened marine turtle ; head large and triangular in shape, and orbits large. Carapace, in adults, arched and devoid of keels, margin serrated at posterior aspect. Costal scutes 5 - 9 on either side ; central scutes 8 - 9, marginal ones 27 - 29 ; mid-marginals much wider. Plastron consists of paired gular, humeral, pectoral, abdominal, femoral and anal scutes ; intergular variable, may be single double or absent ; inframarginal scutes 4 pairs. Head covered with symmetrical shields ; 2 pairs of prefrontals present. Limbs provided with single claw. Carapace olive grey, head grey brown, shields yellow white, plastron creamy yellow and edges of flippers light yellow brown.

Intraspecific variations : *Lepidochelys olivacea olivacea* (Eschscholtz) (Indian and Pacific Oceans ; West coast of Africa, West coast of America, Pacific coast of Mexico and Costa Rica) : Colour dorsally olive ; laterals usually in more than five pairs ; each inframarginal with a pore ; limbs with one or two claws. *Lepidochelys olivacea kempii* (Garman) (Waters of Massachusetts, England, Ireland and Azores) : Colour dorsally dark grey ; laterals usually in five pairs inframarginal poreless ; limbs three clawed (Deraniyagala 1961).

Distribution : The Olive Ridley Turtles are widely distributed in the tropical coastal waters of Pacific, South Atlantic and Indian Oceans. (Dash & Kar 1990).

Nesting of the Olive Ridleys in India is restricted to two beaches in Orissa, namely, the 35 km beach at Gahirmatha (within the Bhitarkanika Wildlife Sanctuary) (Bustard 1976, Bustard & Kar 1981, Kar 1982, Dash & Kar 1990, Silas *et al.* 1983, and Frazier 1982) and a 3-4 km stretch of beach c. 100 km south of the Gahirmatha between Nandikhia muhana and Akasia muhana (Kar 1981), where females are observed to emerge for nesting in very large numbers (Kar 1981, Bustard and Kar 1981 and Tikader & Sharma

1985). The other major nesting sites of the Olive Ridleys in India and around are reported from Gorai, Kihim, Manori and Versova in Maharashtra (Tikader & Sharma 1985) ; a 50 km stretch beach south of Madras and Point Calimere in Tamil Nadu (Bhaskar 1982); Middle Andaman and Rutland in Andaman Islands and Nicobar Islands (Frazier 1982); Digha and Sundarbans coast in West Bengal (Biswas 1982 , Tikader 1983 , Saha 1984 and Raut & Nandi 1985). The minor nesting of this turtle is reported from the coasts of Goa, Kerala, Gulf of Mannar and Andhra Pradesh (Biswas, 1982, 1984 Kar 1983 , Whitaker 1977) ; Lakshadweep Islands (Frazier, 1982 ; Silas, 1984 ; and Bhaskar, 1982) and the Gulf of Kutch (Bhaskar 1978). The Bay of Bengal is a major centre for the Olive Ridleys which nest all along the east coast of India from the Sundarbans to the Gulf of Mannar (Biswas 1982, and Frazier 1985).

Like Orissa, very large scale nesting of the Olive Ridleys occurs at two beaches in Costa Rica on the east Pacific (Cornelius, 1982) , several parts of Pacific Mexico, Panama, Surinam, and Sri Lanka (Tikader and Sharma, 1985). Although most populations of this turtle are thought to be severely depleted throughout its range, small or moderate populations are still available in countries like Angola, Australia, Burma, El Salvador, French Guiana, Guatemala, Honduras, Indonesia, Madagascar, Malaysia, Mozambique, Nicaragua, Oman, Pakistan, Papua New Guinea, Senegal, Tanzania and Thailand (Groomridge & Wright 1982).

Habitat and ecology : The Olive Ridley is a circumglobal species of marine turtle and is widely distributed and relatively numerous in the tropical waters of the Pacific, Atlantic and Indian Oceans (Pritchard 1979, Sternberg 1981 ; and Tikader & Sharma 1985). The typical nesting of this turtle occurs mainly on the mainland beaches all over the world. The turtle is capable of foraging at relatively great depth (up to 150 metres or more) in tropical neritic waters and undertake long journeys in search of suitable feeding grounds. It becomes sexually mature at the age of 8 - 10 years. The general breeding season all over the world is between September and March. Nesting takes place mainly at night. The clutch size ranges between 74-126 in Costa Rica, 37-166 in Surinam, 90-140 in Sri Lanka (Tikader & Sharma 1985) and 79-201 in India (Saha 1987). Eggs are round with a mean diameter of 37.5 - 40.5 mm. The incubation period ranges between 46 and 63 days. (Whitaker 1977 and Saha 1984). Hatching success of eggs and

survival of hatchlings are extremely poor owing to large scale predation by a wide variety of birds, mammals, reptiles and other organisms including ghost crabs, dipteran flies and notably fungi and bacteria. The Olive Ridley feeds mainly on benthic crustaceans like crabs and shrimps and on larger planktonic organisms and marine algae, but sessile and pelagic tunicates, jellyfish, other small invertebrates, small fish and molluscs are also included in the diet (Mortimer 1982).

Population : The population either in the wild or in captivity is not exactly known. According to Dash & Kar (1990), the nesting beaches in Cuttack district, the rookery at Gahirmatha and another near Devi river estuary in Orissa attract about half a million Olive Ridley, nesting annually and laying more than 50 million eggs each year.

Scientific interest and potential value : The Olive Ridley is one of the most economically important sea turtles in India. It is kept in the zoos and aquaria for the visitors. It has considerable potential value for its human consumption and leather trade. The flesh of the Olive Ridley is considered a great delicacy. The eggs are also heavily consumed (Rao 1987 and Murthy & Menon 1976).

Commercial use : Massive commercial exploitation of the Olive Ridleys is done by man for flesh, skin, leather and eggs. The skin of the neck, shoulders and limbs of this turtle is utilized for the hide trade for making luxury goods. The maximum consumption of the skin occurs in Japan and various European countries, especially Italy (Tikader & Sharma 1985).

Trade data : The species has a considerable commercial importance in the economy of the eastern and southern coastal areas of India. Organised turtle fishery operations were done by the fisherman community in the coastal belt of the Bay of Bengal and Orissa during the peak mating and nesting season and the Olive Ridley turtles were the only principal catch. This catch was mainly exported out of the state almost every day from Puri, Bhubaneswar, Malatipalpur and almost all coastal railheads in Orissa. During the period from November, 1974 to January, 1975 from Puri Railway Station alone, a total of 6,339 live turtles were booked to Calcutta (Biswas 1982). During 1978-79, a total of 21,361 live turtles were landed at sea side depots of Digba and Junput of West Bengal (Biswas, 1982). Roughly an estimated

number of 50,000 – 80,000 adult Olive Ridleys of both sexes were captured in every nesting season upto 1980-81 from off shore of Gahirmatha rookery, (Kar & Dash 1984). In addition, during 1982-83 nesting season (mid-December, 1982 to the end of February, 1983) approximately 10,000 live turtles were clandestinely landed at Banshalghat landing centre of West Bengal (Dash & Kar 1990).

A survey of the market places in West Bengal during February, 1983 revealed that "The trade in the Olive Ridleys was continuing more under cover and seemed to be flourishing as well as ever" During 1983-84, several thousand turtles were also transported to the Howrah market from Digha and adjoining areas of West Bengal (Silas *et al.* 1983). During 1974-75 the wholesale price of adult turtles at Howrah market was from Rs. 55 to Rs. 60 per turtle and the meat was sold at Rs. 5 to Rs. 6 per kg. During 1979-80 the price was from Rs. 80 to Rs. 100 per turtle and during 1982-83 from Rs. 110 to Rs. 160 per turtle (Biswas 1982, Dash & Kar 1990). During the late 1970 considering the price of Olive Ridleys at Howrah wholesale market on an average of Rs. 100 per turtle and a rough estimate of an average of about 50,000 turtles arriving at the market places at Calcutta per season, the resource potential roughly valued at Rs. 50 lakhs per season (Das & Kar *loc. cit.*). In addition, it is estimated that various companies in Mexico, Equador and Pakistan, trading in the Olive Ridley leather and flipper skin for luxury goods have slaughtered more than 4,46,000 fully grown adult Olive Ridleys, since 1977 (Tikader & Sharma 1985).

Threats to survival : The major threats to Olive Ridley populations are commercial harvest of adults and its eggs from nest beaches, incidental catch in shrimp trawls, predation on hatchlings and eggs by a wide variety of animals and other organisms including human beings, and habitat destruction/modification etc. (Tikader & Sharma 1985, Valliapan & Whitaker 1974, Kar 1980, 1983, Silas *et al.* 1983, Biswas 1982).

The Olive Ridley Turtle is considered to be an endangered species and has largely depleted over much of its range owing mainly to its massive commercial exploitation by man for flesh, skin, leather and eggs and for high incidental catch in shrimp trawls. The skin of the neck, shoulder and limbs of this turtle is utilized for the leather trade. Destruction of habitats by subsequently emerging females, non-human predators and due to erosion

of the beach, and development of habitat modifications namely construction of holiday homes etc, in the vicinity of nest beaches are further threat to the Olive Ridleys. An outbreak of skin infection among infant Olive Ridleys due to attack by fungi, viruses, bacteria and helminths is also a threat to the species (Whitaker, 1978 ; Cooper & Jackson, 1981 ; Banerjee, 1984 and Banerjee, Nandi & Rauth, 1986). Unexpected drop in the number of nesting females during 1982, 1986 and 1988, is a matter of great concern for environmentalists all over the globe (Barua, Dey and Mohanti-Hejmadi, 1989).

Conservation measures taken : As per latest legislation, an effective and strict ban has been imposed on all the trading of the species and the industrialised fisheries programmes at the nesting beaches. The incubation of ovidual eggs have been started (Tikader & Sharma 1985). Effective conservation programmes for survival of the Olive Ridleys have already been implemented in different countries including India (Bjorndal 1982). The species has been listed on Appendix I of the CITES. However, Japan is the only country which has entered a reservation on Appendix I listing of Olive Ridley Turtle. In India, the species has been considered endangered and is placed on Schedule I of the Indian Wildlife (Protection) Act, 1972, as amended upto 1992 and thereby both turtles and eggs are locally protected. As such extensive conservation measures have been taken by the State Forest Department of Orissa to protect the major Olive Ridley rookery at Gahirmatha beach which is under the Bhitarkanika Sanctuary (Kar & Dash 1984). India's first hatchery dealing with some Olive Ridley eggs was established by Madras Snake Park Trust in 1973 (Whitaker 1977). Captive rearing of Olive Ridley hatchlings was also started at Point Calimere in Tamil Nadu by the State Forest Department (Ponnuswamy & Rehaman 1985). The Project Tiger authority of the Sundarbans in West Bengal came forward to conserve the nesting areas in the Sundarban coast on the Bay of Bengal and established two Olive Ridley hatcheries at Sajnakhali Forest Office and at Bhagabatpur Crocodile Rearing Centre (Saha 1984, and Raut & Nandi 1985).

Captive breeding : Three hatchlings from a natural nest are reported to have been maintained in captivity at Madras Snake Park Trust for two years (Whitaker 1979). An Olive Ridley Sea Turtle hatchery was established near Madras in the winter of 1988-1989. Nests were collected and brought to the

hatchery for incubation under natural condition, in view of releasing the hatchlings after emergence. Altogether 8,625 eggs, representing 69 clutches, were collected and thereby 5,725 living hatchlings were obtained indicating a hatching success of 63.38%. Mean clutch size was 126.83 and incubation period ranged from 39 to 52 days (Abraham 1990). Hatchlings of *Lepidochelys olivacea* for the growth studies were obtained from transplanted nests in the Ekakulanasi hatchery of Orissa (Dash and Kar 1990).

Conservation measures suggested : For the conservation of the Olive Ridley Turtle of the Indian coast, information on population dynamics, such as sex ratio, annual recruitment and mortality, age distribution are important for proper implementation of a conservation programme in the Indian coast. Das and Kar (1990) have, in the meanwhile, done some pioneering research work on different aspects of biology of this endangered turtle at the Gahirmatha Marine Turtle Research and Conservation Centre, Orissa by the efforts of the Government of India and Orissa and the advice of F.A.C.

The following proposals are, therefore, suggested for the protection and conservation of the Olive Ridley population which are equally applicable for other endangered species of marine turtles (Biswas 1982, Dash & Kar 1990).

1. Existing legislations should be effectively and most rigidly enforced and national parks and sanctuaries adequately protected.
2. All the major nesting beaches should invariably be declared turtle sanctuaries where total ban be enforced and the immediate off shore areas be closed for trawling operations particularly off nesting beaches. For Orissa, where Olive Ridley's concentration occurs, a minimum of 10 km wide strip of coastal waters extending from Palmyras Point near Wheeler Islands to False point near Hukitola Island i.e., from latitude 20°47'N to 20°16'N should be declared off limits to all fishing activities during the months between September and March-April (Dash & Kar 1990).
3. There should be complete ban on leather trade of the species and country like Japan must be asked to withdraw its reserva-

tion on Appendix I of CITES listing.

4. High priority must be given to the development of fishing equipments which prevent the incidental catch of these turtles in trawl nests (Anon, 1982).
5. Annual quotas of turtle catch and collection of its eggs should be fixed for each demarcated areas. Fishery and Forest Departments of the concerning States should be entrusted to supervise the exploitation so that it does not exceed the fixed quota.
6. Buying and rebuying scheme of turtle eggs in the entire coast of India should be started under the Fishery and Forest Departments. If the Government can not finance sufficiently for such a scheme, the assistance from the W.W.F., U.N.D.P., I.U.C.N. and other societies interested in the conservation of the natural resources, should be sought for. The eggs thus procured should be buried for incubation.
7. Survey of entire coastal belt of India, particularly of Orissa and monitoring of populations in the area of high turtle concentrations should be taken up regularly.
8. Exploitation of eggs from mass nesting beaches be avoided and poaching and predating of juveniles and nesting females from their breeding grounds should be protected by the coastal, Forest and Lighthouse guards from the poachers and predators by regularly patrolling these areas.
9. Centralised hatcheries may be established for translocation of nests from areas where eggs are liable to be destroyed by beach erosion or by inundation during subsequent high tides to increase overall percentage of hatching.

Experiments relating to beach erosion can be taken up so that immediately after termination of an arribada, eggs from these critical areas can be removed for large scale hatchery incubation.

10. With this end in view a pilot project of a Turtle Ranch as is in operation at the Field Station of the Surinam Forest Service to

raise newly hatched Green Turtle in captivity should be started at a suitable place in the coast of Bay of Bengal (Marine Turtle newsletter No. 7, April, 1975). There is a scope in India for establishing such a project at the Waltair Zoo-garden.

- 11 During the peak hatchling emergence period, collection should be made of the hatchlings which fail to reach the sea before dawn for releasing them into the sea and thus reducing the hatchling mortality.
12. Since the mass nesting habitats of the Olive Ridleys all over the world are very closely related to the presence of mangrove habitats in the vicinity, all such habitats in India should be listed in an inventory. As a result it will have the way to protect the mangrove ecosystem and its associated sea turtle habitats in India (Das and Kar *loc. cit*).
13. To increase conservation awareness in the coastal people and fishermen who will interact with this endangered species, a programme of conservation education should be taken up.
14. There should be international co-ordination in the formulation of conservation and management programmes and detailed investigations on the biology and ecology of the turtle should be persuaded.
15. In India, The Central Marine Fisheries Research Institute (CMFRI) has started an encouraging programme on the conservation and effective management of all the endangered species of marine turtles including the Olive Ridley Turtle (Tikader & Sharma *loc. cit*).

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Leatherback Sea Turtle

Order TESTUDINES

Dermochelys coriacea (Linnaeus, 1766) Family DERMOCHELYIDAE

Measurements : Length of carapace 140–200 cm; Weight 400–725 kg.

Diagnostic characters : largest and the heaviest of all existing species of turtles and tortoises, being devoid of cornified epidermal structures. However, in hatchlings and young, body and limbs being covered with small, irregular, polygonal shields, and top and sides of head with symmetrical plates. In adults, carapace being smooth-skinned and rubber-like and made of 7 strong nodular, longitudinal ridges; jaws provided with sharp edges but devoid of flattened horny plates; upper jaw bears a pair of strong cusps flanked by three deep notches, and lower jaw having median hook. Head large and neck massive. Limbs paddle-shaped and clawless; front flippers triangular, extremely long and powerful; hind flippers broad and connected to tail by fold of thick skin. Tail short. Carapace slaty-black with white spots; ventral colour a mixture of pink, white and black. In adult females, crown of head provided with a pink spot. Tail black (Smith 1931).

Intraspecific variation : No intraspecific variation in the Leatherback Turtle has been reported.

Distribution : The Leatherback Turtle is a circumglobal species and its nesting occurs on the beaches of tropical seas of the Atlantic, Pacific and Indian Oceans. It occasionally migrates to the subtropical and Mediterranean waters also. Most nesting sites of this turtle are restricted to 30° N and 20° S. (Groomridge & Wright 1982).

In India, moderate aggregations of nesting Leatherbacks are recorded every year on certain isolated beaches in the Union Territory of the Andaman, Nicobar and Lakshadweep Islands and the populations of the emerging Leatherbacks are said to be highest (Bhaskar, 1979, Bhaskar 1981 and Frazier, 1982) on the Great Nicobar and Little Andaman Islands. Small-scale nesting of the isolated leatherback turtles are reported on the mainland from Quilon (on the Kerala coast), Goa, other parts of the west coast and certain parts of the central east coast of India. (Bhaskar 1979 and

Murthy & Menon 1976). There are instances of Leatherback turtles being caught in the sea off Visakhapatnam or occasionally coming for nesting on the Waltair coast of Andhra Pradesh (Biswas 1984).

Habitat and ecology : The Leatherback Turtle is ecologically unique among sea turtles having mainly a pelagic mode of life, usually found in open seas and depending on land for nesting. The large, bulky, thick-skinned and oily body with a low surface facilitates the species in maintaining adequate temperature while foraging in cool waters of certain temperate zones. It is a powerful swimmer with a strong instinct for migration and prefers to live in the open seas. The ridges and grooves on the carapace and streamlined, boat-shaped body of the Leatherbacks also provide extraordinary capacity to maintain high-speed swimming in the sea. This is a most secretive animal and is rarely seen away from its nesting sites. It prefers to nest on the mainland beaches instead of Islands. The nesting season differs from place to place, mainly it is between March and February in the countries of the East Pacific. The Leatherback breeds 3–4 times in a year but the peak-period is during May-July. Nesting of the turtle takes place at night. The general nesting process in Leatherbacks is like that of the other marine turtles. A shallow nest-pit between 60–100 cm deep is scooped out by the mother turtle by vigorous movements of all the four flippers and tail. It remains almost undisturbed at the time of egg deposition. After egg laying the nest cavity is refilled and then the mother turtle returns back to the sea. An individual Leatherback may nest 9 times in a season at intervals of 10 days. Re-migration occurs after an interval of 2–3 years. A normal clutch includes 80–85 eggs but mean number of fertile eggs ranges from 66-104. Several clutches are laid during a year. Eggs are white, spherical in shape with a diameter of 53 mm. The incubation period ranges from 56–70 days and hatching success varies from 63 to 70%. The hatchlings at the time of emergence are 53–63 mm in length. Ghost crabs, monitor lizards, birds, pigs and other small mammals and sharks are the principal predators of eggs and hatchlings of the Leatherback turtle. Adult individuals of the turtle are devoured by sharks. Away from the nesting site the turtle is known to migrate considerable distances in the temperate and tropical waters for feeding. The diet of the Leatherbacks is unique among other sea turtles. The food consists almost entirely of jellyfish, and the Portuguese man of War

Physalia utricus, and also planktonic tunicates such as *Salpa*, *Pyrosoma* and ascidians. In the gut contents of the Leatherback, fish, molluscs, shrimps, crabs, and other marine animals are also found and it is because they were first devoured by the jellyfish. (Groomridge & Wright 1982, Pritchard 1979, Tikader & Sharma 1985 and Tikader 1983).

Population – wild/in captivity : The exact population either in the wild or in captivity is not known.

Scientific interest and potential value : Detailed research on life history parameters of this endangered turtle has got sufficient scientific interest for its conservation and management. The Leatherback turtle has got significant potential value due to its excessive consumption of eggs and adults for food and for use of oil and shark-bait. The skin is also of good value for preparing leather goods.

Commercial use : The Leatherback is one of the economically important marine turtles. Although its flesh is not considered to be very palatable but the eggs are considered a great delicacy when fresh. The oil extracted from the meat and eggs of the Leatherbacks is largely used as a preservative for wooden boats at an alarming level in certain countries. Adult leatherbacks are also considerably used as shark-bait. The skin is also of commercial importance for preparation of leather goods. (Pritchard 1979, Groomridge & Wright 1982, Murthy & Menon 1976, Rao 1987 and Tikader & Sharma 1985).

Trade data : No precise trade data is available on the Leatherback Turtle and its products. There is virtually no international trade in Leatherback parts or derivatives.

Threats to survival : The Leatherback Turtle has become endangered on account of excessive consumption of eggs and adults for food. Flesh of adults and eggs are extensively used for extraction of oil and as a shark-bait. Large-scale incidental catch in shrimp trawls and squid nets, increasing habitat destruction/disturbance near the nesting beaches, are other major factors responsible for decline of the population density of this turtle. The nesting females also face considerable mortality for being entangled in masses of dead mangrove roots along many beaches. Water pollution through discharge of industrial effluents to the rivers and seas and also

through recently occurred oil-slicks in the Persian Gulf on account of recent war in the Middle-East, poses a serious problem for survival of this endangered species. Granite blocks and embankments, designed as defences against sea erosion, prevent the turtle approaching beaches for nesting on much of the Kerala coast (Anon. 1981).

Conservation measures taken : The Leatherback Turtle is protected by legislation in most countries where nesting occurs, including Australia, Costa Rica, Dominican Republic, French Guiana, India, Indonesia, Malaysia, Mozambique, South Africa, Sri Lanka, Surinam and USA. As a conservation measure, operation of driftnets, which entrap these sea turtles, is prohibited along various nesting beaches during the nesting season. The species is listed on appendix 1 of the CITES and also considered as endangered under the 1973 U.S. Endangered Species Act. In India, the turtle is considered endangered and is placed on Schedule 1 of the Indian Wildlife (Protection) Act, 1972, as amended up to 1980.

Conservation measures suggested : For survival of the Leatherback Turtle and for preventing decline in its existing populations, the most effective measure will be to put a complete ban on its exploitation for any purpose, and all the legislations aimed at protection of the species must be enforced with strict rigidity. Restricted fishing zones should be established in areas of high Leatherback concentrations and use of excluder devices for trawl nets encouraged (Anon. 1982). Certain important beaches where considerable nesting occurs must be fenced off as a turtle sanctuary. Public awareness of the importance of wildlife conservation must be created in effective areas of overexploitation of the species. High priority should be given to the interest and needs of the local people who are engaged in the trade of this turtle for eggs and meat and measures should be taken to arrange alternate resources for implementing proper conservation and management measures. Effective measures should also be taken for controlling water pollution. Habitat destruction or disturbance in the process of urbanization in the coastal zones all over the world should be restricted to minimum.

Captive breeding : The Leatherback is entirely a free living pelagic marine turtle and does not prefer any unnatural habitat like a holding tank for captive breeding. Hatchlings are difficult to raise in captivity and do not

survive for more than a few months (Pritchard 1979). Although efforts are being made for captive breeding of this turtle at Miami Seaquarium in USA and at Himeji Aquarium in Japan, but nowhere it proves to be favourable so far.

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Batagur or Terrapin

Order TESTUDINES

Batagur baska (Gray, 1831)Family EMYDIDAE

Measurements: Total length about 61 cm; weight about 18 kg.

Diagnostic characters : A moderately large, web-footed, aquatic species of terrapin, with head comparatively small and upturned, and snout strongly pointed. A denticulated mid-dorsal ridge in both upper and lower jaws. Front feet provided with four claws. Carapace smooth, heavy and moderately depressed. Nuchal shields broader than long ; second and third vertebrals subequal. Plastron consists of paired gular, humeral, axillary, pectoral, abdominal, inguinal, femoral and anal shields. Plastron much smaller in size than shell opening, laterally angulate in the young and somewhat rounded in the adult, truncated anteriorly and notched posteriorly ; inguinal shields larger than axillary. Costal shields 4 on each side and marginal 25 or 26 (including one nuchal and a pair of supracaudal). Shell uniformly brown, olive brown or greenish ; head, under surface of neck and front limbs deep crimson ; hind part dull reddish purple and eyes greenish yellow (Smith 1931, Tikader 1983, Tikader & Sharma 1985).

Intra-specific variation : No intraspecific variation has so far been recorded in the species.

Distribution : India : The River Terrapin is confined only to the deltaic region of the mangrove in the Sundarbans. The species once was found in the Saltlake of the eastern Calcutta Metropolis (Das 1989). The remains of the *Batagur baska* has been wrongly reported from Saranath, U.P. by Nath (1959). After more than a decade Ghosh and Mandal (1990) have recorded the species again from the Indian part of the Sundarbans. Das (1986) has reported this River Turtle from a pond in Kumirmari in the deltaic part of the Sundarbans. The turtle is reared in captive condition by the local people. Das (1989) has mentioned the possible availability of this species in the Bhitarkanika National Park, Orissa.

Elsewhere, the species is distributed in Bangladesh (part of the Sundarbans), Burma, Thailand, Vietnam, Malay Peninsula and Sumatra.

Population in the wild/captivity : The population of the species either in the wild or in captivity is not exactly known but the density of population has been depleted to an alarmingly low level on account of indiscriminate and extensive commercial exploitation.

Habitat and ecology: The Batagurine River Turtle is found in fresh, brackish or even salt water. It occurs in fresh water lakes, canals, and other water bodies. But its most favourite habitat is the shallow, muddy and tidal regions at the wide river mouths amidst mangrove or other vegetation. The species is omnivorous but prefers a vegetatrian diet consisting of stems, leaves and fruits of riverine plants ; it also partly feeds on molluscs, crustaceans and fishes. Mating occurs between September and November. It nests in a colony on sandy banks from the beginning of January to early March. The female Batagur lays 50-60 eggs in three clutches (generally 10-30 eggs in each clutch). The interval of egg laying varies from 15 to 20 days. The incubation period under natural condition varies between 80 and 100 days. Artificial hatching of the species has been recorded for the first time in India (Ghosh and Mandal 1990). Altogether 79 hatchlings emerged from eggs after 60-66 days of incubation in the hatchery and average hatching success of 48% was recorded.

Scientific interest and potential value : The River Terrapin, *Batagur baska* is of considerable scientific interest in regard to its commercial exploitation on a very large scale. The species was largely eaten by man as palatable flesh. Its eggs are considered a great delicacy. It is alarmingly endangered over much of its range. The study of its natural history and present status has got considerable scientific interest for its protection, conservation and management.

Commercial use : The turtle was under heavy commercial exploitation in Bengal in the mid - nineteenth century for its palatable flesh and eggs as food and for its fat which was largely used as raw material in the manufacture of soap in Calcutta.

Trade data : Although no precise data on trade is available, it is known that the species was once extensively exploited for commercial purposes.

Threats to survival : The Batagurine River Terrapin has become exclusively endangered in the range of its distribution owing to extensive

commercial exploitation for its flesh, eggs and fat. Habitat destruction is also a major factor for the decline of the species in India, Malaysia and Thailand. Factors that are responsible for habitat destruction of the species are deforestation, removal of riverine sand, clearing of river side vegetation, exposing the banks to erosion, construction of illegal hutments, urbanisation along the banks and day to day increase in the steamer traffic in the rivers. Predation on eggs and juveniles by a number of mammals, birds, reptiles and fishes is also one of the causes of threat to survival of the species.

Conservation measures taken : The terrapin is protected by wildlife legislation throughout its range. During the last 35 years many hatcheries have been established in Malaysia and Thailand to incubate batagur eggs. Hatchlings and juveniles of different age groups are released in the rivers from time to time. An estimated figure of 10,000 is believed to have been released in Perak river since 1969 (Moll, 1980). The species has been listed as endangered by IUCN in its Red Data Book (Groomridge & Wright, 1982). It has also been considered endangered by the Convention on International Trade in Endangered species of Wild Fauna and Flora (CITES) and placed in Appendix I of the CITES according to which the species and its products can not be traded in the international markets. The species has also been listed as endangered and placed in Schedule I of the Indian Wildlife (Protection) Act, 1972.

Conservation measures suggested : There is an urgent need to enforce the Wildlife (Protection) Act with sufficient rigidity. The present habitat of the species must be preserved to protect the existing population in the deltaic regions of the Indian part of the Sundarbans. More status surveys should be conducted and suitable habitats of the species should be identified and protected under sanctuary management. Peak breeding and nesting seasons of the species fall between September and November and January and March respectively. A ban on exploitation during the above period would greatly enhance the production of the species. Our knowledge on the status, habitat requirement and biology of the species is very limited. With this end in view co-ordinated and comprehensive research projects should invariably be undertaken for effective conservation and management of the species. Public awareness in regard to wildlife conservation must be created to gain more support for sanctuary management.

High priority should be given to the interest and needs of the local people and suitable measures to be adapted in arranging alternative resources wherever possible.

Captive breeding : Altogether 79 hatchlings of the Batagurine River Turtle have been raised for the first time in India from artificial incubation in a hatchery at Pakhirala in the Sundarbans Biosphere Reserve, West Bengal (Ghosh and Mandal 1990).

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Indian Tent Turtle***Kachuga tecta*** (Gray, 1831)

Order TESTUDINES

Family EMYDIDAE

Measurements : Total length about 23 cm.

Diagnostic characters : A small freshwater turtle, males smaller than females, with head moderately small, pointed and shorter than orbits. Skin of posterior part of head divided into large shields. Skull having a bony temporal arch. Carapace elevated and rounded. Ventral keel prominent, abruptly transforms into a strong spinous process at the posterior margin of third shield. Posterior margin of carapace generally not much serrated. Nuchal shield broadest at the posterior margin ; first vertebral shield variable in shape ; second vertebral shield generally longer than the third, and obtusely pointed posteriorly ; third vertebral not much elongate, always pentagonal and pointed behind and touches the pointed extremity of the fourth vertebral ; fourth vertebral shield much longer than the other vertebral shields ; fifth vertebral broader than long and much broader than other vertebrals. The plastron consists of paired gular, humeral, axillary, pectoral, abdominal, inguinal, femoral and anal shields. Plastron as long as carapace, angulate laterally and truncate posteriorly ; the longest median suture between the abdominal shields, shortest between the gular and anal; axillary and inguinal shields almost equal. Limbs having broadly webbed digits and transversely enlarged scales. Tail short. Body dorsally olivaceous, with minute black spots and orange or reddish vertebral stripe ; latter almost distinct on anterior dorsum extending up to first three shields. Spots become indistinct in adult individuals. Colour on ventral aspect reddish yellow with large dark brown or almost black spots. Head blackish, temporal region orange or yellow with thin yellow longitudinal lines ; limbs dark olive with yellow spots, and back of thighs with dark transverse streaks (Tikader 1983).

Intraspecific variation : None

Distribution : *India* : The North Indian Roofed Turtle is distributed in the Ganga and Brahmaputra River systems of northern India. Fossils of the

species have been recorded from the Pleistocene of the Siwalik Hills (Smith 1931).

The species is also available in the Sind River system of Pakistan (Smith *loc. cit.*).

Habitat and ecology : The turtle is entirely aquatic and inhabits fresh-water bodies with plenty of aquatic vegetation. It is a less active species and comparatively a poor swimmer. It is predominantly a herbivorous species, feeding chiefly on vegetable matter. The breeding habits of the species is not much known. Eggs are round or oval in the same clutch. (Smith *loc. cit.*, Pritchard 1979, Tikader and Sharma 1985). Defensive behaviour of the turtle has been recently recorded by Das (1988).

Population in wild/captivity : The population of the North Indian Roofed Turtle either in the wild or in captivity is not exactly known.

Scientific interest and potential value : Detailed scientific research on the biology and status of this freshwater turtle is highly essential with regard to its suitable conservation and management. In absence of detailed knowledge on the population status and biology of this species, effective conservation measures could not be taken.

The turtle and its eggs have reasonable economic importance. It is a source of cheaper food for the local tribals as well as the poorer sections of the urban and rural people. It is also useful to mankind by its role in cleaning the aquatic ecosystem, acting as a species for "Biological Control of Pollution". It is further useful for medical uses. People use it as medicine for curing piles, inflamed eyes, healing sores or burns, stomach problems, menorrhagia, colds and tuberculosis (Moll 1984, 1985, Rao 1986, 1987, Tikader & Sharma 1985).

Commercial use : Eggs and adults of the North Indian Roofed Turtle are commercially exploited on a large scale for food as a cheap source of protein and for medicines (Moll *loc. cit.*, Rao *loc. cit.*, Tikader & Sharma *loc. cit.* and Pritchard *loc. cit.*).

Trade data : Exact trade data on this freshwater turtle is not available. However, illegal trade on this species occurs in northern India. A large number of these turtles are caught from several north Indian rivers and sent to various wholesale markets, especially in Howrah, a suburb of Calcutta

(Moll 1984).

Threats to survival : Not much information on the status of this riverine freshwater turtle is available. This most familiar species has become extremely vulnerable and its population reduced drastically on account of over-exploitation of eggs and adults for food as a chief source of protein and medicines (Moll *loc. cit.*, Tikader and Sharma *loc. cit.*, Rao *loc. cit.*, Pritchard *loc. cit.*, and Whitaker and Das *loc. cit.*). Habitat destruction or alteration is also an important threat to the species. The water development projects in India are serious threats to the freshwater turtle populations. The construction of various dams and barrages on the rivers mainly affects the natural riverine habitats of this turtle. The nesting areas of the species are destroyed by removal of sand for conversion of river banks into agricultural fields and as such aquatic vegetation is lost. Owing to these factors the scarcity of food for these turtles increase and the population declined (Moll *loc. cit.*, Rao 1985 and 1987, Tikader and Sharma *loc. cit.*). The bank erosion, flood tides and other abiotic factors are also population decline of this turtle (Rao 1987). Mortalities of this turtle in polluted rivers due to toxins from pesticides and industrial wastes along with the sewage of riverside communities is also not ruled out. (Rao *loc. cit.*).

Conservation measures taken : The North Indian Roofed Turtle is listed in Schedule I of the Indian Wildlife (Protection) Act, 1972 and (Tikader 1983 and Moll 1985) in Appendix I of CITES. During 1982-83, Dr. E.O. Moll, the then Chairman of the Freshwater Turtle specialist Group, conducted status surveys of Indian freshwater turtles to collect informations on species diversity and causes of population decline (Moll *loc. cit.* and Rao 1985, 1986, 1987). The report of these status surveys recommended a major revision of these freshwater turtles listed in CITES Appendices and in the Schedules of the Indian Wildlife (Protection) Act, 1972 and provides a preliminary management plans for the chelonians of India (Rao *loc. cit.*).

Conservation measures suggested : In his recommendations to the Wildlife Department, Dr. E.O. Moll, emphasised the need to establish additional sanctuaries, provide hatcheries, protect nesting areas of turtles, legislate closed seasons for turtle exploitation (Dec – May for hard-shelled turtles and Aug – Dec for soft shelled turtles) and stepping up the enforce-

ment of India's Wildlife (Protection) Act, 1972 (Rao 1985, 1986 and 1987, Moll 1984, 1985 and 1987 and Whitaker and Das *loc. cit*). A major difficulty with enforcement has been that few Wildlife officers have the training to identify the freshwater species. The Wildlife officers should have reptile identification unit in the curriculum of the Wildlife Training Institute at Dehradun (Moll 1985) or members of the Wildlife officer and staff should be trained by the experts in the identification of the species.

Our knowledge on the habitat requirement and biology of this endangered freshwater turtle is very limited (Murthy and Pillai 1986). So, in view of taking suitable conservation steps well planned research studies are highly essential. More status surveys of this turtle should be conducted and suitable habitats should be identified and protected under sanctuary management.

An awareness of the importance of wildlife conservation should be created among the public to gain more support for sanctuary management. High priority should be given to the interest and needs of the local people and measures should be taken to arrange alternative resources wherever possible. (Rao 1985 and Tikader and Sharma *loc. cit.*).

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Indian Flap-shelled Turtle
Lissemys punctata (Lacepede, 1788)

Order TESTUDINES
Family TRIONYCHIDAE

Measurements : Carapace length about 24 cm ; maximum recorded length 35 cm (Bhupathy 1989).

Diagnostic characters : A small, flat turtle, with head moderately large, and snout short and broad, length less than that of orbit. Carapace and plastron covered by a cutaneous sheet of soft skin and their callosities finely granulated. Lateral and hinder portion of carapace flexible. Two neural plates rest between first pair of costals. First marginal bone in adults much larger than other marginals. Plastron with soft, semicircular flaps which conceals the retracted hindfoot. Plastron with seven callosities in adults, namely, paired hyo-hypo, xiphi, and epiplateral and a single entoplastral. Limbs fully webbed, with only three claws on each foot. Tail very short. Body olive brown above ; carapace also olive brown with or without numerous black bordered yellow spots, irregularly arranged and with a light yellow marginal rim.

Intraspecific variations : Two subspecies occur in India, namely, *Lissemys punctata andersoni* and *Lissemys punctata punctata*. Former is found in northern India and the Andaman Islands, and the latter in southern India, south of the Ganga river system. First marginal bone in *andersoni* is very large, larger than other marginal ones and entoplastral callosity quite small, whereas first marginal bone smaller than second and entoplastral callosity very large in *punctata*.

Distribution : India : The Indian Flap-shelled Turtle is distributed throughout India, except Jammu and Kashmir, Arunachal Pradesh, Nagaland, Manipur, Mizoram and Tripura.

The North Indian or the Indo-Gangetic Flap-shelled turtles are found in the whole of northern and northwestern India, mainly in the Ganga River System (Smith 1931, Tikader & Sharma 1985, Moll 1985). Very recently it has also been authentically reported from the Brahmaputra River System (Talukdar 1979, Das 1990). The turtle is specifically recorded from the Kutch district

(Smith 1931 , Sharma 1982 , Tikader & Sharma 1985), Vadodara, Surat and Bhatnager districts (Vyas & Patel 1990) and the Gir Wildlife sanctuary, Gujarat (Frazier 1989) ; the Pali district (Sharma & Vazirani 1977 , Biswas & Sanyal 1977) ; and Keoladeo National Park, Bharatpur, Rajasthan (Auffenberg 1981 , Whitaker 1981 , and Bupathy 1989 , John 1988) ; The Ganga River Systems of U.P., M.P., Bihar, West Bengal, and Sikkim (Smith 1931) ; Kaziranga National Park, Sibsagar district, Assam (Talukdar 1979 and Das 1990) ; West Khasi Hills of Meghalaya (Das 1990) and the Andaman Islands (Tikader & Sharma 1985). The most recent records of this turtle, (*Lissemys punctata andersoni*) from both Assam and Meghalaya, indicate its significant and widespread distribution in the Brahmaputra drainage also.

The South Indian or Peninsular Flap-shelled turtle is confined to peninsular India, south of the Ganga River System (Smith 1931 and Tikader & Sharma 1985). It has been specifically recorded from the Barakar, Kasai, Mahanadi and Godavari rivers ; in Tamilnadu, it occurs in the hills upto 1000 m altitude and at sea-level ; it also occurs in Andhra Pradesh, Madhya Pradesh (Jhansi), Maharashtra and Gujarat (Smith, 1931). Annandale (1912, 1913) recorded this turtle from the Chotanagpur plateau (Manbhum district), Bihar and the Mahanadi river and its tributaries, Orissa. It has also been found in the lakes, ponds and rivers of Orissa (Biswas & Acharjyo 1977 and 1984), Goa (Sharma 1975), Narmada Valley, Jabalpur district (Khajuria & Agrawal 1981), and Bhupal and National Chambal Sanctuary over Chambal river in Madhya Pradesh (Rao 1986).

The North Indian Flap Shelled Turtle is distributed in Bangladesh, Nepal, Pakistan (Sind river systems) and Burma (Akyab and on Jerdo Island off the coast of Arakan) (Ingolby & Procter 1923, Smith 1931 and Tikader & Sharma 1985). The Southern or The Peninsular Flap-shelled Turtle is confined to Sri Lanka only (Smith 1931, Pritchard 1979, Tikader & Sharma 1985).

Habitat and ecology : The North Indian Flap-shells prefer to inhabit shallow, muddy ditches, lakes and marshes. Annandale (1912) remarks that although it rarely leaves the ponds in which it lives, it is fond of sunning itself on logs or stones projecting from water. It is extremely timid and difficult to approach.

The southern Flap-shells prefer to live in ponds and tanks with muddy

bottoms and embankments (Tikader & Sharma *loc. cit.*) In Sri Lanka, it is generally distributed at low altitudes, being found chiefly in ponds and lakes.

The northern subspecies is a carnivorous turtle and feeds mainly on frogs, fishes, shrimps and snails (Tikader & Sharma *loc. cit.*). According to Sharma and Vazirani (*loc. cit.*), in captivity, it is omnivorous and a voracious feeder and devours almost everything which is considered worth eating i.e. aquatic vegetation, plant leaves, flowers, fruits, grasses, all kinds of seeds and flesh of any kind.

The southern subspecies is strictly carnivorous and has a great liking for fish but devours frogs, shrimps, and snails also (Tikader & Sharma *loc. cit.*). Deraniyagala (1939) states that it is very destructive to fish and during the night it wanders ashore in search of other food. It is a very pugnacious creature and bites savagely and suddenly when caught (Smith *loc. cit.* and Tikader & Sharma *loc. cit.*). Yadav (1989) reported this subspecies to be omnivorous in habit.

The North Indian Flap-shells are reported to have well adapted to deal with draught conditions and successfully burry themselves in dry pond bottoms. This phenomeon reduces dessication as well as predation of these turtles (Auffenberg 1981). Sexual dimorphism in *Lissemys punctata andersoni* has been recently observed by Agarwal (1987).

Very little is known about the breeding habits of either of these forms. Both are said to lay 10-12 spherical eggs in a single clutch, being burried in the ground close to the water. The eggs of the South Indian form are known to measure 30-33 mm in diameter. (Smith *loc. cit.* and Tikader & Sharma *loc. cit.*).

Population in wild/captivity : Of the six species of Soft-shells inhabiting India, the Flap-shell is the most common and widespread, occurring in a variety of habitats from small tanks to large rivers (Moll 1985). No exact figure is available on either of the population.

Scientific interest and potential value : The turtle provides an important source of protein and hence a large number of people eat its meat and eggs. The population density of the species has declined considerably due to illegal over-exploitation and habitat destruction. As such it has become

endangered over much of its range. Although protective legislation is being enforced it is not sufficiently rigid anywhere owing to inadequate knowledge on the biology of this turtle. Therefore, co-ordinated and comprehensive research on the bioecology of this turtle is necessary for conservation and management of the species (Rao 1987 and Tikader & Sharma *loc. cit.*).

Commercial use : The economic benefits of this turtle both direct and indirect are a matter of consideration. The former involves the extensive commercial exploitation of the species for various uses such as protein-rich food and medicine and the latter includes those benefits to mankind from its role in cleaning the aquatic ecosystem, acting as a medium for "Biological Control of Pollution" (Moll 1985, Murthy & Menon 1976, Rao 1987, and Vyas & Patel 1990). People prepare medicines from this turtle for curing piles, inflamed eyes, sores or burns, stomach problems, menorrhagia, colds and tuberculosis (Moll 1982, Murthy & Menon 1976, Rao 1987).

Trade data : A regular trade in this turtle existed in Calcutta and Howrah where they were readily sold in large numbers (Murthy & Menon 1976). In recent year a large number of freshwater turtles including the Indian Flap-shells reach the West Bengal markets from several north Indian rivers (Moll 1984, 1985) and Madhya Pradesh (Rao 1985).

Threats to survival : The Indian Flap-shelled Turtle is threatened owing to ruthless killing and illegal over exploitation of adults and their eggs for protein-rich food and in the making of tonic and medicines to cure diseases. Habitat destruction in the form of urbanization is another threat for survival of the species. The biological needs (breeding behaviour) of the turtle are being affected to a greater magnitude by changes in its natural environment, that is being altered by water development projects in the form of construction of dams and barrages, and cultivation along the river banks, etc. Other general factors responsible for the decline of the species are water pollution, drug trade, and human activities (Tikader & Sharma *loc. cit.*, Moll *loc. cit.*, Rao *loc. cit.*, and Auffenberg 1981).

Very recently Bhupathy & Vijayan (1989) reported that predation pressure is very high (46%) on the Northern Flap-shell Turtles in the Keoladeo National Park, Rajasthan, and major predator on land is the white scavenger vulture and in water the Ganges Soft-shelled Turtle, *Trionyx*

gangeticus Cuvier. According to Sivasubramaniam & Bhupathy (1990), Adjutant stork is also reported to be a predator of the turtle.

The vulnerability of the species to draught was drastically reported by Stan and Belinda while filming the aquatic reptiles at Bharatpur, Rajasthan, witnessing death of several thousand flap-shelled turtles due to extreme draught (Whitaker 1981a).

Conservation measures taken : The species has been protected by legislation and export of adults and their products is prohibited. But the legislation is nowhere sufficiently rigid. In India it has been considered endangered and protected under Schedule I of the Indian wildlife (Protection) Act, 1972 and in Appendix I of CITES. Exact data on the population density of these turtles is though, not available, it has declined in recent years. The Madras Crocodile Bank has developed the turtle breeding and research programme on the endangered Indian turtles and tortoises. Fresh water Turtle Rearing Centre has been recently established at the National Chambal Sanctuary in Madhya Pradesh and Uttar Pradesh (Rao 1987). A project for rehabilitation of freshwater turtles including the Indian Flap-shells has been initiated in Uttar Pradesh (Basu 1986). Survey of freshwater turtles in India is being carried out by a research team of the Zoological Survey of India (Murthy, pers. comm.). Various national parks, sanctuaries and biosphere reserves have been created in India in recent years for protection and conservation of the wildlife wealth of India.

Conservation measures suggested : For effective protection and conservation of the species legislation must be enforced with more rigidity in all the areas of its distribution, restricting its illegal exploitation and trade. An "All India co-ordinated and comprehensive programme of research on the status and bioecology will pave the way to formulate suitable management plans for conservation of this endangered species. Such studies might be taken up by the research personnel of the Department of Environment, Govt. of India, in collaboration with the Wildlife Institute of India. The following measures are suggested for conservation and management of the Indian Flap-shelled Turtles.

- 1 Detailed studies on the ecology and behaviour of this turtle in order to identify its conservation requirements.

2. Identification of the turtle populations in different river systems by counting the nesting females.
3. Detailed studies of ecological relationship among sympatric species.
4. Comprehensive studies on the environmental parameters required to successfully breed these turtles.
5. Detailed studies on species diversity and causes of decline of the population density.
6. Captive breeding should be encouraged to meet the market demand which may release pressure of turtle capture in nature.
7. Natural habitats of the turtle to be preserved urgently.
8. An awareness of the importance of wildlife conservation should be created amongst the public to gain more support for protection and preservation of the endangered species.
9. The Wildlife Officers concerned with the enforcement of the Wildlife (Protection) Act must be trained in the identification of freshwater turtles.

Captive breeding : Informations on captive breeding of the Indian Flap-shelled Turtle, *Lissemys punctata* are not available from any where in India. A programme on rehabilitation of the freshwater turtles including the Indian Flap-shell has, however, very recently been initiated in U.P. (Basu 1986).

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Indian Soft-shelled Turtle
Trionyx gangeticus (Cuvier, 1824)

Order TESTUDINES
Family TRIONYCHIDAE

Measurement : Length of shell about 700 mm.

Diagnostic characters : A very large and most commonly occurring soft-shelled turtle, with an oval shell. Head large and broad, dorsolaterally situated eyes and quite a thick and somewhat elongated proboscis ; diameter of snout equal to that of orbit. In skull, post-orbital arch one-half to one-third the diameter of orbit ; alveolar surface of upper jaw flat, with a well-defined medial axillary groove between them ; mandibles with raised inner edges, which meet at the symphysis to form a short, median projection; length of symphysis less than diameter of orbit, in adults. Two neural plates rest between first pair of well-developed costal plates ; last pair of costals generally contacting in mid-line ; all the plates of carapace coarsely pitted and vermiculated ; Nuchal shield absent ; anterior limbs of epiplastra long and slender, in contact with or narrowly separated from one another ; four plastral callosities, hyo, hypoplastral and xiphiplastral well developed in the fully grown adults; in old individuals a fifth callosity also present upon entoplastron. Limbs three clawed. Tail short. Dorsally, carapace dull olive or greenish, with irregular dark reticulations ; plastron ivory white ; head greenish, with a black longitudinal streak from between the eyes on the nape, and three oblique black streaks on either side diverging from it ; another streak starting from behind eye. Juveniles greenish, with a fine black reticulated pattern of four irregular ocelli on carapace ; sometimes with black longitudinal line on top of head.

Intraspecific variation : No intraspecific variation has so far been reported in the species.

Distribution : The Ganga Soft-shelled Turtle chiefly inhabits the river systems of the Ganga and Mahanadi (Anderson 1872, Boulenger 1890, Annandale 1912, Smith 1931, Pritchard 1979, Sharma 1982 , Daniel 1983 , Biswas & Acharjyo 1984, Tikader & Sharma 1985, Das 1985). The turtle is also found in the Brahmaputra river system (Moll 1985), the rivers of Jodhpur

and Dungarpur districts (Sharma & Vazirani 1977) and Keoladeo National Park, Bharatpur in Rajasthan (Bhupathy & Vijayan 1989, Bhupathy 1990), in the Mahi Narmada, Tapti, Sabarmati, Purna and Ambika rivers in Gujarat (Sharma 1982, Vyas 1989 a, b, Vyas & Patel 1990), Betwa river (Rao 1985, 1986 & 1987), lakes in Bhopal (Rao 1986) and the Chambal river of the Gangetic system in the National Chambal Sanctuary (Rao, 1986). Biswas & Acharjyo (1984) however, remarked that the distribution of the species from Madhya Pradesh and western part of Orissa is poorly known.

The species is common in the Sind river system of northwest Pakistan (Anderson 1872, Prasad 1914, Smith 1931, Minton 1966, Pritchard 1979, Tikader & Sharma 1985 and Das 1985), Padma and Meghna river systems of Bangladesh (Whitaker 1981, Whitaker and Das 1989) and the Nepal foot hills (Tikader & Sharma 1985).

Habitat and ecology : The species is known to be highly aquatic inhabiting the deep turbid rivers but it is frequently seen basking on sandy banks or retiring in shallow waters with its head stricking out of water. It is an omnivorous species and the diet comprises a wide range of aquatic vegetation and animal food like fish, molluscs, frogs and crustaceans. It is known to be a very prominent scavenger also, feeding even on human corpses ; and as such the turtle is useful to mankind by its role in cleaning the aquatic ecosystem, acting as a species for 'Biological control of Pollution' (Tikader & Sharma 1985, Rao 1987). Rao (1986) reported that *Trionyx gangeticus* can live without food for more than a year and it also consumes meat and eggs of its own species in captivity, which is an evidence of cannibalism. Very recently Bhupathy and Vijayan (1989) reported for the first time that the Ganga Soft-shell turtle feeds also on Indian Flap-shelled turtle, *Lissemys punctata* in the Keoladeo National Park, Bharatpur, Rajasthan. According to Sharma and Vazirani (1977), the Ganga Soft-shell turtle feeds on aquatic weeds, plants grasses, small fishes, earthworms, rotten flesh, tad-poles, gram seeds, wheat flour, ground nuts, bread and other eatables, in captivity. The reproductive behaviour of Indian freshwater turtles is poorly known. However, sexual cycles of female and male *Trionyx gangeticus* were studied by Rao (1985 b, 1986 c, 1987), Rao and Shaad (1985) and Singh (1986). Egg laying continues from May to December. A natural clutch of small *T. gangeticus* (mean carapace length 45 cm) have up to 15 eggs.

(Singh 1986), and of large turtles having 60 cm carapace length up to 40 eggs (Rao 1983).

Population, in wild/captivity : Although no precise data on the population density, either in the wild or in captivity, is available, the species has been drastically depleted owing to heavy commercial exploitation without effective controls or resource management over the years.

Scientific interest and potential value : The most extensive use of Ganga Soft-shells and its eggs in India is as food that provides an important source of protein to the local tribals and poorer sections of the urban and rural population. The species has been greatly endangered due to extensive commercial exploitation and habitat destruction (Tikader & Sharma, 1985 ; Murthy & Pillai 1986). Comprehensive research on various aspects of biology of the species, therefore, has got reasonable scientific interest for initiating appropriate conservation and management plans for survival of the turtle (Moll 1984, 1985 , Rao 1987).

Commercial use : The economic benefits of the turtle both direct and indirect, are a matter of consideration. The former involves the extensive commercial exploitation of the species for various uses such as protein-rich food and medicines and the latter includes those benefits man derives from its role in cleaning the aquatic ecosystem, acting as a species for 'Biological control of Pollution' (Moll 1985 , Rao 1987). People prepare medicines from this turtle for curing piles, inflamed eyes, for healing sores or burns stomach problems, menorrhagia, colds, tuberculosis, etc. (Moll 1985 , Murthy and Pillai 1986 , Rao 1987).

Trade data : Amongst the mud-turtles, species of *Trionyx* and *Lissemys* are mostly edible and a regular trade in these species exists in the Calcutta markets where they are readily sold (Murthy & Menon, 1976). In recent years a large number of freshwater turtles including the Ganga Soft-shells are sent to West Bengal markets from several north Indian rivers (Moll 1984, 1985 , Rao 1985). Moll (loc. cit.), however, mentioned "now the turtle catch from West Bengal had dwindled to such a point that in most areas it is no longer profitable to fish for the market vendors, and thus the collapse of the turtle industry in West Bengal has increased the pressure on turtle populations in neighbouring states"

Threats to survival : *Trionyx gangeticus* has become endangered on account of excessive killing of the adults for flesh, and overexploitation of eggs for food and medicines, (Tikader & Sharma 1985). Habitat destruction is also a principal threat to survival of the species. Their biological needs are affected to a greater extent by changes in their natural environment, which is being altered by water development projects in the form of construction of hydro-electric dams and barrages, agricultural activities along the river banks etc. (Rao 1987). Other general factors responsible for the population decline of the species are predation on eggs, juveniles and nesting females by predators like mongooses, jackals, dogs, birds etc., human disturbances, water pollution, and natural disasters including drought (Moll 1984 , Rao 1985).

Conservation measures taken : The species is legally protected from killing and trade by inclusion in Schedule I of the Wild Life (Protection) Act and Appendix I of CITES. Frazier has made short studies at several places in Gujarat and submitted a report on the conservation of chelonians in the Gir Wildlife Sanctuary (Frazier 1989). Basu (1986) reports that a project for rehabilitation of freshwater turtles has recently been initiated in Uttar Pradesh. Several species of soft-shelled and hard-shelled turtles are being reared at the Madras Crocodile Bank for display to the visitors and also as an attempt of captive breeding. Bioecological studies on the freshwater turtles in Keoladeo National Park were also undertaken by the scientists of the Bombay Natural History Society at its ecological centre at Bharatpur, Rajasthan (Bhupathy and Vijayan 1989, Bhupathy 1990).

Conservation measures suggested : For effective protection of this species legislation should be enforced more strictly in the known range of its distribution and rigid measures to be taken against its illegal exploitation and trade. A more detailed co-ordinated programme of research on the status and ecology will lead us to formulate suitable management plans to scientifically conserve this endangered species (Tikader & Sharma, 1985 ; Rao, 1985). An 'All India co-ordinated research project on turtle research' has been recently considered by the Department of Environment, Govt. of India, in collaboration with the Wildlife Institute of India. Some of the studies and courses of action needed for turtle conservation and management as suggested by Rao (1985, 1986, 1987) and Moll (1985) are as follows :

- 1 Detailed studies on the ecology and behaviour of this turtle in order to identify its conservation requirements.
2. Identification of the turtle populations and its suitable habitats in different river systems by counting the nesting females.
3. Detailed studies of ecological relationship among sympatric species.
4. As it is difficult to explain the rate of mortalities among the newly emerged hatchlings, it is recommended to adopt the same technique of the grow and release programme' as is being practiced for Indian crocodilians.
5. Under management programmes, regular monitoring of the rehabilitated turtles should be conducted by trained field staff.
6. Detailed studies on the environmental parameters needed to successfully breed the turtles.
7. Natural habitats of the turtles to be preserved and agricultural practices on the river banks to be stopped as far as practicable.
8. An awareness of the importance of Wildlife conservation should be created amongst the public to gain more support for protection and preservation of this endangered turtle.
9. The freshwater turtles listed in CITES Appendices and in the Schedules of the Indian Wildlife (Protection) Act, 1972 should be thoroughly reviewed based on more detailed reports.
10. Co-operative management and conservation efforts between the states and federal government are highly necessary, if turtles are to continue as an important, renewable protein resource within the country.
- 11 Imposition of legislation in the peak nesting seasons for turtle exploitation.
12. The Wildlife officers and staff should be trained in the identification of the freshwater turtle species that are listed in Schedule I for proper enforcement of the Wildlife (Protection) Act, 1972.

Captive breeding : Information on captive breeding of the Ganga Soft-shelled Turtle is very limited. Breeding groups of several species of hard shelled and Soft-shelled turtles including the Ganga Soft-shells, *Trionyx gangeticus* are being reared at the Madras Crocodile Bank, Tamil Nadu for display to the visitors and also as an attempt at captive breeding (Anon. 1985). A project for rehabilitation of freshwater turtles including the Ganga Soft-shells, has recently been initiated in Uttar Pradesh (Basu 1986).

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Compiled by S.K. Talukdar, B. Duttagupta, & G. Dasgupta

Peacock-marked Soft-shelled Turtle
***Trionyx hurum* Gray, 1831**

Order TESTUDINES
Family TRIONYCHIDAE

Measurement : Total length 60 cm and above.

Diagnostic characters : A gigantic soft-shelled turtle, with relatively large head and snout prominently projecting downwards and longer than the diameter of orbits. Postorbital arch one-half to one-third the diameter of orbits ; alveolar surface of upper jaw sloping gradually to meet median maxillary groove ; median groove of mandibular symphysis longer than orbital diameter. Other characters of carapace and plastron same as in *Trionyx gangeticus*. Body olive green dorsally, reticulated with black and generally with 4 striking ocelli like the peacock eyes. Head dark green with several yellow spots. A pale yellow spot across snout present. Plastron ivory white.

Intraspecific variation : No intraspecific variation has so far been reported in the Indian Peacock Soft-shelled Turtle, *Trionyx hurum*.

Distribution : Until recent past the species was known to be distributed in the lower reaches of the Ganga and the Brahmaputra river systems (Smith 1831, Pritchard 1979, Daniel 1983, Tikader & Sharma 1985 and Das 1985). Very recently the species has been reported from the West Champaran district of northwestern Bihar, near the Nepal-Uttar Pradesh border (Moll & Vijaya 1986) and Sitapur district of Uttar Pradesh (Basu & Pai 1988). Interesting records of occurrence of this turtle have also been made very recently from Pune, Maharashtra (Varghese & Tonapi 1986), Bhopal in Madhya Pradesh (Das 1987), and from the Keoladeo National Park, Bharatpur in Rajasthan (Bhupathy & Ajit Kumar 1988) which are far away from its previously known range. The present records clearly suggest that *Trionyx hurum* may be distributed in other isolated north Indian rivers. According to Moll (1985), the Peacock Soft-shelled Turtle is frequently encountered in the northern tributaries of the Ganga.

The species has extralimittally, been found from the lower reaches of the Sind river system, in Pakistan (Mertens 1969, quoted by Khan

and Mirza 1976).

Habitat and ecology : Very little information is, so far, available on the food and feeding habits, growth rate, ecology and on the breeding behaviour of this endangered turtle, which are essential in any attempt aimed at exploitation of our turtle resources in a rational manner (Murthy and Menon 1976 and Murthy and Pillai 1986). However, the Peacock Softshelled Turtle, *Trionyx hurum* is known to be markedly aquatic and omnivorous in habits (Tikader and Sharma 1985, Murthy 1985), and generally lying concealed in the bottom mud or sand and preying on organisms that pass over them. It inhabits swamps, ponds, pools with thick vegetation, sizeable lakes, brooks, rivers and even large streams (Rao 1987). The turtle feeds largely upon fish, prawns, molluscs, frogs, decaying organic and vegetable matter (Moll 1985, Rao 1987). Thus the turtle is highly useful to mankind by its role in cleaning the aquatic ecosystem, acting as a species for "Biological control of pollution". In captivity, it is said to devour rice, bread, sweet meats and other plant food (Murthy & Menon 1976). The females of *Trionyx hurum* are known to be larger than males. The peak nesting season appears to fall between August and December (Moll 1985 and Rao 1987), and it lays small, hard and round eggs (Rao 1987, Tikader and Sharma 1985).

Population in wild/captivity : Information on the population density of this endangered turtle either in wild or in captivity is not exactly known so far, but it is presumed to have drastically depleted in recent years (Tikader and Sharma 1985, Moll 1984, 1985, Murthy and Pillai 1986, Rao 1987).

Scientific interest and potential value : The most extensive use of the Indian Peacock Soft-shells and their eggs in India is as protein-rich food. The species has become, endangered due to commercial overexploitation and habitat destruction (Tikader & Sharma 1985, Murthy and Pillai, 1986, Moll 1984, 1985, Rao 1987). Detailed studies on various aspects of biology of this turtle, therefore, have got considerable scientific interest for initiating appropriate conservation and management actions for preservation of this endangered turtle (Moll 1984, 1985, Tikader and Sharma 1985, Murthy and Pillai 1986, Rao 1987).

Commercial use : Both direct and indirect economic benefits are derived from this turtle in India. The former involves the extensive commercial exploitation of the species as protein-rich food to the local tribals and poorer sections of the urban and rural people and the latter includes those benefits man derives from its role in cleaning the aquatic ecosystem, acting as a species for 'Biological control of Pollution' (Moll 1984, 1985, Murthy & Menon 1976, Murthy & Pillai 1986, Rao 1987). The turtle is also useful to mankind for medical purposes. People prepare medicines from this turtle for curing piles, inflamed eyes, for healing sores or burns and to cure stomach problems, menorrhagia, colds and tuberculosis etc. (Moll 1985, Murthy and Pillai 1986, Rao 1987).

Trade data : Amongst the mud-turtles, different species of *Trionyx* and *Lissemys* are mostly edible and a regular trade in these species exists in Calcutta, and Howrah markets where they were readily sold in large numbers (Murthy and Menon 1976). In recent years a large number of freshwater turtles including the Peacock soft-shells were sent to West Bengal markets from several north Indian rivers (Moll 1984). Rao (1985) added "illegal freshwater turtle trade in Bhopal included both soft-shelled and Flap-shelled turtles (collected from lakes and nearby rivers) that are sent to West Bengal markets and supplied to local slaughter houses during 1979–1980"

Threats to survival : In recent years *Trionyx hurum* has become much endangered on account of commercial overexploitation of adults and their eggs for food as a cheap source of protein (Daniel 1983, Tikader & Sharma 1985, Moll 1984, 1985, Murthy & Pillai 1986, Rao 1987); for medicines (Moll 1984, 1985, Murthy & Pillai 1986, Rao 1987) and due to habitat loss (Tikader & Sharma 1985, Murthy & Pillai 1986, Moll 1984, 1985, Rao 1985, 1986, 1987). The water development projects in India are significant threat to the riverine freshwater turtle populations including the Peacock Soft-shelled Turtle. The construction of various dams and barrages on the rivers largely affects the natural riverine habitats of these turtles (Moll 1984, 1985, Rao 1987). The nesting areas are destroyed by removal of sand for conversion of river bank into agricultural fields. It also resulted in loss of aquatic vegetation and consequent food scarcity for the turtles thus the population automatically declined (Moll 1985, Rao 1985, 1987). Loss of eggs, hatch-

lings and nesting females due to large scale predation by man, domestic and wild animals and birds, human disturbances, bank erosion, flood tides, natural disasters, water pollution and other abiotic factors are also among the principal factors for population decline of the species (Moll 1984, 1985, Tikader & Sharma 1985, Rao 1985, 1987).

Conservation measures taken : The species is legally protected from killing and trade by inclusion in Schedule 1 of the Indian Wild Life (Protection) Act and Appendix 1 of CITES respectively (Tikader 1983, Tikader and Sharma 1985, Moll 1985, Rao 1985, 1986, 1987). Although conservation laws were enforced, effective conservation and management plans could not be successful because of lack of adequate knowledge on the population status and biology of the species (Moll 1985, Rao 1985). With this end in view Dr. E. O. Moll, the then Chairman of the Freshwater Turtle Specialist Group, conducted status surveys of the freshwater turtles throughout India during 1982–83. The surveys were undertaken under an Indo-American Project to collect informations on species diversity and causes of population decline (Moll 1985, Rao 1985). The report of this status surveys recommended a major revision of the freshwater turtles listed in CITES Appendices and in the Schedules of the Indian Wildlife (Protection) Act, 1972 and suggested a preliminary management plan for the turtles of India (Rao 1985, 1987, Whitaker and Das 1989). The turtle gets protection in many of the conservation areas falling within its distributional range.

Conservation measures suggested : After completion of the status surveys of the freshwater turtles of India Dr. E. O. Moll, in his recommendations, emphasised the necessity of establishing additional Wildlife sanctuaries, national parks and biosphere reserves wherein the threatened species of turtles may have the avenues to increase their populations. He further stressed the need of establishing hatcheries, protect the nesting sites, legislate closed season for turtle exploitation and stepping up the rigid enforcement of India's Wildlife (Protection) Act, 1972 (Moll 1984, 1985, 1987, Rao 1985, 1986, 1987 and Whitaker and Das 1989). The peak nesting season of the species appears to fall between August and December. By legislating this period as closed season, the increased annual recruitment of young turtles into the populations could help to balance those being lost due to exploitation (Moll, 1985). The major turtle markets are found in West

Bengal. If these markets are permanently closed to either soft-shelled or hard-shelled turtles, there would be very little incentive to collect the species in other states. To be an effective instrument in the conservation of the species, the Wildlife (Protection) Act, 1972 should be very rigidly enforced. The Wildlife officers should have proper training to identify the species.

Our knowledge on the status, habitat requirement and biology of the species is very limited. With this end in view co-ordinated and comprehensive research studies are highly essential for effective conservation and management of the species. More status surveys should be conducted and suitable habitats should be identified and protected under sanctuary management.

Awareness of the importance of wildlife conservation should be created invariably amongst the public to gain more support for sanctuary management. High priority should be given to the interest and needs of the local people and measures to be adopted in arranging alternative resources wherever possible (Rao 1985, Tikader and Sharma 1985).

Captive breeding : Informations on captive breeding of the Peacock-marked Soft-shelled Turtle is not available from anywhere in India.

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Common Indian Monitor
Varanus bengalensis (Daudin, 1758)

Order SQUAMATA
Family VARANIDAE

Measurements : Head and body length 72–75 cm; tail 100 cm.

Diagnostic characters : A medium-sized, dark brown or olive brown monitor, with acute, long, and compressed teeth. Snout convex terminally, its length from two to two and a half times its height. Scales on crown of head much larger than nuchal scales and rounded and keeled posteriorly; supraocular scales small and subequal; mid-body scales 132–176 and abdominal scales in 90–100 transverse rows. Digits elongate. Tail long and strongly compressed, with a double-toothed crest above. Lateral caudal scales keeled and smaller than subcaudals. Tongue very long, forked and protrusible. Body dark brownish or olive brown above, usually with blackish dots; underparts yellowish or spotted with black; spots numerous on throat.

Intraspecific variations : Out of two subspecies, the nominate subspecies occurs in India and differs from *V. b. nebulosus* in mid-body scales (132–176 vs 70–90) and dark brown vs greyish body colour (Cogger 1979, Mertens 1942).

Distribution : The common Indian Monitor is quite predominant amongst the Asiatic monitor species. It occurs throughout the Indian subcontinent including Western Ghats (Smith 1935, Murthy 1978, 1985, Tikader 1983 and Auffenberg 1986). There are specimens in the collections of the Zoological Survey of India from Bigrani, Western Himalayas and Darjeeling in the Eastern Himalayas. The species is also reported from the Great Nicobar Island (Biswas & Sanyal 1977).

Extralimitally, the species is distributed in Sri Lanka, the greater part of Burma as far south as lat. 17°13' N; Nepal; Bangladesh; south-east Iran; Afghanistan; Pakistan and southeastern Uzbekistan (Smith 1935, Mertens 1942, Cogger 1979, Tikader 1983, Murthy 1985 and Auffenberg 1986).

Habitat and ecology : The Common Indian Monitor is mostly diurnal in habit. It is found in a wide range of habitats, viz. forest, desert, river banks,

by the side of nullah, marshy land, tidal creeks and even the sea coast. It occupies burrows, dense vegetation, hollows of trees, cracks and crevices. It is graceful in its movements and is a good climber, runner, fighter and swimmer (Murthy 1978 and Tikader 1983). In Bangladesh, the species is more commonly found on the high ground often around human habitation (Whitaker 1981). Though basically an animal of the plains, it is also found in the mountains up to 2,000 metres alt and from dry scrub to thick rain forest areas. The monitor is reported to be particularly partial to the drier parts of Burma, being found both in remote forests as well as on the outskirts of villages (Smith 1930). Monitors are carnivorous and feed mainly on terrestrial vertebrates preferring birds and their eggs, rats, frogs, fish and rotten flesh; also feed on crabs, arthropods and coleopterans (Smith 1930, Murthy 1978, Auffenberg 1979, Tikader 1983). They do not normally chew or crush their food but swallow it whole or in large chunks. Whitaker (1981) reports that in Madras rodents constitute 60% of its total gut contents. The combat, agonistic and courtship behaviour, seasonal testicular changes and female reproductive cycle have been studied in detail (Auffenberg 1979b, 1980, 1983, Upadhyay and Gukaya, 1972, Burhardt 1957, Jacob and Ramaswami 1976).

The common monitor is oviparous and from 10 to 20 eggs are laid in holes on secluded piles of rocks and debris between July and October (Whitaker 1981). However, Burhardt (1957) and Tikader (1983) mention from 19 to 30 eggs in a clutch. Eggs containing fully developed embryos of this monitor were collected in the end of March from the Megapod mound in Great Nicobar of the Andaman and Nicobar group of Islands (Biswas and Sanyal 1977). In central India (Madhya Pradesh), of this lizard are reported to have been deposited during September and the eggs measured approximately 25 X 45 mm in size (d' Abreu, 1932). Vijaya (1981) is of opinion that the Common Indian Monitor lays eggs in termite mounds in the Guindy Forest area, Madras during July.

Population : Exact figure of the wild population of this species is not known. Daniel (1970) and Dharmakumarsinghji (1978) mentioned alarming decrease in the population of *Varanus bengalensis* in northwestern India.

One specimen has been reported to breed in captive condition in the Honolulu Zoo in 1981 (Cogger 1979).

Scientific interest and potential value : Well planned co-ordinated and comprehensive research in collaboration with the Wildlife Institute of India on the status and bioecology of this endangered reptile has got considerable scientific interest in view of effective conservation and management needed. The lizard and its products are of great commercial importance in the international market.

Commercial use : The skin of *Varanus bengalensis* is highly prized and largely used in the manufacture of leather goods including articles of apparel and household use such as hand bags, wallets, shoes, watch-straps, (Bhanotar *et al.* 1974 , Murthy 1978, 1988, Smith 1930, Tikader 1983, Whitaker 1981), and scabbards for kukris (Das 1988). Its eggs are considered a delicacy and the entire animal is also eaten (Murthy 1978, 1988, Smith 1930 and Das 1989) ; oil extracted from fat is used in the treatment of failing eye-sight (Murthy 1986) and in cooking (Auffenberg 1986). Das (1989) remarks "Unani, the Greco-Arabian system of medicine which is part of the Indian materia-medica recommends the use of various body parts of monitors to cure numerous ailments" The flesh of freshly killed Indian monitor causes healing in case of thorn pricks and bites of poisonous animals (Hussain 1771 , Khan 1911, Vohora and Khan 1979), besides curing tuberculosis, skin problems and sexual debility (Nadkarni 1954 ; Vohora and Khan 1979). Monitor fat is an aphrodisiac and the excretion used in the treatment of eye and skin diseases (Hussain 1771 , Khan 1911 and Vohora & Khan 1979). Travelling hakims in India also exhibit a variety of drugs and tonics derived from these animal sources (Das 1989).

Trade data : A correct statistical record of production of fancy reptilian skins, especially of the Indian monitors, in different states of India is not readily available, but it was estimated that in 1932 about 12,000,000 animals including reptiles were killed for the sake of their hides and skins" (Bhanotar *et al.* 1974). In 1932, India exported two and a half million reptile skins and in 1933 about two and three quarter million. In September, 1932, over 600,000 skins chiefly of monitor lizards were shipped from Calcutta port alone. In 1955, the export figure of reptilian skins both raw and tanned to overseas market eg. Europe and America reached an enormous figure. In 1955, 12,71,000 skins were exported to France; Holland received 5,19,000, New York 14,38,000 whereas U.K. 6,63,000 skins. The exported

value of this trade is fairly high and India earned a good sum of money in the shape of foreign exchange to the tune of two crores.

An estimated 60 million worth of skin is smuggled out of the country every year. At present there are 15 million snake skins and 2,00,000 lizard skins in Madras city alone. Inskipp (1981) reported that despite laws protecting the Indian monitors, fairly large numbers are hunted for the leather trade in India. He further mentioned that in December 1979, dealers in Calcutta held over 3 million lizard skins in their stock, over 50% of these were of *Varanus flavescens* and an equal number of *Varanus bengalensis* and *Varanus griseus*. Whitaker (1981) and Khan (1989) commented that during 1978-79 nearly 2,00,000 monitor lizard skins were exported from Bangladesh to Japan for handbags, wallets, shoes and watch straps, of these about 25% was of the common Indian monitor. In June 1990, more than 17000 monitor skins were seized in Calcutta, which were being illegally sent outside.

Threats to survival : The population of the Common Indian Monitor, *Varanus bengalensis* has alarmingly dwindled throughout the Indian sub-continent mainly due to excessive exploitation of the adults for their commercially valuable skins, as food and in traditional medicines. Habitat loss due to large scale deforestation, urbanization, dams and hydroelectric projects and other abiotic factors are also responsible for the population decline of the species.

Conservation measures taken : The species has been declared protected under Schedule I of the Wild Life (Protection) Act. The IUCN has also considered the species endangered and listed in Appendix I. It is also listed in Appendix I of CITES according to which any international trade in the species and its products and any sort of commercial exploitation is strictly prohibited. The species gets protection in conservation areas falling within its distributional range.

Conservation measures suggested : Legislation must be enforced more strictly all over the range of distribution of the species for effective protection and conservation. Thailand and Japan must be convinced to withdraw their reservations and allow their monitor populations to be covered by Appendix I of CITES. There should be international co-ordination in starting suitable conservation programmes for the species. People

should be educated all over the world in conservation methods to evoke public awareness in order to protect the monitors.

Captive breeding : Very little information on captive breeding of *Varanus bengalensis* has been reported. One specimen has, so far been reported to breed in Honolulu Zoo in 1980. (Jenkins 1986).

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Yellow Monitor

Order SQUAMATA

Varanus flavescens (Hardwicke & Gray, 1827) Family VARANIDAE

Measurements : Head and body length 31.5 cm; tail 38.4 cm.

Diagnostic characters : A small species as compared to other Asian monitors. Potentially significant geographic, sexual and ontogenic variations exist in *Varanus flavescens*. Of these, the most important pertain to scalation, bodily proportions and colour pattern (Auffenberg *et al.* 1989). Characterised by slit-like nostrils located closer to tip of snout than to eyes, skull high in proportion to length, lower jaw robust, body scales relatively large, head scales smaller than strongly keeled nuchal scales, no enlarged supraoculars, dorsal scales much larger and heavily keeled. Scales around mid-body vary from 84 to 104. Ventral longitudinal scales from gular fold to insertion of hindlimb vary from 68 to 85. Body colour black or dark to light brown, with fused light tranverse bars. Throat provided with several black, posteriorly directed V's.

Intraspecific variation : None (Jenkins 1986).

Distribution : According to Auffenberg *et al.* (1989) "The species is found in the Indus, Ganges and Brahmaputra rivers and all of their tributaries, except those of the Ganges that are considered "Peninsular" (Chambal, Betwa and Ken Rivers; see Mani 1974).

The monitor is known from northern and northeastern India from Punjab to Orissa, West Bengal and Assam. In Orissa, the species inhabits the drainage systems of the Brahmani and Mahanadi rivers (Biswas & Kar 1982), being recorded from Balasore and Cuttack districts. In West Bengal, it is apparently more widely distributed than in the rest of the gangetic plain, where it seems to occur in isolated populations (Auffenberg *et al.*, 1989). In West Bengal, the species is found Terai, Siliguri in Darjeeling district; Calcutta; botanical gardens in Howrah district; Sagar Islands, Pathar Pratima, and Kakdwip in 24 Paraganas district (Auffenberg *et al.* 1989), Krishnagar in Nadia district; Singur, Hooghly district; Goalbathan, Pakur, Kharagpur and Medinipur in Medinipur district (Smith 1932). In Assam, the monitor is

reported from Guwahati, Guwahati district; and Goalpara in Dhubri district (Smith 1932). In Bihar, the lizard is reported from Patna (d'Abreu 1932 and Auffenberg, *et al.* 1989); Saran district (Smith 1932); Chapra and Bettiah districts (Auffenberg, *et al.* 1989). In Uttar Pradesh, the monitor was recorded from Gorakhpur, Fatehgarh, Varanasi, Mirzapur, (Auffenberg *et al.*, 1989) and Agra district (Anderson 1871 and Smith 1932), and New Delhi.

Extraliminally, the Yellow Monitor is known from Bangladesh (d' Abreu 1932, Whitaker 1981, Whitaker & Hitada 1981, Auffenberg *et al.*, 1989), Nepal (Boulenger 1885, Gurung 1983, R. Jackson, in litt.), and Pakistan (Murray 1884, Mertens 1942, Auffenberg *et al.* 1989, Hora & Chopra 1923, Mc Mohan 1901).

Habitat and ecology : The Yellow Monitor is primarily a species of marshlands (Jheels) in low-lying, sandy areas bordering large rivers and subject to annual flooding. This hydric habitat occurs in almost every locality where the species was observed in the wild – a heavily forested tract with many marshes and broods. The species lives in moist to wet rather than dry habitats (Visser 1985). It is a good swimmer and prefers to make burrows on muddy bunds, around ponds, lakes and marshlands. Captive Yellow monitors are carnivorous and reported to regularly feed upon mice and prepared reptile food (Visser 1985). According to Auffenberg; *et al.* (*loc. cit.*), evidence of prey found in 32 adult individuals included frogs, toads, amphibian eggs, reptile eggs, birds and their eggs insects and mammals (all rodents). Of these 40% were frogs, 9% were toads, 15% were reptile eggs, and 6% was mammals and the rest insects. Tikader (1983) states that the monitor feeds mainly on freshwater crabs and fishes. The Yellow Monitor sexually matures at the age of about three years (Visser 1985). Investigations on the female reproductive cycle of *V. flavescens* by Auffenberg *et al.* (1989) suggest that the females lay eggs annually in a single clutch. Considered on an annual basis, egg laying in yellow monitor occurs during a relatively short period-three months maximum. There are 4–30 eggs in a clutch. These are soft, smooth and leathery. Visser (1985) has shown that incubation time in captive monitors of this species is 149–155 days at temperature of 30°C. Biswas & Kar (1981) mentioned that July is the month of hatching. Whitaker (1981) reported that August is the month of egg laying for the Yellow monitor in India. Informations on male reproductive cycle of

varanid lizards are very limited. Average testicular volume of the Yellow monitor is lowest from September to February. It increases from March to July (Auffenberg, *et al.* 1989).

Populations in wild/captivity : Although exact data on the population either in the wild or in captivity of this Yellow monitor, is not available (Jenkins, 1986), the present wild population has been alarmingly dwindled throughout the range of its distribution. Auffenberg, *et al.* (1989) considered *V. flavescens* as the most endangered of all monitor species on the Asian mainland. Population and status data are particularly difficult to get. Hence, sustained and extensive status surveys in the range of its distribution are required to assess the population dynamics in the wild.

Scientific interest and potential value : All India well planned, co-ordinated and comprehensive researches in collaboration with the Wildlife Institute of India and other international institutions and organisations, on the status and bioecology of this most endangered monitor, will reveal considerable scientific data for its effective conservation and management. The monitor and its products are of significant commercial importance in the international market.

Commercial use : The Yellow monitors, *Varanus flavescens* are most extensively hunted for its commercially valuable skins like other Asian monitor species. The skin of this monitor is highly prized and largely used in the manufacture of leather goods including articles of apparel and household use such as hand bags, wallets, shoes and watch-straps (Bhanotar, *et al.* 1974, Murthy 1978, 1988, Tikader 1983, Whitaker 1981) including scabbards for Kukris (Das 1988). It is also used as upper leather for expensive shoes in the international market (Bhanotar, *et al.* 1974). Very recently Das (1989) published a review of human utilization patterns of the Indian Monitor lizards including *V. flavescens*. Few parts of the monitors are thrown away : eggs are considered a delicacy and the entire animal is also eaten (Murthy 1978, 1988, Das 1989); oil extracted from fat is used in the treatment of failing eye-sight (Murthy 1986) and in cooking (Auffenberg 1986). Das (1989) remarks – "Unani, the Greco-Arabian system of medicine which is part of the Indian materia medica recommends the use of various body parts of monitors to cure numerous ailments" The flesh of freshly killed Indian monitors causes healing in case of thorn pricks and bites of numerous

animals (Hussain 1771, Khan 1911, and Vohora & Khan 1979) besides curing tuberculosis, skin problems and sexual debility (Nadkarni 1954, Vohora & Khan 1979). Monitor fat is an aphrodisiac and the excretion used in the treatment of eyes and skin diseases (Hussain 1771, Khan 1911 and Vohora & Khan 1979). Travelling hakims or country doctors in India also exhibit a variety of drugs and tonics derived from these animal sources (Das 1989). Chakraborty and Chakraborty (1987) reported collection of the Yellow monitor, *V. flavescens* by local tribals of Birbhum district, West Bengal for sale to hakims.

Trade data : Approximately 6,80,000 skins of the Yellow monitor, *Varanus flavescens* were traded between 1975 and 1979. No trade in live specimens recorded by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) parties between 1982–1983 (Jenkins 1986). Bhanotar, *et al.* (1974) states that although a correct statistical record of production of fancy reptilian skins, especially of the Indian monitors, in different states of India, is not available readily, but in September, 1932 over 6,00,000 skins chiefly of monitor lizards, were shipped from Calcutta port alone and about 12,000,000 animals including reptiles were killed for the sake of their hides and skins. Bhanotar *et al.* (*loc. cit.*) further states that in 1955, the export figure of reptilian skins including those of Indian monitors (both raw and tanned) to overseas markets e.g. Europe and America reached an enormous figure and 12,71,000 skins were exported to France; 5,19,000 to Holland; 14,38,000 to New York and 6,63,000 to UK. "An estimated 60 million worth of skin is still smuggled out of the country every year (Anon. 1981). Bombay is the smuggler's favourite haunt, but Nepal is fast coming up as a rival. At present there are 15 million snake skins in Madras city alone, and 2,00,000 lizard skins" These lizard skins are presumed to be of Indian Monitor lizards. According to Das (1989) a fairly significant number of monitors is believed to be in India's luxury leather trade. Inskipp (1981) reported that despite laws protecting the Indian monitors, fairly large numbers are hunted for their trade in India. He, further, mentioned that in December, 1979, dealers in Calcutta held over 3 million lizard skins in their stock; over 50% of these were the 'Oval grained lizard', *Varanus flavescens*, with an almost equal number of 'Agra lizard' and 'Bengal lizard'. Whitaker (1981) Whitaker & Hitada (1981) and Khan (1989)

commented that during 1978–1979 nearly 2,000,000 monitor lizard skins were exported from Bangladesh, almost all to Japan for hand bags, wallets, shoes and watch-straps, of these 70% were of the Yellow monitors. Das (1988) states “Large number of varanid skins are known to be in the illegal reptile skin trade in Bangladesh and at least a part of this originate from the Indian state of West Bengal” Illegal trade of the monitor skins is still going on and in June, 1990, more than 17,000 monitor skins including those of the Yellow monitor were seized in Calcutta district for Bombay. Thus a significant drain on the wild population of this monitor is also suspected as a result of external commercialisation.

Threats to survival : The population of the Yellow monitor has alarmingly dwindled and become extremely endangered throughout the Indian subcontinent primarily due to illegal and extensive exploitation of the adults for their commercially valuable skins, utilisation by man for food and traditional medicines. These skins are used in the manufacture of luxury items, which are traded both in India and abroad. This luxury leather trade constitutes the principal threat to survival of the species. Local exploitation for meat, eggs and traditional medicines is the second major threat to survival of the species. The population density of this monitor has also greatly run down because of the requirement for preserved specimens as biological material used by north Indian Universities and colleges and museums (Auffenberg, *et al.* 1989) Habitat loss and other abiotic factors are largely responsible for the population decline of the Yellow monitor. Biswas and Kar (1982) remarked “Though the species is stated by earlier workers as common in many places of North India it is poorly represented even in the recent collections of Zoological Survey of India.” Smith (1932) mentioned the cause of rare distribution, “As its distribution coincides with one of the most densely populated parts of India, it may be that it is gradually exterminated” According to Auffenberg, *et al.* (1989) much of the original flood plain habitat throughout the range of the species has been greatly modified by agriculture, and in some instance, entire local populations of this lizard have been exterminated. The situation along the Yamuna river near Agra is an ideal example of this. The species was first reported by Anderson in 1871 and recently no specimen has been found from there (Auffenberg *et al.* 1989). “The same pattern of marshland conversion to

paddy fields has occurred on a massive scale throughout much of the Indo-gangetic Plain in the past and is responsible for much reduction in range and abundance of this species" Auffenberg *et al.* (*loc. cit.*) further remarks "This factor, plus the natural long term trend of desertification at least in the western half of the range of the species and the restriction of marshy areas to flood plains to begin with, accounts for the very spotty distribution of the species at the present time. The distributional pattern has changed in some areas due to high hunting pressure for its skin. Collectively, these factors lead us to consider *Varanus flavescens* as the most endangered of all monitor species on the Asian mainland.

Conservation measures taken : The Yellow monitor has been considered endangered and declared protected under Schedule I of the Indian Wildlife (Protection) Act, 1972. The International Union for Conservation of Nature and Natural resources (IUCN) has also considered the species as endangered and listed in Appendix I. The monitor is also included in Appendix I of the convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), according to which any international trade in the species and its products and any sort of commercial exploitation is strictly prohibited in the countries that have ratified CITES. Among the signatories of CITES, Japan has entered reservation on *Varanus flavescens* (Gaski 1988). The establishment of national parks, wildlife sanctuaries and biosphere reserves by the Government of India and State Governments have paved the way for protecting the monitor lizard population to a greater extent under sanctuary management.

Conservation measures suggested : Since the protective legislation is not adequately rigid, it must be enforced with more rigidity all over the known range of the species for effective protection and conservation. Japan must be convinced to withdraw its reservation and allow its trade on Yellow monitors to be covered by Appendix 1 of CITES. There should be international co-ordination in establishing suitable conservation programmes for the species. In addition, an 'All India co-ordinated and comprehensive research in collaboration with Wildlife Institute of India, on the status and bioecology of this most endangered species, should be taken up for its effective conservation and management. Suitable action plans must be formulated for protection of the interesting habitats, feeding grounds,

nesting areas, and hibernating spots of this monitor as far as practicable. Forest guards and wildlife officials must be deployed to keep constant vigil for checking illegal poaching and trading of the species and its products. People should be educated in conservation methods to evoke public awareness for suitable protection of the Yellow monitor and its ecosystem.

Captive breeding : Informations on captive breeding of the Yellow monitor, *Varanus flavescens* are very limited. Dr. Walter Auffenberg of the Florida State Museum, University of Florida, Gainesville, U. S. A. kept 32 adult individuals in Florida, in captivity, for his study, while Dr. G. J. Visser studied the courtship and breeding behaviour of his captive Yellow monitors in the Rotterdam Zoo in 1984–85 (Auffenberg *et al.* 1989, Visser 1985).

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Water Monitor***Varanus salvator*** (Laurenti, 1768)

Order SQUAMATA

Family VARANIDAE

Measurement : Total length 300 cm including the tail.

Diagnostic character : Largest of the Indian monitor lizards, with tapering head, and long slender neck. Snout depressed at the end and its length at least three times its height ; nostrils round or oval, twice as far from eyes as from tip of snout. Teeth long, sharp, recurved and acute, and strongly compressed. Scales on crown of head larger than nuchal scales ; median supraoculars transversely enlarged ; body covered with small, overlapping, granular and keeled scales. Abdominal scales feebly keeled and in 80-95 transverse rows. Digits elongate. Tail long, strongly compressed, powerful and keeled above. Subcaudal scales much larger than lateral caudals. Body dark olive, indistinctly spotted with yellow. Snout lighter and with transverse black bars. Ventral surface yellow. A temporal streak bordered by yellow extends along side of neck.

Intraspecific variation : Out of 7 subspecies of *Varanus salvator*, two occur in India. One, namely, *V.s.salvator* is found in India extending east to Southeast Asia and the *V.s.andamanensis* in Andaman Islands. The former is characterised by the mid-ventral surface pale with dark transverse bands only on sides ; nape scales scarcely or not enlarged ; sides of neck without longitudinal stripes. The latter has a blackish appearance with few narrow, vertical black V-shaped marks extending on the sides of the belly ; dorsal yellow spots absent.

Distribution : The Water Monitor, *Varanus salvator* is one of the most widely distributed monitor lizard species (Mertens, 1942 b).

In India, it is now largely restricted to the mangrove swamps of the Sundarbans in West Bengal (Smith 1935, Biswas & Kar 1982), Bhitarkanika in Orissa (Biswas & Kar 1981, 1982) and The Andaman and Nicobar groups of Islands (Smith 1935, Biswas & Sanyal 1977, Das 1988). Very recently the monitor has been recorded from the Khasi Hills, Meghalaya (Das 1989), although it was reported by Peary (1932) from the Garo Hills in Meghalaya.

(Previously in Assam) about sixty years back.

The Water Monitor has, extralimittally, a very wide range of distribution in southeast Asia, being known from Bangladesh, Bhutan, Brunei, Burma, Southern China, Hongkong, Indonesia, Kampuchea, Laos, Malaysia, Nepal, Philippines, Singapore, Sri Lanka, Thailand and Viet Nam (Jenkins, 1986).

Habitat and ecology : The Water monitor, *Varanus salvator* is more aquatic in its habits than the other Asiatic species, and is seldom found far from water. It inhabits wet, marshy and humid forests, bank of rivers, canals, the sea coast, particularly in the estuarine forests (Smith, 1935 ; Murthy, 1978). Whitaker (1981) reports that in Bangladesh it is rarely seen outside the Sundarbans Reserve forest in Khulna district. The monitor is reported to climb trees readily (Smith, 1935 ; Green, 1909 ; Deraniyagala, 1931) and to swim remarkably well far off in the sea (Smith, 1935) in search of food. Green (1909) reported that the water monitor, which is commonly known as 'Kabaragoya' in Sri Lanka, is arboreal in its habit. On land, it can travel at a considerable pace. It is omnivorous in diet and takes crabs fish, carrion, rats, birds, frogs, rotten flesh and insects but has special liking for birds and its eggs and fishes. Whitaker (1981) is of opinion that the stomach and intestine of the monitors in Bangladesh contain remains of a wide variety of insects, crabs, snails, frogs, feathers of birds and even goat horn. In captivity, the Water Monitor is reported to feed upon small fish, rats, crabs, and frogs (Andrews & Gaulke 1990). In India, it breeds from June to August (Whitaker 1981, Biswas and Kar 1981, Tikader 1983). 15-30 eggs are laid in holes on the river banks or on trees beside water. The breeding biology of this species has been very well worked out in captivity. The egg laying frequency of the females show that two clutches might be laid within one year and the average clutch size was found to be 13.8 (Schmidt 1927, Honnegger 1971, Kratzer 1973, Biswas & Kar 1981, Bowers 1981, Groves 1984, Andrews & Gaulke 1990).

Population : Although precise data on the population density either in the wild or in captivity of this water monitor is not available, the present wild population has been drastically depleted all over its known range (Murthy 1978).

Scientific interest and potential value : An 'All India Co-ordinated and

comprehensive Research' on the status and bioecology of this endangered monitor, will generate considerable scientific interest in regard to effective conservation and management. The monitor and its products are of significant commercial importance in the international market.

Commercial use : The Water monitor, *Varanus salvator* is most extensively exploited for its commercially valuable skins. The skin is highly prized and largely used in the making of leather goods including articles of apparel and household use viz. handbags, wallets, shoes and watch straps (Bhanotar *et al.* 1974, Murthy 1978, 1988, Whitaker 1981, Das 1988a), including scabbards for kukris (Das, 1988) and drums (Whitaker & Whitaker 1980). It is also used as upper leather for expensive shoes in the international market (Bhanotar, *et al. loc. cit.*). Very recently Das (1989) has published a review of human utilization patterns of the Indian Monitor lizards including *Varanus salvator*. Few parts of the monitors are thrown away : eggs are considered a delicacy, and the entire animal is also eaten (Murthy 1978, 1988 , Das 1989) ; oil extracted from fat is used in the treatment of failing eye-sight (Murthy 1986) and in cooking (Auffenberg 1986). The flesh of freshly killed Indian monitors including the water monitor causes healing in case of thorn pricks and bites of numerous animals (Hussain 1771 , Khan 1911 and Vohora & Khan 1979) besides curing tuberculosis, skin problems and sexual debility (Nadkarni 1954, and Vohora & Khan 1979). Monitor fat is an aphrodisiac and the excretion is used in the treatment of eye and skin diseases (Hussain 1771, Khan 1911 and Vohora & Khan 1979).

Trade data : From 1930 till recently, about 20,000,000 skins of the Indian water monitor *Varanus salvator* have been shipped from Calcutta alone. Its skin is in heavy demand in several countries in Europe. According to Jenkins (1986) 1615 consignments were recorded by The Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) Parties from 1975 to 1983 on an average of 4,19,910 live specimens and skins per year. Jenkins (*loc. cit.*) further adds "700,000 skins are traded per year from Singapore to Japan alone. 1989 live specimens reported by CITES Parties in 1982 and 1983 (main exporting country Thailand ; main importing countries U.S.A., F.R. Germany and United Kingdom)". According to Whitaker (1981) during 1978-1979 nearly 2,000,000 monitor lizard skins were exported from Bangladesh, almost all to Japan for handbags, wallets, shoes

and watch-straps and of these, about 70% were of the yellow monitor (*Varanus flavescens*), 25% of the Bengal Monitor (*Varanus bengalensis*) and 5% of the Water monitor (*Varanus salvator*). Bhanotar *et al.* (1974) states that although a correct statistical record of production of fancy reptilian skins, especially of the Indian monitors, in different states of India is not readily available, but in September, 1932 over 6,00,000 skins chiefly of monitor lizards, were shipped from Calcutta port alone. Bhanotar, *et al.* (*loc. cit.*) further adds that in 1955, the export figure of reptilian skins both raw tanned to overseas markets viz. Europe and America reached an enormous figure and 12,71,000 skins were exported to France ; 5,19,000 to Holland ; 14,38,000 to New York and 6,63,000 to United Kingdom. " An estimated 60 million worth of skin is smuggled out of the country every year. (Anon. 1981) Bombay is the smuggler's favourite haunt, but Nepal is fast coming up as a rival. At present there are 15 million snake skins in Madras city alone, and 2,00,000 lizard skins" All these lizard skins are presumed to be of the Indian monitor lizards including those of the water monitors. Das (1988) further states" large number of varanid skins are known to be in the illegal reptile skin trade in Bangladesh and at least a part of this originate from West Bengal in India. In June 1990, more than 17000 monitor skins including those of water monitor were seized in Calcutta which were being sent outside the country.

Threats to survival : The population of the Water Monitor, *Varanus salvator*, has drastically depleted and become alarmingly endangered throughout the Indian sub-continent primarily due to extensive exploitation of their commercially valuable skins, utilisation by man for food and for traditional medicines. Habitat loss due to large-scale deforestation, urbanization, various water development projects (hydro-electric) in the form of construction of dams and barrages, hydro-agricultural activities, and other abiotic factors, are largely responsible for the population decline of the water monitors.

Conservation measures taken : Enlisted in Schedule I of the Indian Wildlife (Protection) Act, 1972. The export of reptiles and their products from India has been banned since 1979. The International Union for Conservation of Nature and Natural Resources (IUCN) has considered species as endangered. The monitor is also listed in Appendix II by the

Convention on International Trade in Endangered Species of wild Fauna and Flora, according to which the water monitor can be exported or imported by those countries that have ratified CITES, provided shipment are accompanied by appropriate permission from the country of origin (Das 1989). The establishment of national parks, wildlife sanctuaries and biosphere reserves by the Government of India and the various State Governments has paved the way of protecting the water monitor population to a greater extent under sanctuary management.

Conservation measures suggested : It is, suggested that legislation pertaining to effective protection and conservation, must be enforced with more rigidity all over the known range of the species. Japan must be convinced to withdraw its reservation and allow its trade on water monitors to be covered by CITES list. The monitor must also be included in Appendix I instead of Appendix II of CITES, for absolute ban on any international trade in the species and its products and any sort of commercial exploitation. 'All India co-ordinated and comprehensive study' on the status of this endangered monitor and its natural history is of prime importance before any further exploitation for skins, food and purported medicines, etc. is permitted. Suitable conservation programmes must be formulated for protection of the interesting habitats, feeding grounds, nesting areas and hibernating spots of this monitor as far as practicable. Forest guards and wildlife officials must be deployed to keep constant vigil for stopping illegal poaching and trading of the species and its products. Finally, people must be educated in conservation methods for evoking public awareness for better protection of the water monitor population and its ecosystem.

Captive breeding : Informations on captive breeding of the Water monitor, *Varanus slayator* are very scanty. According to Reuben (1970) and Whitaker (1977) the Ahmedabad Zoo authority is known to have successfully bred the water monitor. Jenkins (1986) states that one specimen of this monitor was bred in the Madras Snake Park in 1978, whereas five monitors were bred in San Antonio Zoo in 1980. Very recently Andrews and Gaulke (1990) reported that they made a comprehensive study on the breeding biology of this monitor, in captivity, at the Madras Crocodile Bank, Madras, TamilNadu.

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Desert Monitor***Varanus griseus*** (Daudin, 1803)

Order SQUAMATA

Family VARANIDAE

Measurements : Head and body length about 52 cm ; tail 80 cm.

Diagnostic characters : A medium-sized monitor, with a moderately broad, head, a pointed snout being depressed at the end, nostrils obliquely slit, lying much nearer to eyes than snout. Head scales small, polygonal but larger than nuchal scales ; mid-dorsal body scales small (108–139 scales rows around the body), granular above and squarish below dorsal scales obtusely keeled ; abdominal scales smooth and in 110-125 transverse series; lateral caudal scales indistinctly keeled. Tail round in cross section throughout most of its length and 1.5 times longer than snout-vent length.

Body sandy dorsally, speckled with dark grey to black ; 3-4 cross bands on trunk, bordered by and sometimes enclosing white or brown spots ; brown cross bars upon the back and tail and 2-3 longitudinal brown streaks upon neck. Head dark grey to black. Tail often crossed with 8-12 greyish bands. Ventral surface white.

Intraspecific variations : Out of three subspecies of *Varanus griseus*, only one, namely, *V.g.koniecznyi* occurs in India and Pakistan. It is characterised by posterior half of tail round in cross section, dorsal pattern with grey transverse bands, and with 3-5 bright greenish transverse bands other than nuchal bands.

Distribution : The Desert Monitor is found in the desert regions of north-western India and westwards through southern Asia to the Caspian Sea and North Africa (Smith 1935). Auffenberg *et al.* (1990) states that it is distributed from northern Africa to north-central India.

The lizard appears to be fairly common in parts of Rajasthan and has been obtained as far east as Ambala, Agra, and Narshingarh in the extreme north of Madhya Pradesh, (Smith 1932, 1935). The species is also reported from Sikandara (Auffenberg, *et al.* 1990) near Agra (Carlleyle 1869), Dayalbagh (Auffenberg, *et al.* 1990), Agra (Boulenger 1885), and Oudh (Murray 1884) in U.P. ; Delhi (Jerdon 1870) ; Surat (Gleadow, 1905) ; Deesa (Smith 1932)

and Kutch (Stoliczka 1872) in Gujarat Ambala in Haryana Bikaner, Barmer and Pugal (Dave 1961), Pokaran (Auffenberg, *et al.*, 1990), Jodhpur (Smith, 1932 & Auffenberg, *et al.* 1990) and Jaipur (Auffenberg, *et. al.* 1990) in Rajasthan. Auffenberg *et al.*, (1990) states "At the southeastern limit the subspecies (*V. g. koniecznyi*) ranges into, but not beyond, the Gujarat Plains (Survey of India Maps, Pl. 41), and eastward to, but apparently not beyond the Ganga-Jamuna Doab"

The Desert Monitor is distributed westwards through southern Asia to the Caspian Sea and North Africa (Smith, 1935). It extends to Pakistan, Afghanistan, Iran and North Africa (Minton 1966, Tikader 1983). According to Cogger (1979) and Mertens (1942, 1954, 1956, 1969, 1971) the species is distributed in North Africa through Egypt, Sudan, Syria, Lebanon, Israel, Jordan, Saudi Arabia, Iraq, Iran, and Pakistan.

Habitat and ecology : The Desert Monitor inhabits sandy places, usually where the ground is undulating and the vegetation sparse (Smith 1935, Minton 1966, Tikader 1983, Auffenberg *et al* 1990). It can attain great speed in its movements, if required (Tikader 1983). It chiefly feeds on small rodents, lizards, snakes, insects and other small vertebrates. However, insects comprise the major food item (Corkhill 1928, Smith 1935, Tikader 1983, Dave 1961, Auffenberg *et al* 1990). In captivity, it feeds on fish, rats, mice, small toads and eggs (Minton 1966). The monitor sometime digs its own burrow but more often lives in holes made by other animals. It does not hibernate. There is little information on the reproductive biology of this species. The clutch size varies much. It ranges from 2 to 15 in Pakistan (Auffenberg *et al.* 1990), and 15-20 in India (Smith 1935, Tikader 1983). Females produce only one clutch per breeding season. Testes volume is highest in April and of ovary and ovum in August.

Population : Exact population either in the wild or in captivity of the Desert Monitor is not known.

Jenkins (1986) states that 4 specimens of *Varanus griseus caspius* were bred in the Novosibirsk Zoo (USSR) in 1980.

Scientific interest and potential value : An all India co-ordinated and comprehensive study on the status and bioecology of this endangered monitor will be of considerable scientific interest for its effective conserva-

tion and management. The lizard and its products have got considerable commercial importance.

Commercial use : Tikader (1983) states that like other monitors, the Desert Monitor is hunted extensively for its valuable skins. The skin of Varanus monitor is largely used in the making of leather goods including articles of apparel and household use such as handbags, wallets, shoes and watch-straps etc. (Bhanotar *et al.* 1974, Murthy 1978, 1988). Very recently Das (1989) published a review of human utilization patterns of the Indian monitors. According to him few parts of the monitors are thrown away ; eggs are considered a delicacy and the entire animal is also eaten ; oil extracted fat is used in the treatment of failing eye-sight (Murthy 1986) and in cooking (Auffenberg 1986). The flesh of freshly killed monitors causes healing in case of thorn pricks and bites of poisonons animals (Hussain 1771 , Khan 1911 and Vohora & Khan 1979), besides curing tuberculosis, skin problems and sexual debility (Nadkarni 1954 , Vohora & Khan 1979). Travelling hakims and country doctors in India also exhibit a variety of drugs and tonics derived from these animal sources (Das 1989).

Trade data : Approximately 180,000 skins of the Desert Monitor were traded between 1975 and 1979. No trade in live specimens has been recorded by CITES Parties in 1982-1983 (Jenkins 1986). Bhanotar *et al.* (1974) states that although a correct statistical record of production of fancy reptilian skins, especially of the Indian Monitors, in different States of India, is not available readily but in September, 1932 over 600,000 skins chiefly of monitor lizards were shipped from Calcutta port alone. Though the export of reptiles and its products from India have been totally banned since 1979, fairly large number of skins of snakes and monitor lizards are believed to be involved in the trade. Inskipp (1981) reports that despite laws protecting the Indian monitors, fairely large numbers are hunted for the leather trade in India. He further mentions that in December, 1979, dealers in Calcutta held over 3 millions lizard skins in their stock ; over 50% of these were the 'Oval-grained lizard,' *Varanus flavescens*, with an almost equal number of 'Desert monitor', *Varanus griseus* and 'Bengal monitor', *Varanus bengalensis*.

Threats to survival : Though in general much of the original preferred habitat of the Desert monitor in India remains intact, the population has

become exceedingly low in recent years owing to illegal exploitation of the adults for their commercially valuable skins (Tikader, 1983). Luxury leather trade both in India and abroad is the principal threat to survival of the species. Local exploitation for meat, eggs and traditional medicines is another threat to survival of the monitor. According to Auffenberg *et al.*, (1990) some schemes have been proposed in both India and Pakistan to convert some of the desert lands to agricultural lands, and this will undoubtedly result in some habitat destruction of the Desert monitor, but it is the least threatened lizard amongst the Asian monitor species.

Conservation measures taken : The species has been considered endangered and declared protected under Schedule I of the Indian Wildlife (Protection) Act, 1972. The monitor is also declared protected under Appendix-I of the International Union for conservation of Nature and Natural Resources (IUCN) and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) according to which any international trade in the species or its products and any sort of commercial exploitation is strictly prohibited. The creation of Desert National Park has also paved the way of protecting the monitor under sanctuary management.

Conservation measures suggested : Legislation must be enforced with more rigidity all over the range of the species for effective protection and conservation. In addition, an All India co-ordinated and comprehensive research in collaboration with Wildlife Institute of India, on the status and bio-ecology of this endangered species should be taken up for its effective conservation and management. Suitable action plans must be formulated for the protection of the interesting habitats, feeding grounds, nesting areas, etc. of the monitor as far as practicable. People should be educated all over the world in conservation methods to evoke public awareness for suitable protection of the Desert Monitors.

Captive breeding : Data on captive breeding of the Desert Monitor is very scanty. Only 4 specimens of *Varanus griseus caspius* Mertens were bred in Novosibirsk Zoo (U.S.S.R.) in 1980. (Jenkins, 1986).

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Indian Rock Python

Order SQUAMATA

Python molurus Linnaeus, 1758Family BOIDAE

Common local names : Ajgar (Hindi), Ajar Saap (Beng.).

Measurements : Total length 2.5-4.5 m ; maximum recorded length 7m.

Diagnostic characters : Second largest and heaviest of all the Indian snakes. Head distinct from neck and has symmetrical shields ; rostrals, anterior supralabials and anterior and posterior infralabials smooth and arranged in 60 - 75 rows. Tail short. Body colour pale grey to yellow above and yellow below ; flanks paler. A dorsal series of large walnut coloured crown saddles alternate with pinkish laterals giving a blotch pattern on the body.

Intraspecific variations : The Indian Rock Python has two distinct subspecies namely *Python molurus molurus* and *Python molurus bivittatus* which are popularly known as the Indian and Burmese pythons respectively. Former is distributed in Pakistan, Nepal, Bangladesh, Sri Lanka and India, and the latter is confined to northeastern India and Andaman and Nicobar Islands.

Distribution : The Indian Rock Python is distributed in the whole of the Indian subcontinent from Kashmir to Kanyakumari including northeastern India and Andaman and Nicobar Islands.

Apart from India, the species is found in Pakistan, Nepal, Bangladesh, and Sri Lanka.

Habits and habitat : Reliable information on the population, habitat and ecology of this giant snake is not available, although notes on its distribution, food and general biology are available (Whitaker 1978 and Daniel 1983). The Indian Rock Python is a serpent of marshes, gallery forests and wet rocky areas near streams and pools. It is a denizen of burrows, dense clumps of vegetation, large rotten logs, caves, crevices and old ruins namely, structures and monuments. It is a good climber and sometime suspends itself from the branches of trees, waiting motionless for a prey to come

within its easy reach. It is extremely fond of water and is an expert swimmer. Like all other species of reptiles it is poikiothermal by nature and as such it hibernates into hollows of trees, underneath rocks or rock - shelves. In Keoladeo Ghana National Park, Bharatpur (Rajasthan), this Python usually prefers saline patches where porcupine burrows are common (Bhupathy and Vijayan, 1989). The species is more nocturnal than diurnal. Its dietary habits are largely restricted to reptiles, birds and smaller mammals. It is oviparous and exhibits parental care like all other animals. The mother python coils herself around the eggclutch, varying from 60 - 100 eggs, till they hatch (Mukherjee, 1982 ; Tikader, 1983 ; Beadon, 1924 ; Begbie, 1907 ; Cadell, 1913 ; Channer, 1895 ; Forsyth, 1911 ; Keays, 1929 ; Leigh, 1928, 1936; Wall, 1919).

Homing behaviour of an injured rescued Python (*Python molurus*) has very recently been recorded in the Simlipal Tiger Reserve, Jashipur, in Orissa (L.A.K. Singh, *et al.* 1992).

Population in the wild/captivity : Data on the population density of the species either in the wild or in captivity is not precisely known so far.

Scientific interest and potential value : The Indian Rock Python, and its products are of significant commercial importance in the national and international markets and as a result the population density of the species has been alarmingly depleted. An all India co-ordinated and comprehensive research on the present status and natural history, including commercial farming of the species, therefore, is highly essential to generate considerable scientific interest in regard to its suitable protection, conservation and management.

Commercial use : The skin of the Indian Rock Python is highly prized and largely used in the manufacture of leather goods including articles of apparel and household use such as bag, wallets, perches, shoes, belts and artefacts and even curios. Fat is used in the Pharmacheutical industry ; bones are utilised for the production of fertilizer, and meat is consumed by some tribal communities. The stuffed pythons are also used as exhibits in different musea and live-specimens are kept in various zoos throughout the globe for public education.

Trade data : Since, 1925, the business in the reptilian skin, especially

of the Indian Rock Python, took an appreciable turn in the international market. Considering the extensive commercial exploitation, Bhanotar *et al.* (1974). remarked "Although no precise data of production of fancy reptilian skins in different states of India is available, it is estimated that in 1932 approximately 12,000,000 animals including the Indian Rock Python were slaughtered for the sake of their hides and skins and India exported 2.5 million reptile skins in 1932 and 2.25 millions in 1933. In 1935, the export figure of the reptilian skins both raw and tanned to overseas markets namely Europe and U.S.A. reached an enormous figure. In 1955, an estimated number of 12,71,000 skins were exported to France; Holland imported 5,19,000 skins, U.S.A. 14,38,000 skins and U.K. 6,63,000 skins, mostly of the Indian Rock Python, monitor lizards and crocodilians. The export value of this trade was fairly high in the recent past and India earned foreign exchange to the tune of 2 crores.

Threats to survival : The population of Rock Python has depleted alarmingly during the last 50 years on account of heavy commercial exploitation of its skin and their products which are in high demand in the world market. Habitat destruction is another important threat to the species (Mukherjee 1982, Tikader 1983, Groomridge & Wright 1982, Murthy 1979).

Conservation measures taken : The Indian Rock Python was under heavy commercial exploitation and as such its population density has been alarmingly depleted in recent years. The species, therefore, has been declared endangered under Schedule I of the Indian wildlife (Protection) Act, 1972 (Mukherjee, 1982; Tikader 1983). The species has also been listed in IUCN Red Data Book (Groomridge & Wright, 1982). It has also been listed in Appendix I of the convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), according to which any international trade in the species or its products or any sort of commercial exploitation is strictly prohibited. The species further finds protection in various conservation areas.

Conservation measures suggested : An all India co-ordinated study on the present status and biogeography of the species is urgently needed in furthering the cause of protection, conservation and management. Enforcement of the protection Act should invariably be rigid. Public conservation awareness programme should be launched on a very large scale for con-

servation and management of the species.

Captive breeding : Captive breeding programme have been taken up by different state governments. These programmes are being continued in the Madras snake Park Trust & Reptile Research Centre, Madras and Nandankan Biological Park, Barang (Orissá). It is also being practiced in the Simlipal Tiger Reserve and various other zoos throughout India (Whitaker 1978).

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Reticulated Python

Order SQUAMATA

Python reticulatus (Schneider, 1801)Family BOIDAE

Measurement : Total length about 10 m.

Diagnostic characters : Largest and heaviest of all the Indian snakes. Body light brown or yellowish dorsally, with a series of large, dark brown, circular or rhomboidal spots edged with black and yellow, often confluent with each other; ventral surface whitish or yellowish (Smith 1943).

Intraspecific variation : None.

Distribution : The Reticulated Python is known from northeastern India and Nicobar Islands; also found in Burma and southeast Asia.

Population : No precise data on the population density of this species is available either in the wild or in captivity.

Habits and habitat : The Reticulated python (*Python reticulatus* Schneider) inhabits the wet evergreen forest and is semiaquatic in habits. It largely feeds on small mammals, birds and reptiles. It occasionally feeds on medium-sized mammals like wild boar, deer, cattle, and even man who become its prey among larger vertebrates. It lays eggs in a large clutch, up to 100 in number. The mother python exhibits considerable parental care till the eggs are hatched.

Scientific interest and potential value : The Reticulated python is a commercially important serpent which has been drastically depleted in recent years. It is, therefore, considered endangered. It has attained considerable scientific interest from the point of zoological research and as such an all India co-ordinated and comprehensive research on the species should invariably be undertaken for its suitable protection, conservation and management.

Commercial use : The species and its products are of considerable commercial importance. It is largely used and highly prized for household apparel namely, wallets, perches, watch straps, belts, shoes and house hold curios. The species is kept live in zoos and as exhibits in various musea

throughout India for educational purposes.

Trade data : No precise data on trade of the species is available.

Threats to survival : The Reticulated Python is the most threatened species amongst the Indian serpents. In southeastern Asia, approximately 1,85,700 pythons were slaughtered ruthlessly during 1958–1964 for their highly prized skins.

Conservation measures taken : As a conservation measure, the species is listed in Schedule 1 of the Indian Wildlife (Protection) Act, 1972 as amended up to 1990 (Anon. 1982, Biswas 1983, Mukherjee 1976, 1982, Tikader 1983). The International Union for Conservation of Nature and Natural Resources (IUCN) and Species Survival Commission (SSC) has listed this species as endangered and included in IUCN Red Data Book (Groomridge & Wright, 1982). The species has also been enlisted in Appendix 1 of the convention on International Trade in Endangered Species of Wild fauna and Flora (CITES), on account of which trading in this species or its products is strictly prohibited in the countries that have ratified the Convention. The species further finds protection in various conservation areas.

Conservation measures suggested : Wildlife protection laws should be provided with adequate arms to counter the poachers. Furthermore, conservation education is ought to be propagated amongst the general public through Non-government Organisations.

Captive breeding : Proper captive breeding programme may be initiated in various zoos and rearing centres of India.

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Indian Egg-eating Snake
Elachistodon westermanni Reinhardt

Order SQUAMATA
 Family DASYPELTIDAE

Measurement : Total length 80 cm.

Diagnostic characters : Olive in colour; a black stripe runs from rostral to neck above eyes, and stripes of black from posterior portion of eyes to neck region. Body somewhat laterally compressed; no clear demarcation between head and neck. Tail relatively short. Vertebral scales yellowish white except at the outer margin, forming a light brown vertebral stripe along almost the whole length of body. Maxilla provided with a few minute teeth followed by two small grooved fangs at the extreme posterior end (Tikader 1983).

Intraspecific variation : None.

Distribution : The Indian Egg-eating snake is endemic to northern India, specifically from Mal and Baradighi Tea Estate, Baradighi, Jalpaiguri District, West Bengal, Purnea District, northeastern Bihar; and lately the Carbett National Park, Nainital District, northwestern Uttar Pradesh, along the Himalayan foot hills (Wall 1913, Shaw and Shebbeare 1927–31, Shaw, *et al.*, 1938–42, Talukdar and Sanyal 1977, Sanyal and Talukdar 1977, Talukdar 1983 and Tikader 1983).

Extralimitally, the species is found from Rapti Dun in the vicinity of the Chitwan National Park, southeastern Nepal and Rangpur District in northwestern Bangladesh (Wall 1913, Swan and Leviton 1962, Fleming Jr. and Fleming, Sr. 1973).

Habitat and ecology : It is a denizen of moist deciduous tropical forest area and characteristically non-aggressive and wary. It is presumably an egg-eater like its closely allied species of other Egg-eating snakes, *Dasypeltis scaber*, and *Climatophora* sp. of south Africa, but supposed to feed on other organisms also. Practically nothing is, hitherto, known of the habits of this fascinating snake which is especially adapted for living on eggs of birds and other organisms without digesting its shell (Wall 1913, Shaw and Shebbeare 1927–31, Shaw *et al.* 1938–42). Smith (1943) remarked 'It is

presumably an egg-eater and if it is so, not exclusively' Gans (1952), Gans and Williams 1954 and Rosenberg and Gans (1976) are of opinion that the feeding habit of this interesting serpent is more similar to those of the African Egg-eaters. Fitzimons (1962) and Chernov (1957) who pursued a detailed study on the bio-ecology and natural history of the different species of *Dasypeltis*, attributed the Indian Egg-eater to be practically very rare and is of considerable significance in regard to its egg-eating adaptations.

The egg is swallowed by the Egg-eater by a succession of gulps accompanied by a forward push of the muscles of the head and thorax. When the egg is swallowed the bases of the anterior vertebrae, scientifically known as hypapophyses, which are enlarged, serves to break the shell following the closer of the mouth. The yolk and albumen of the egg pass on to the stomach and the fragments of the shell are regurgitated (Hass 1973, Rosenberg and Gans 1976, Talukdar and Sanyal 1977, Talukder 1983 and Tikader 1983). It is oviparous.

Population in wild/captivity : It is an extremely rare snake. Present status on the wild population of this fascinating species is yet to be ascertained. There is no record of this snake in captivity.

Scientific interest and potential value : Practically nothing is so far known on the present status of the species. However, from the historical review of collection of the species, it appears to be the rarest snake represented in museum collections. Being endemic to the Himalayan foot hills and adjacent plains of India, the serpent implies interesting zoo-geographical implications and as such it symbolises considerable scientific interest in regard to its protection, conservation and management.

Commercial use : No precise data on the commercial use of the species and its product is so far available.

Trade data : No trade data is available.

Threats to survival : Habitat destruction owing to large scale deforestation in the range of distribution is the principal threat to survival of the species. Construction of dams and barrages for irrigation projects, agricultural developments and urbanisation are another major threats to survival of the species.

Conservation measures taken : As a conservation measure the species has been declared endangered and listed in Schedule I of the Indian Wildlife (Protection) Act, 1972, as amended upto 1990. The International Union for Conservation of Nature and Natural Resources (I. U. C. N.) and Species Survival Commission (S. S. C.) have enlisted the species as vulnerable, basing on the point of its rarity (Mukherjee, 1982, Talukdar, 1992).

Conservation measures suggested : An all India research project in collaboration with the Zoological Survey of India and other institutions like Wildlife Institute, World Wildlife Fund and other NGOs should invariably be taken up for a detailed status survey of the species in its zoogeographical range in view of the need for its suitable protection and conservation.

Conservation education should be initiated for creating public awareness on the rarity of the species. Natural habitat of the species should be preserved as far as practicable, keeping in view that large-scale deforestation in the range of its distribution should be stopped invariably, otherwise the species will be totally exterminated. The members of the staff of the Government and NGOs should be trained to gain adequate knowledge on the identity of the species.

Captive breeding : Practically no captive breeding has so far been possible on the species, as it is an extremely rare species.

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Himalayan Newt

Order CAUDATA

Tylototriton verrucosus Anderson

Family SALAMANDRIDAE

Diagnostic characters : A dark brown newt, having a long, tubercular, scaleless body, depressed head, two pairs of limbs and a vertically flattened tail, as long as head and body or a little longer. Mid-dorsal vertebral ridge and cranial ridges prominent. Two rows of knob-like porous glands present on either side of vertebral ridge. Each row has 14-18 glands (Boulenger 1890, Tikader 1983).

Distribution : Recorded from West Bengal (Darjiling district), Sikkim, Arunachal Pradesh and Manipur. Elsewhere found in Nepal (Shrestha, 1984), Myanmar, Thailand and Western China.

Intraspecific variation : None.

Habitat and ecology : This newt is found in both seasonal and perennial pools in hilly pockets of eastern Himalaya between 1260 and 2220 m altitudes. Its food consists of aquatic vegetation, insect larvae, earthworms and tadpoles. Breeds during April-May. Some males develop vivid hue and put on special structures during the breeding season to arouse the female (Annandale, 1907, 1908; Das Gupta, 1984).

Population in the wild/captivity : Nothing is known about the exact population size of this species either in the wild or in captivity.

Threats to survival : Large scale destruction of habitat (swamp & wetland) due to developmental activities has threatened the existence of this species.

Conservation measures taken : The species is legally protected in India by inclusion in Schedule II of the Wild Life (Protection) Act, 1972 as amended up to 1991

Conservation measures suggested : The species should be kept in schedule I of the Wild Life (Protection) Act. The areas where this newt occurs be declared as conservation areas. Captive breeding may be tried to increase its number.

Scientific interest and potential value : This is the only species of salamander so far recorded in India. The interesting part of this species is that the larval tail is retained throughout life. It is indirectly beneficial to human beings by feeding on insect larvae.

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