उत्तराखण्ड जैवविविधता बोर्ड
UTTARAKHAND BIODIVERSITY BOARD

THREATENED SPECIES OF UTTARAKHAND

This book is dedicated to the
Conservation loving people
of Uttarakhand

डॉ० भगत सिंह बरफाल,
भ०व०से० (सेवानिवृत्त)
अध्यक्ष
उत्तराखण्ड जैव विविधता बोर्ड

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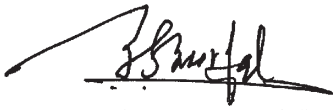
FOREWORD

It gives me great pleasure to know that Uttarakhand Biodiversity Board is coming out with this very informative publication on "Threatened Species of Uttarakhand". The book contains details about the threatened floral and faunal species found in Uttarakhand. It is well known that the state of Uttarakhand is a part of Indian Himalayan System (IHM) which is very rich in biodiversity and is a store house of enumerable rare, endangered and endemic floral and faunal species. People of Uttarakhand have been living in the close proximity of forests since ages and have been traditionally using biological resources for meeting their daily requirements of food, fuel wood, fodder and daily health care. Forest resources and biodiversity has always been a part of the rich culture and traditions of the state and is one of the major sources of income as well. The age-old system of people's participation in the forest resources named "Van Panchayat" exists only in Uttarakhand much before the advent of Joint Forest Management in India. But due to the change in life style, rising aspirations and expectation of the people and ever changing and increasing market forces, the pressure on biodiversity found in Uttarakhand has increased multifold. Hence, it is pertinent to know the threat status of the floral and faunal species so that conservation, multiplication and preservations policies and strategies can be formulated and corrective actions can be initiated before it becomes too late for the revival of the species.

I am sure that the book will be of immense help to the policy planners, foresters, universities, research institutions and to all those who are interested in biodiversity or those who earn some economic gains out of biodiversity to direct their actions towards the conservation and preservation of these threatened species found in state.

I congratulate Dr. Rakesh Shah, Member Secretary, Uttarakhand Biodiversity Board and his team for bringing out this informative book and also to all those who have contributed to this publication by way of photographs or write ups.



(Dr. B. S. Burfal)
Chairman,
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PREFACE

Biodiversity is the very basis of the life on Earth. Without it, the functioning of ecosystems, which provide us with products and services, could not be possible. Oxygen, food, fresh water, fertile soil, medicines, shelter, protection from storms and floods, stable climate and recreation - all have their source in nature and healthy ecosystems. Biodiversity is extremely complex, dynamic and varied. Its innumerable plants, animals and microbes physically and chemically unite the atmosphere (the mixture of gases around the Earth), geosphere (the solid part of the Earth), and hydrosphere (the Earth's water, ice and water vapour) into one environmental system that makes it possible for millions of species, including human, to exist. But at the same time, no other feature of the Earth has been so dramatically influenced by human activities. By changing biodiversity, human well being and the well being of every other living creature is very severely affected.

Biodiversity is the outcome of over 3.5 million years of natural evolutionary process influenced by human actions. It sustains the web of life and humans fully depend on it. Therefore, conservation of biodiversity is the basis for our survival.

India has a remarkable assemblage of biological resources in its diverse habitats and ecosystems that has made it one of the 12-mega diversity countries of the world and one of the four in Asia. India has two hotspots out of 25 world's biologically richest and most threatened ecosystems namely Western Ghats and Eastern Himalayas. India accounts for 7.31% of faunal species and 10.78% of floral species of the world with 18% of world's human population and 18% of world's cattle population (MoEF report, 1997). The endemism in Indian biodiversity is very high. About 33% of the countries recorded flora is endemic to the country and is concentrated mainly in North-East Himalayas, Western Ghats, North-West Himalayas and Andaman and Nicobar Islands.

Uttarakhand being a part of Indian Himalayan Region (IHR) is home to vast variety and unique range of floral and faunal diversity of India as the state is uniquely endowed with a diverse assemblage of natural ecosystems. According to scientific studies, the diversity under 1503 genera and 213 families of flowering plants, including 93 endemic species is harbored in various vegetation types, ranging from sub-tropical forests in upper Gangetic plain and Shiwaliks zone in the south to arctic-alpine vegetation of trans-Himalayan cold desert in the north in Uttarakhand. Besides 487 species of ferns of which 15 species are endemic, 18 species of gymnosperms are also reported from the state.

Uttarakhand state is bestowed with great faunal diversity also. It is a home for many species of birds, mammals, and reptiles and for the threatened and endemic

species. Uttarakhand houses the faunal biodiversity of 3748 species belonging to 1848 genera and 427 families of both vertebrates and invertebrates. To be precise, there are 499 genera with 1060 vertebrates and 1349 genera with 2688 species of invertebrates found in Uttarakhand. Of these, 451 species are reported for the first time from Uttarakhand constituting new records for state of which 22 are also new records for India. 35 species reported from Uttarakhand are endemic to the state while one is even endemic to India. The enormous faunal diversity is represented by 93 species of Mammals (which is about 25 % of the known Indian species), 743 species of birds, including migratory winter visitors (representing 60% of the Indian avi-fauna, second to the Assam State), 72 species of reptiles and about 439 species of butterflies.

It is evident that the endemism is very high in the species found in Uttarakhand also there are other species which has a high threat status. If proper policies and strategies are not formed and proper action is not directed towards the conservation and preservation of these species, then there is every likelihood of these species becoming extinct.

The present compilation contains the species found in Uttarakhand, which has a high threat status. The book contains numerous photographs making it user-friendly. The book can be of immense use for the policy makers, foresters, students, research organizations, trackers, cultivators and all those who are interested in the biodiversity and its conservation and preservation.

Last but not the least, Uttarakhand Biodiversity Board is indebted to the Chairman of the Board, Dr. Bhagat Singh Burfal (Retd. IFS) for guiding the present compilation and advising the authors on various aspects of the species in question. UBB is also thankful to Dr. Shrikant Chandola, IFS, PCCF cum Managing Director, Uttarakhand Forest Development Corporation for guiding the Board on various aspects of compilations and helping us to find the contributors. Uttarakhand Biodiversity Board is also thankful to Shri Monish Mullick, IFS for advising the board on various aspects of the publication. The Board is thankful to Dr. H.B. Naithani for contributing in the floral part of the book along with Dr. Rakesh Shah. Board is also thankful to Dr. G.S. Rawat, Dr. Bilal Habib, Dr. Ramesh, Dr. S.A. Hussain, Dr. Sathyakuma, Mr. K. Ramesh and Ms. Joanna Van Grussen all from Wildlife Institute of India, Dehradun for contributing the faunal part in the present compilation. Board is also thankful to Shri Dhanajay Prasad, Assistant Conservator of Forests/Research Officer (Monitoring & Evaluation), Shri. Kunal Lal Research Officer (Projects) Shri Arvind Uniyal, Administrative Officer, Shri Alok Mishra, JRF, all from Uttarakhand Biodiversity Board for rendering necessary help.

It is hoped that the book will serve the purpose for which it has been published and will help conserve and preserve the threatened species found in Uttarakhand.

Dr. Rakesh Shah, IFS

CONTENTS

FLORA

Aconitum balfourii Stapf.

Scientific Name : ***Aconitum balfourii*** Stapf.

Family : Ranunculaceae

Common name : Mitha/vish

Local Name : Mitha/Banwa

Description: Herbs, biennial; roots tuberous, conical, yellow in colour and 5 – 10 cm long, paired. Stems erect, up to 1 m high, robust. Basal Leaves decay at the time of flowering; lower petioles up to 7.5 cm long.

Inflorescence up to 30 cm long, many-flowered, with yellowish tomentum.

Sepals blue, pubescent; uppermost helmet - shaped. Petals glabrous. Filaments hispidulous. Carpels 5, yellowish tomentose. Follicles oblong, loosely hairy. Seeds broadly winged along raphe.

Economic value: Dried tubers are sold readily to herbal industry. Current market price is around Rs. 200 per kg.

Medicinal value: The roots contain the alkaloid pseudacnitine, which is highly toxic and biologically 1.5 times as active as aconitine. Paste is applied for rheumatism, against neuralgia, fever and bone complaints also used in gastric disorders, leprosy, swelling and sciatica and wound.

Aesthetic value: No recommendation due to toxic nature of plant.

Distribution: Sub-alpine, shady, moist slopes, (3000-4000m) Uttarakhand to Nepal. Wide but sparsely distributed. Chamoli, Pithoragarh, Milum, Deoban (Chakrata) Uttarkashi, Berinag.

Endemism: Broadly endemic to Uttarakhand and Western Nepal.

Threats: Over exploited species due to ready market for tubers which are used in ayurvedic medicine.

Measures taken to conserve/protect: Confined only to alpine regions with scattered population which are also declining day by day. A critically endangered species. In-situ conservation is required by the Forest Department. The species is generally protected in National Parks (Valley of Flowers, Nanda Devi National Park and Govind National Park) and deserves specific measures of conservation within sanctuaries, Reserved Forest and Biosphere Reserve.

Any other related information: Several provenances and local eco-types are known to occur in Uttarakhand which need detailed genetic study. Toxic tubers are known to be used occasionally by local communities to poison carcasses of cattle/livestock in retaliation of killing by large carnivores.

Aconitum heterophyllum Wall.ex Royale.

Scientific Name : ***Aconitum heterophyllum*** Wall.ex Royale.

Common name : Atis/Patis/Ativish/Atvika

Local Name : Phataki/Atis

Description: Biennial; roots paired, 2.5 – cm long, tuberous. Stems erect simple or branched, 90–120cm high. Leaves are of various forms; basal leaves long petioled; petioles 10-12cm long; cordate or ovate, upper leaves sessile, ovate, elongate or varied in shape; sharply toothed, sessile or shortly petioled and stem clasping, 5–8 x 2-6cm. Inflorescence a slender raceme or a panicle; bracts ovate, acute, sharply toothed, up to 10x5 mm; upper 3 fid or entire; pedicle up to 3cm long. Sepals greenish-blue, marked with red or violet; uppermost sepal navicular, shortly beaked. Petals glabrous.

Filaments pale-green, glabrous or minutely hairy; anthers brown. Carpels 5, pubescent. Follicles 5, contiguous, green, downy. Seeds smooth.

Economic value: One of the high value medicinal herbs. Dried tuber are sold at the rate of Rs. 7000 – 8000 per kg in the market.

Medicinal value: Roots are used to cure dysentery, diarrhoea, fever, malarial fever, cough, cold colic, headache, piles, hysteria, throat infection, cure for dyspepsia, especially when appetite is lost after illness and also in vomiting, abdominal pain and diabetes. It also checks excessive menstrual flow. Fresh leaves used to cure toothache.

Distribution: Open slopes in sub alpine and alpine areas between 2500-3500m. Jammu & Kashmir, Himachal Pradesh and Uttarakhand. Pakistan and Nepal.

Endemism: Pan endemic to Himalayan Region.

Threats: Over exploitation for medicine and due to degradation it has become one of the most highly threatened medicinal plant species that is showing a steady decline in wild populations.

Measures taken to conserve/protect: This species is one of the intensively exploited herbs. Due to over-exploitation by traders its populations are greatly threatened and in-situ conservation is required. In-situ conservation measures have been initiated in Konain compartment no. 10 of Chakrata Forest Division. Ex-situ conservation measures have been taken at Deoban, Songad and Harsil nursery of the Forest Department where excellent germination from seed has been obtained. A local NGO (SHER) based at Dehradun has successfully raised nurseries of Atis and involved farmers in its cultivation at Sankari, Uttarkashi.

Any other related information: The Atis from Bagi Bugyal (Alpine Meadow) in Tehri Forest Division of Uttarakhand is considered to be of the best quality.

Aconitum violaceum Jacq.ex Stapf.

Scientific Name : ***Aconitum violaceum*** Jacq. ex Stapf.

syn. *Aconitum multifidum* Royle; *Aconitum napellus* var. *multifidum* (Royle) Hook. f. & Thom.

Family : Ranunculaceae

Common name : Doodh Atis, Chhota Atis.

Description: Dwarf, biennial herbs up to 35 cm high. Roots tuberous, 2-3 cm, Paried (mother and offspring tubers representing old and fresh tubers respectively). Leaves very few, 1 or 2 at the bases of the stem and 1 or 2 higher up on the stem; lamina orbicular, cordate or reniform, deeply 5 – partite, 2.5 – 7.5 cm in diameter. Inflorescence a short raceme or reduced to a solitary flower; bracts small, linear. Flowers 2 – 2.5 cm long, blue or violet, hairy. Filaments hairy in upper part. Carpels 5. Follicles densely yellowish hairy.

Economic value: Valuable medicinal herb, highly traded.

Medicinal value: Roots contain the alkaloid indoconitine, and is tonic and is used in cough, cold, stomach pain, fever, bronchitis, epilepsy, headache, inflammations, snake-bite, renal pain and rheumatism.

Distribution: Alpine meadows throughout Himalaya, from 3500 – 4500 m. in Jammu & Kashmir, Himachal Pradesh and Uttarakhand. Pakistan and Nepal.

Endemism: Pan endemic to Himalaya.

Threats: Habitat degradation and over exploitation.

Measures taken to conserve/protect: The species is found in high altitude Protected Areas namely Valley of Flowers, Nanda Devi National Park, Govind National Park where it is well protected. More effort required in other areas for conservation.

Any other related information: Tubers are also used locally as a household remedy for various ailments, specially for children.

Eremostachys superba Royale ex Benth.

Scientific Name : ***Eremostachys superba*** Royle ex Benth.

Family : Lamiaceae.

Description: Unbranched, tender herb, 0.6 – 1 m tall. Stem annual, from a large tuberous rootstock. Leaves chiefly radical, pinnately–lobed, 12-20 cm long (including densely white hairy petiole). Recognized easily by large whorls of very showy yellow flowers. Calyx lobes blunt. Corolla yellow, tubular. Fruits (Nutlets) densely bearded at the top.

Medicinal value: In Jammu the tubers are given by Gujjars to buffaloes to increase the milk production.

Aesthetic value: This plant has the potential to be introduced as an ornamental plant. Can be raised as a garden plant.

Distribution: In shade below the cut – edges of fields at 300-600 m, Shiwaliks of Jammu, Uttarakhand and Pakistan. Cultivated at Botanical Survey of India, Dehra Dun. In Uttarakhand it is found in just one locality on the Mohand-Dehradun highway where only 3-5 plants appear every spring.

Endemism: Near endemic to Shiwaliks or North Western India and Pakistan.

Threats: Trampling and overgrazing.

Measures taken to conserve/protect: In-situ and ex-situ conservation is required.

Any other related information: Well known botanist J. F. Duthie has called it "extremely local and very handsome plant".

Gentiana kurroo Royle

Scientific Name : *Gentiana kurroo* Royle

Family : Gentianaceae

Common name : Karvi, Kamalphul, Nilkanth (Hindi), Trayaman (Sanskrit) Indian Gentian (English)

Local Name : Karru

Description: Perennial spreading herbs with bunched roots. Basal leaves 10–12 cm, linear – lanceolate, extremely bitter in taste. Roots branched, white, fleshy and stout. Spectacular flowers of this species are deep blue, spotted with green and white in the throat, usually two or more on a stem, sometimes solitary. Corolla narrow, funnel shaped upto 5 cm, triangular with acute lobes and sharp pointed lobules. The flowers of *Gentiana kurroo* are visible from August to October in cascading groups that wither with the onset of winter to yield capsules containing fine seeds.

Economic value: Promising commercial potential as source of herbal bitters to be used in human as well as veterinary medicine.

Medicinal value: It is known to be very beneficial as a liver tonic febrifuge, anthelmintic, emmenagogue, blood-purifier, carminative, digestive and is

used for the treatment of diabetes, digestive disorder, hepatic disorder, bronchial asthma, and urinary infection. The entire plant is used, especially the roots.

Aesthetic value: Can be developed as an attractive potted and trailing plant.

Distribution: This beautiful gentian is known to occupy precipitous south and south-west facing limestone outcrops at approximate altitudes of 1700 -2100 m. In Uttarakhand it is chiefly found as scattered populations in and around Surkanda Hill of Mussoorie Forest Division, Jaadi top of Narendra Nagar Forest Division and Deoban hills in Chakrata Forest Division. It is also known to occur in Himachal Pradesh and Jammu & Kashmir.

Endemism: Endemic to Western Himalaya.

Threats: Excessively exploited till the 1960s. The existing habitats of this species are vulnerable to pilferage, degradation, road widening etc.

Measures taken to conserve/protect: Medicinal Plant Conservation Area (MPCA) has been established at Deoban in Chakrata Forest Division for the conservation of this species. It has been successfully raised from seed and root shoot cuttings in Kaddukhal Nursery of the Narendra Nagar Forest Division in Bhagirathi Circle. Some local farmers have also been encouraged to grow these plants in their backyards.

Any other related information: This species has become extremely rare to find in the wild. With its disappearance from much of its range, it slowly came to be replaced in the commercial herbal market by Kutki (*Picrorhiza kurrooa* Royle ex Benth.) that is found at much higher altitudes. It was used by the British to feed their horses, and this may be one of the reasons that led to its decline. Karvi is avidly eaten by a native goat antelope (Ghoral) that have been observed to literally chew into the rock to get at the fleshy and robust roots.

Nardostachys grandiflora Jatamansi

Scientific Name : ***Nardostachys grandiflora*** DC. (*Nardostachys jatamansi* DC.)

Family : Valerianaceae.

Common name : Masi, Jatamasi (Hindi and Sanskrit), Indian Spikenard (English)

Description: A perennial herb with aromatic rootstock. Leaves elliptic, lanceolate, or spathulate, rising mostly from the rootstock that is clothed in remnant fibre nets of old leaves and hence the name. Flowers purple to white in dense heads/clusters. A distinctive smell emanates from the whole plant.

Economic value: Extremely valuable oil known as Spikenard oil, used in perfumery and cosmetics.

Medicinal value: The rhizome and the oil from the rhizome are considered as tonic, stimulant, anti-spasmodic, diuretic, emmenagogue, stomachic and laxative and is used in hysteria, insomnia, dysmenorhoea, skin diseases, throat trouble, lumbago, ulcer, rheumatism, paralysis etc. Known to impart equanimity of mind and used traditionally as a hair tonic to cure loss of hair as well.

Distribution: Nardostachys is found at heights of 3400 – 4200 m in moist alpine rocky slopes of the state and is becoming extremely rare to find. However, good population of the species exist in Nanda Devi National Park and Bagi area of Tehri Forest Division.

Endemism: Himalaya; from Himachal Pradesh to SW China.

Threats: Excessive exploitation and trampling by large herds of sheep and goats in the alpine meadows.

Measures taken to conserve/protect: The populations of Jatamansi revive easily when offered protection as in the case of Nanda Devi and Valley of Flowers National Parks.

Any other related information: The plant is closely related to local mountain culture and is considered sacred amongst hill folk in Uttarakhand and Himachal to the extent that it forms part of routine rituals and religious ceremonies. Its strength in warding off evil spirits and events is considered so powerful that persons leaving for long journeys carry a bit of the root in their caps or stuck in the wedge of the ear. Jatamansi is also one of the most pleasant incense herbs. The oil of the hairy swindle shaped roots, that are in fact persistent fibres of old leaves, is known to be an effective cure for falling hair and baldness and also finds its way into many cosmetic applications. The valuable Spikenard oil was shipped to Europe in vast quantities by the British during their rule.

Schrebera swietenioides Roxb.

Scientific Name : ***Schrebera swietenioides*** Roxb.

Family : Oleaceae

Common name : Ghant (local), Banpalas or Banda (Hindi), Mokha (trade name), Weaver's Beam Tree (English).

Description: A medium sized handsome tree with distinct ashy bark. Leaves oblong, acuminate, entire, base acute or obtusely cuneate, softly pubescent on both surfaces, middle pair of leaflets normally the largest, often accompanied with rust spots. Flowers 0.5 inches, white, fragrant, in lax terminal cymes. Capsule pear shaped, 2.5 to 3 inches long, splits to release winged seeds.

Economic value: The wood is durable and consists of dense interlocking grains. Hence it has been compared to Boxwood (*Buxus sempervirens*) due to which it was prescribed for wooden utensils, weaver looms, cups, jars, combs, wheels etc., even for cabinetry and mathematical instruments.

Medicinal value: The leaves are considered to possess stomachic properties and are used in the treatment of urinary discharges. The bark is used for treating boils and burns and the roots as a cure for leprosy. Crushed roots

are also used by local grazers as an application for killing worms in infested wounds.

Aesthetic value: In view of the extreme uncommonness of the tree, its adoption as an avenue tree would be of great help in conserving it.

Distribution: Extremely rare in Uttarakhand restricted to ridges of Shiwalik hills. A few individuals have been located along the Karwarghatti ridge and top of Beri Chaur in Corbett National Park. The distribution of the species is wide as in addition to Uttarakhand it is reported from Rajasthan, Chotta Nagpur, West Bengal and the Deccan Plateau. However, nowhere has it been observed to be common and is difficult to be met with in the wild. Uttarakhand is the north western most limit of the distribution of the tree.

Endemism: Near endemic to Indian sub continent, Central – South India.

Threats: Decreasing numbers lead to eventual extinction of a species due to restricted gene variability and this species is direly threatened due to this fact.

Measures taken to conserve/protect: Some saplings have been raised from seed in Halduparao Forest Rest House campus of Sonanadi Wildlife Sanctuary, Corbett Tiger Reserve.

Any other related information: In both the provenances mentioned just 5-6 trees each are present and there is no regeneration. The species is frost tender but drought hardy. A traditional use has been the keeping of slaked lime of tobacco chewers in boxes made out of unripe fruits.

Pinguicula alpina Linn.

Scientific Name : ***Pinguicula alpina*** Linn.

Family : Lentibulariaceae

Common name : Alpine butterwort

Description: A small perennial insectivorous herb, upto 12 cm when in flower. The plant is supported by 1-2 cm long fleshy roots, yellowish – white, branched. Leaves five to eight in number, fleshy, light-green to reddish, elliptic to lanceolate, in rosettes, ad-pressed to the ground. The leaves of this species are able to further aid digestion of insect prey by growing in such manner that the leaf edge rolls toward the center, bringing additional glands into contact with the prey. Flowers 10-16 mm in length, white in colour, 2-lipped (upper lip 2-lobed and lower 3-lobed) with a short yellow-green spur. The flowers are protogynous i.e., stigmas mature before the anthers, and pollinated by flies. It forms prostrate rosettes of green to red leaves and white flowers during summer–monsoon and has a tight hibernaculum during winter dormancy.

Distribution: Plants are found in moist rocky slopes in sub-alpine and alpine habitats. Also in temperate and alpine regions of Eurasia, Himalaya. Although, reported from different parts of Eurasia, it is extremely rare in Uttarakhand. Locally restricted to rocky, moist slopes between 3500 – 4500 m asl. So far seen only in Napalchu nala (Byans) and Upper Pilthi river (Ralam valley).

Endemism: Pan endemic, Himalaya and Eurasian Mountains

Threats: Habitat degradation.

Any other related information: Taxonomic uniqueness and botanically interesting species, *Pinguicula alpina*, also known as the alpine butterwort, is species of carnivorous plant, native to high latitudes and altitudes. The upper surface of the leaves are sticky from the mucilage secreted by stalked glands covering the leaf surface. Small insects alighting upon this surface are caught by the mucilage, upon which sessile glands embedded in the leaf surface (except for the central vein) secrete digestive enzymes to digest the prey. Like all members of the genus, *Pinguicula alpina* uses mucilagenous glands covering the surface of its summer leaves to attract, trap, and digest arthropod prey. No information exists on the ecology, pollination biology and plant – insect interaction.

Phaius tancarvilleae (Banks et L. Herit.) Blume

Scientific Name : ***Phaius tancarvilleae*** (Banks et L. Herit.) Blume
Syn: *Limodorum tankervilleae* Banks et L. Herit., Sert. Angl.: 28 (1789)

Family : Orchidaceae

Common name : Nun's Orchid, Nun's Cap Orchid, Chinese Ground Orchid, Red Crane Orchid, Swamp lily, Veiled Nun Orchid

Description: Robust ground orchid. Pseudobulbs conical to ovoid, above the ground, sheathed by leaf-bases. Leaves 2-4 in each pseudobulb, 25-120 cm long, elliptic - lanceolate, acuminate, strongly ribbed, arising from the side of pseudobulbs. Pseudobulbs annulate, internode greenish - white. Inflorescence many-flowered raceme. Peduncle stout, straight, cylindrical, sheathed. Flowers vary in colour from purplish-orange to pale orange-yellow with an orange-yellow to purplish - white lip. Bracts orbicular - ovate, acuminate or cuspidatele acute, 11-nerved. Sepals lanceolate, acute, 7-veined. Petals lanceolate or oblong-lanceolate, acute or subacute. Lip erect, 3-lobed, ovate-rotund at the anterior part, middle dilated, margin crisped, undulate. Spur 1.3-1.8 cm long. Column clavate, long. Fruit ellipsoid, long.

Economic Use: Often used as Ornamental Plant in gardens.

Aesthetic value: Beautiful fragrant flowers make it an attractive garden plant.

Distribution: Throughout North East India, Tropical and Subtropical Asia to South Pacific in Uttarakhand it is restricted to very few moist patches in deciduous Sal forests of Corbett National Park.

Endemism: Pan endemic: Himalaya and South East Asia.

Threats: Extraction from wild for ornamental purpose and trade.

Measures taken to conserve/protect: Cultivated as ornamental orchid in North East India.

Any other related information: Enlisted in Appendix II of CITES. Plants are often reported to be found along the forest streams; hence the habitat is very specific. The plants propagate with the help of subterranean corms.

Pecteilis gigantean (J.E.Sm.) Rafin.

Scientific Name : ***Pecteilis gigantea*** (J.E. Sm.) Rafin. syn: *Orchis gigantea* Sm.; *Habenaria gigantea* (Sm.) D.Don. *Hebenaria susannae* auct.

Family : Orchidaceae

Common name : Butterfly Orchid, Lady Susan's Orchid, Waghchora (Marathi).

Description: Terrestrial, up to 80 cm high. Stem with many funnel-shaped sheaths on its lower portion. Leaves ovate - oblong or oblong-lanceolate, acute. Inflorescence 2-6 flowered raceme. Flowers white. Bracts longer than the ovary. Sepals white, spreading, 4-5 cm long, entire, the dorsal one suborbicular, lateral pair subquadrately oblong, obtuse. Petals 3-4 cm long, linear, falcate, and acute. Lip white, 3-cleft, 5-9 cm, mid-lobe simple, tongue like, side-lobes split up in 10-16 thin, long, linear- filiform segments. Spur pale-green, obtuse, 8-11 cm long. Column white, oblong, 7 mm long. Flowering: September-October.

Economic Use: Excellent potential in horticulture as ornamental plant.

Distribution: Indian Subcontinent to Myanmar. Uttarakhand: Below Mussoorie, Dehradun; Sahia, Chakrata; Mohtronwala, Dehradun; Shiwalik, Mansa Devi, Haridwar; Aglar Valley, Tehri; Between Dharsu and Dhoonda, Uttarkashi; Ransi, Pauri. Kumaon – Chowkori, Berinag, Pithoragarh; Khela, Kali Valley, Narayana, Pithoragarh; Dharchula, Kali Valley, Pithoragarh; Ramgarh, Nainital; Near Naruwakhigol, Almora.

Endemism: Broad endemism.

Threats: Extraction from wild for aesthetic value and trade, habitat degradation.

Any other related information: Plant has bright, fragrant, lasting flowers, which are often used for aesthetic value. Around cities like Mussoorie and Nainital this species has declined drastically due to habitat degradation and unscrupulous collection by botanists. This species has often been misidentified as *P. susanne* (Linn.) Lindl., which does not occur within Indian territory.

Diplomeris hirsuta (Lindl.) Lindle.

Scientific Name : ***Diplomeris hirsuta*** (Lindl.) Lindl. syn: *Diplochi loshirsutus* Lindl.

Family : Orchidaceae.

Common name : Snow Orchid.

Description: Terrestrial orchid. *Tubers* globose. *Stem* short. *Leaf* solitary, radical, sessile, hirsute, oblong-elliptic, base minutely cordate. *Inflorescence* solitary. *Flowers* snow-white. *Bracts* ovate, oblong, acute, pubescent. *Sepals* white, ovate-oblong, subacute, much smaller than petals. *Petals* white, orbicular-reniform, apex slightly acute. *Lip* shaded yellow, longer than sepals, suborbicular, clawed at the base, the apex broad emarginate, mucronate, upper surface smooth, and the midrib broad and somewhat thickened. *Spur* long, greenish, infundibuliform at the mouth, curved, pubescent outside.

Aesthetic value: Has excellent potential as horticultural plant.

Distribution: Foot-hills of Himalaya, Kumaon to Arunachal Pradesh, South China. In Uttarakhand very restricted distribution, near Doagaon, on road to Nainital from Kathgodam.

Endemism: Pan endemic to Eastern Himalaya and SW China.

Threats: Habitat is under threat due to construction of roads.

Any other related information: Enlisted in Appendix II of CITES. Confined to moist sandstone rocks, very attractive white flowers with long Spur.

Cyathea spinulosa Wall.ex Hook.

Scientific Name : ***Cyathea spinulosa*** Wall.ex Hook. syn: *Alsophila spinulosa* (Hook.) Tryon.

Family : Cyatheaceae

Common name : Sala tree

Description: Tree fern. Rhizome thick, creeper, covered with pale brown hairs, many frons arise from single rhizome, hairs dark brown, 4-8 celled long, upto 10 cm long, deciduous. Stipe upto 40 cm long, chestnut reddish brown, hairy: hairs similar to that of rhizome but light brown in colour. Lamina upto 60 x 15 cm, lanceolate, consists of numerous pinna, middle pinna upto 12 x 1.5 cm, sessile consists of numerous pinnules, sessile, deeply lobed, about 10 x 3 mm, hairy, basal 6-7 pairs of pinnules gradually reduced to auricle, primary and secondary rachis hairy; about whole of the plant fertile except some basal pairs. Sori arise at the tip of each lobe of the pinnules, cup shaped, sporangia with 20 celled annulus; Spores light-brown, globose.

Economic value: Often used for Ornamental purpose.

Medicinal value: Not known

Aesthetic value: Has potential to serve as avenue tree but only in high rainfall areas.

Distribution: Warm temperate zone of Himalaya from Uttarakhand to NE India, South China, SE Asia. In Uttarakhand : Near Gopeshwar Chamoli, Sandev in Pithoragarh.

Endemism: Pan endemic: Eastern Himalaya, China and SE Asia.

Threats: Forest fires, habitat degradation, collection for ornamental or purposes or botanical interest.

Measures taken to conserve/protect: Its in-situ conservation is required

Any other related information: Enlisted in Appendix II of CITES. Extremely graceful plant restricted to shady moist ravines, with very few individuals in the shown locales of Uttarakhand.

Turpinia nepalensis Wall. ex W. & A.

Scientific Name : ***Turpinia nepalensis*** Wall. ex W. & A. syn : *Turpinia pomifera* auct. non DC.

Family : Staphyleaceae.

Common name : Thali

Description: Small glabrous tree upto 1.2 m in girth and 8 m high. Bark pale brown or whitish, rather deeply cracked, corky. Leaves characteristic feature, dark pinnate, 20 - 30 cm long, 3-7 usually 5-foliate. Leaflets subequalm the terminal one 10 – 15 x 3 – 5 cm; all oblong or elliptic-oblong, caudate-acuminate, base cuneate acute, shallowly and evenly serrate, glabrous, dark rather glossy gren above with pale midrib and 5-8 pairs of rather indistinct arcuate secondary nerves. Flowers under 2 mm diameter, white, in long-peduncled lax axillary panicles, 15 – 22 cm long with rather slender, opposite primary branches. Fruit 8 mm diameter, globose, somewhat laterally compressed, indistinctly 6-lobed, succulent, purplish. Seed 1.

Economic value: Extremely useful as small timber and good for wood carving

Aesthetic value: Fruits used by a large number of birds.

Distribution: Himalaya (Nepal to Bhutan), Assam, Myanmar, Thailand, Indo-China, W. China. In Uttarakhand very sparse, recently seen near Patuadangar close to Nainital and near Didihat.

Endemism: Pan endemic: Himalayan North East India.

Threats: Habitat degradation.

Measures taken to conserve/protect: Its in situ conservation is required.

Any other related information: The species has been relocated recently in eastern Kumaon after a gap of nearly 80 years since the time of A.E. Osmaston. Assisted natural regeneration recommendation in Patuadangar area.

Indopiptadenia oudhensis (Brandis) Brenan

Scientific Name : ***Indopiptadenia oudhensis*** (Brandis) Brenan (syn. *Piptadenia oudhensis* Brandis).

Family : Mimosaceae.

Common name : Genti (Avadhi - dialect of Hindi).

Description: A small to middle – sized branchy tree with short trunk, drooping branchlets and rough greyish or reddish – brown bark, which exfoliates in woody scales, armed with large compressed conical prickles. Leaves bipinnate; rachis 6-12 cm long; pinnae two pairs with a conical gland between each pair, long stalked; leaflets one pair, nearly sessile, 3-9 x 2.5 – 3-8 cm, obliquely broad ovate or kidney shaped, obtuse at apex, secondary nerves prominent, running into loops near the margin. Flowers greenish - yellow, subsessile or sessile, about 3-5 mm long, in dense, pubescent spikes 2.5 – 8 cm long. Calyx cup–shaped with minute teeth. Petals nearly free, oblong, acute, much longer than the calyx. Stamens 10, exceeding the petals; anthers with apical glands. Ovary stalked; ovules many; style filiform. Pod 20-30 x 1.5 cm, flat, reddish–brown, glabrous, narrowed to a stalk. Seeds 15-20, compressed, broadly oval.

Economic value: The wood is yellowish or reddish, close grained and hard and is considered to be durable.

Aesthetic value: Can be cultivated as an avenue tree.

Distribution: Plains of Uttarakhand, Uttar Pradesh and Nepal. One small tree planted in the Botanical Garden of Forest Research Institute, Dehra Dun. Found between Tanakpur and Chukha in Distt. Champawat.

Endemism: Near endemic to Awadh region of erstwhile United Province and footers on Nepal.

Threats: Excessive lopping effects seed production and regeneration.

Measures taken to conserve/protect: It is confined to North India and Western Nepal, thus its in-situ conservation is required.

Any other related information: Used as a fodder by local people.

Meizotropis pellita (Hook.f.ex Prain) Sanjappa

Scientific Name : ***Meizotropis pellita*** (Hook. f. ex Prain) Sanjappa (syn. Butea pellita Hook. f. ex Prain).

Family : Fabaceae

Common name : Patwa.

Description: A shrub with stout woody perennial rootstock, 1.8 m high, 2 cm in diameter. Stems ribbed. Leaves, stems, inflorescence and pods densely clothed with spreading white or pale-brown tomentum. Leaves 45–75 cm long; petiole 12-30 cm, furrowed above; leaflets subequal, 20-50 x 15-35 cm, broadly ovate, the lateral pair somewhat oblique, entire, base truncate or obtuse, rather thick, lateral nerves 7-10 pairs. Flowers bright – red, 2-2.5 cm long, in fascicles of usually 3 or 5, arranged in erect terminal and auxiliary simple racemes. Calyx 12 mm long, campanulate, thick, densely brown – tomentose; lobes 4. Corolla bright red, wings and keel changing to orange towards the base inside; Petals clothed outside with silky white hairs. Pod 4-7 x 2-5 cm, oblong, coriaceous. Seed 1.5 – 2 cm in diameter, compressed, glabrous, reddish-brown.

Aesthetic value: Potential as ornamental plants.

Distribution: Endemic around Patwadangar near Nainital, Uttarakhand at 1500 m.

Endemism: Narrow endemism. Confined to Patwadangar near Nainital, Uttarakhand at 1500 m.

Threats: Fire and trampling, general degradation of habitat.

Measures taken to conserve/protect: It is endemic in a small area its in-situ conservation is required by the SBB.

Any other related information: The hillock "Patwadangar" near Nainital is named after this species.

Trachycarpus takil Becc.

Scientific Name : ***Trachycarpus takil*** Becc.

Family : Arecaceae

Common name : Thakal or Jhagerau.

Description: A medium – sized palm with erect stem up to 10 m high, and 30 cm in diameter, covered with a fibrous network, the upper portion more or less hidden by the persistent dead leaves which hang down. Leaves 90 –180 cm long, fan – shaped, margin segmented; the segments shortly bifid or bidentate at the tip, glaucous beneath; petiole 30-120 cm long, subtrigonous, the margins armed with minute irregular sub-spinescent teeth. Flowers greenish-yellow, clustered on the branches of a paniculate spadix 30-60 cm long; peduncle compressed, 2.5 – 3.5 cm broad, reflexed in fruit. Male flowers: sepals sub-orbicular; petals twice as long as the calyx. Spathes 20-25 cm long, reddish – brown, densely clothed with deciduous scurfy tomentum. Drupe reniform.

Economic value: Used by the local people for fiber for churning curd and making ropes. Leaves are used as broom.

Aesthetic value: Grown as an avenue plant.

Distribution: Eastern Kumaon (Uttarakhand) and Western Nepal.

Endemism: Near endemic to Uttarakhand and Western Nepal

Threats: Extremely poor regeneration and habitat degradation.

Measures taken to conserve/protect: State Forest Department of Uttarakhand should take effective measures for it in-situ conservation in Thalkedar, Kalamuni, Ratapani cliff, Pithoragarh district, Uttarakhand. Collections of seeds from Natural population and introduction into botanical gardens is required.

Any other related information: One of the few palm species that thrives in frost and snow.

FAUNA

Gyps bengalensis

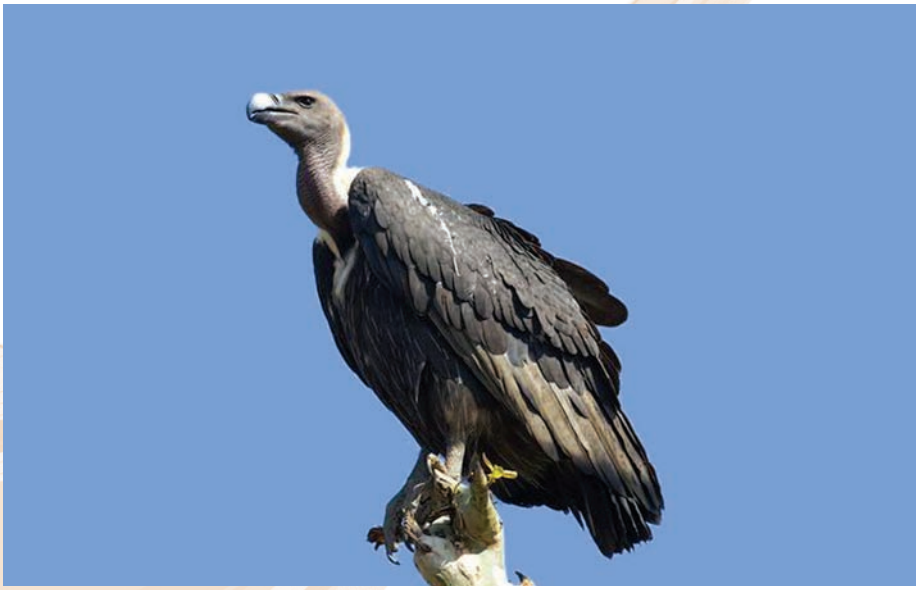
Scientific Name : ***Gyps bengalensis***

Family : Accipitridae

Common name : White-rumped Vulture, Asian White-backed Vulture, Oriental White-backed Vulture, White-backed Vulture

Description: Throughout Indian Sub-continent including Pakistan, Nepal and Bhutan. Also reported from Cambodia, Iran, Lao People's Democratic Republic, Myanmar, Thailand and Vietnam. Regionally extinct in Bangladesh, China and Malaysia. Vagrant in Afghanistan, Brunei Darussalam and Russia. In Uttarakhand sizeable populations are recorded in Himalayan foot hills in Rajaji-Corbett landscape.

Morphology: The White-rumped Vulture is a typical vulture, with an unfeathered head and neck, very broad wings, and short tail feathers. It is much smaller than European Griffon. It has a white neck ruff. The adult's whitish back rump and underwing coverts contrast with the otherwise dark plumage. The body is black and the secondaries are silvery grey. The head is tinged in pink and bill is silvery with dark ceres. The nostril openings are slit-like. Juveniles are largely dark and take about four or five years to acquire the adult plumage. In flight, the adults show a dark



leading edge of the wing and have a white wing-lining on the underside. The undertail coverts are black. This is the smallest of the *Gyps* vultures, but is still a very large bird. It weighs 3.5-7.5 kg, measures 89–93 cm in length, and has a wingspan of 260 cm.

Special features: This vulture builds its nest on tall trees often near human habitations in northern and central India, Pakistan, Nepal, and southeast Asia, laying one egg. Birds form roost colonies. The population is mostly resident. Like other vultures it is a scavenger, feeding mostly from carcasses of dead animals which it finds by soaring high in thermals and spotting other scavengers. It often moves in flocks. At one time, it was the most numerous of the vultures in India. Within the well-supported clade of the genus *Gyps* which includes Asian, African, and European populations, it has been determined that this species is basal with the other species being more recent in their species divergence.

Threats: By mid-2000, *Gyps* vultures were being found dead and dying in Nepal, Pakistan, and throughout India, and major declines and local extirpations were being reported. The anti-inflammatory veterinary drug diclofenac, used to treat domestic livestock, has been identified as the cause of mortality from renal failure resulting from visceral gout in the vast majority of examined vultures. Other likely contributory factors are changes in human consumption and processing of dead livestock, and poison and pesticide use.

Measures taken to conserve the species: In accordance with the directives issued by Govt. of India, ban has been imposed on the use of Diclofenac for veterinary use in the state.

Sarcogyps calvus

Scientific Name : ***Sarcogyps calvus***

Family : Accipitridae

Common name : The Red-headed Vulture (*Sarcogyps calvus*), also known as the Asian King Vulture, Indian Black Vulture or Pondicherry Vulture

Distribution: Widely but sparsely distributed in Indian Sub-continent including Nepal, Bangladesh and Bhutan. Also reported from Cambodia, China, Lao People's Democratic Republic, Myanmar, Thailand and Vietnam. Possibly extinct in Malaysia. Vagrant in Pakistan and Singapore. In Uttarakhand this vulture can occasionally be sighted in the lower to middle hills, mostly in pairs.

Description: Its a medium size vulture of up to 85 cm (34 in) long, weighing 3.7-5.4 kg (8.2-11.9 lbs) and having a wingspan about 2.45 - 2.60 meters. The adult has a prominent deep red to orange naked head and the juvenile being of paler red. It has a black body with pale grey band at the base of flight feathers. The sexes differ in colour of the iris: males have a paler, whitish iris, while in females it is dark brown.

Morphology: With its striking, bare, red head and jet-black body, the red-headed vulture is unmistakable among vulture species. Despite being a medium-sized vulture, this species still possesses an impressive wingspan of over two metres. Both the head and legs are dark red and the neck is flanked by two broad, red folds of skin known as lappets. The black-feathered body is characterised by white patches on the flanks above the thighs, bare red patches either side of the crop and tapering wings Males and females are similar, except for the eyes, which, in the male are white or yellowish, and dark in the female.

Threats: Rapid decline over the last eight years is believed to have been driven by the pharmaceutical NSAID diclofenac used to treat livestock, which has proven highly toxic to vultures, causing mortality from renal failure resulting from visceral gout. It seems plausible that this species previously had less exposure to the chemical owing to competitive exclusion from carcasses by *Gyps* spp**.**

Measures taken to conserve the species: In accordance with the directives issued by Govt. of India, ban has been imposed on the use of Diclofenac for veterinary use in the state.

Conservation Status: It used to be declining, but only slowly; in 1994 it was uplisted to Near Threatened from Least Concern by the IUCN. The widespread use of the NSAID Diclofenac in veterinary medicine in India has caused its population to collapse in recent years, however. Diclofenac is a compound now known to be extremely poisonous to vultures. The population of this species has essentially halved every other year since the late 1990s, and what once was a plentiful species numbering in the hundreds of thousands has come dangerously close to extinction in less than two decades. Consequently it was enlisted as Critically Endangered in the 2007 IUCN Red List. Several NSAIDs have been found to be harmful to scavenging birds. Diclofenac, carprofen, flunixin, ibuprofen and phenylbutazone were associated with mortality. Meloxicam has thus far been found to be "Vulture-Safe" and its use in veterinary treatment of livestock is being encouraged.

Vanellus gregarius

Scientific Name : ***Vanellus gregarius***

Family : Charadriidae

Common name : Grey-headed Lapwing

Distribution: The sociable lapwing breeds in Russia and Kazakhstan, dispersing through Kyrgyzstan, Tajikistan, Uzbekistan, Turkmenistan, Afghanistan, Armenia, Iran, Iraq, Saudi Arabia, Syria and Turkey to winter grounds in Israel, Eritrea, Sudan and north-west India. A small population has been located in the terai belt of eastern Uttarakhand. However, this species is suffering a very rapid decline in numbers and a severe range reduction.

Morphology: This plover is marked with yellow cheeks beneath a black stripe running from the black beak through the eye. It has a white stripe above the eye and a black crown. The wings, chest and tail are pale brown, with a dark brown, red and white underside. Juveniles are pale brown with a streaked black belly. The sociable lapwing calls with a harsh *'kretsch kretsch'* and a rapid chattering.

Threats: The cause of the recent decline in sociable lapwing numbers is unknown. This species is known to breed near villages, where land use practices have undergone drastic changes in recent decades. It is plausible that both the breeding and wintering grounds of this species may have undergone successive degradation over time.

Special Features: (*Vanellus cinereus*) is a lapwing species which breeds in northeast China and Japan. The mainland population winters in northern Southeast Asia from northeastern India to Cambodia. The Japanese population winters, at least partially, in southern Honshū. This species has occurred as a vagrant in Russia, the Philippines, Indonesia and New South Wales, Australia.

Description: The Grey-headed Lapwing is 34–37 cm long. It has a grey head and neck, darker grey breast band and white belly. The back is brown, the rump is white and the tail is black. This is a striking species in flight, with black primaries, white under wings and upper wing secondaries, and brown upper wing coverts.

Adults of both sexes are similarly plumaged, but males are slightly larger than females. Young birds have the white areas of plumage tinged with grey, a less distinct breast band, and pale fringes to the upper part and wing covert feathers. The call of the Grey-headed Lapwing is a sharp *chee-it*.

Behaviour: This species nests from April to July in wet grassland, rice fields and marshland edges. It winters in similar habitat and is then gregarious. It feeds in shallow water on insects, worms and molluscs.

Hyaena hyaena (Striped hyena)

Scientific Name : ***Hyaena hyaena***

Family : Hyaenidae

Common name : Striped Hyena

Distribution: Once widely distributed in Indian Sub-continent, mostly in drier tracts, this animal is now restricted to fewer pockets, especially in and around Protected Areas. A small population exists in Chilla Range of Rajaji National Park. Global distribution includes African countries, Georgia, Iran, Iraq, Israel, Jordan, Mali, Nepal, Saudi Arabia, Turkey, Turkmenistan and Uzbekistan. It is possibly extinct from Kuwait, Qatar and United Arab Emirates.

Morphology: Striped hyena is a medium sized canid with a downward sloping back and a roundish head with a pointed muzzle and pointed ears. It is generally pale grey or beige in colour with a black patch on the throat. It sports 5–9 distinct vertical stripes on the flanks, with clearer black transverse and horizontal stripes on the legs. A seasonal dimorphism in pelt colour is noticeable; the stripes of the summer coat are much blacker and well defined as compared to the winter coat. The mid-dorsal line has a mane which can be held erect, making it appear bigger. The mane serves as a signalling device during social interactions. It has a bushy tail which is black and white in colour, with long, coarse hair. Four toes with short, blunt, non-retractable claws are present on the feet. Males weigh between 26–41 kilograms while females weigh 26–34 kg. Excluding the tail, total body length varies between 1.0 and 1.15 m. Shoulder height is between 0.66 and 0.75 m. Striped hyenas have scent glands resembling fairly large, hairless pouches which are located at the opening of the anus.

Special features: The striped hyena is primarily a scavenger, and will readily consume carrion and the remains of kills of other predators, using

its powerful jaws to gnaw and crush bones. It does occasionally feed on live prey. Striped hyenas in Turkmenistan have been recorded to feed on large numbers of tortoises, though they have also been observed hunting wild boar, kulan and porcupine. In the Caucasus, grasshoppers are their primary food source. Striped hyenas will supplement their carnivorous diet with vegetation. In Israel hyenas feed on fruits, particularly dates and melons

Threats: The major reasons for the apparent decline include persecution (especially poisoning), decreasing natural and domestic sources of carrion due to declines in the populations of other large carnivores (wolf, leopard, lion, tiger) and their prey. Humans are consistently indicated as the major source of mortality throughout its range. Striped hyena are very susceptible to accidental or targeted poisoning as it readily accepts strychnine-poisoned bait.

The **Striped Hyena** (*Hyaena hyaena*) is a species of true hyena native to North and East Africa, the Caucasus, the Middle East, Middle and Central part of the Indian Subcontinent. It is listed by the IUCN as Near Threatened, as the global population is estimated to be under 10,000 mature individuals which continues to experience deliberate and incidental persecution along with a decrease in its prey base such that it may come close to meeting a continuing decline of 10% over the next three generations.

It is the smallest of the true hyenas and retains many primitive viverrid characters lost in larger species, having a smaller and less specialised skull. Though primarily a scavenger, large specimens have been known to kill their own prey, and attacks on humans have occurred on rare instances. The striped hyena is a monogamous animal, with both males and females assisting one another in raising their cubs. A nocturnal animal, the striped hyena typically only makes itself visible in complete darkness, and is quick to return to its lair before sunrise. Although it is often considered a cowardly animal (due to its habit of feigning death when attacked), it has been known to stand its ground against larger predators such as leopards in disputes over food.

The striped hyena features prominently in Middle Eastern and Asian folklore. In some areas, its body parts are considered magical, and are used as charms or talismans. It is mentioned in the Hebrew Bible, where it is referred to as *tzebua* or *zevoa*, though the species is absent in some English translations.

Paws: The striped hyena has a fairly massive, but short torso set on long legs. The hind legs are significantly shorter than the forelimbs, thus causing the back to slope downwards. The legs are relatively thin and weak, with the forelegs being bent at the carpal region. The neck is thick, long and largely immobile, while the head is heavy and massive with a shortened facial region. The eyes are small, while the sharply pointed ears are very large, broad and set high on the head. Like all hyenas, the striped hyena has bulky pads on its paws, as well as blunt but powerful claws. The tail is short and the terminal hairs do not descend below the calcaneal tendon. Unlike the genitalia of the spotted hyena, the female reproductive organs of the striped hyena are normal. **The female has 3 pairs of teats**. Adult males weigh 26 kilograms (57 lb)-41 kilograms (90 lb), while females weigh 26 kilograms (57 lb)-34 kilograms (75 lb). Total body length excluding tail varies between 100–115 cm and shoulder height between 66–75 cm. The male has a large pouch of naked skin located at the anal opening. Large anal glands open into it from above the anus. Several sebaceous glands are present between the openings of the anal glands and above them. The anus can be everted up to a length of 5 cm, and is everted during social interaction and mating. When attacked, the striped hyena everts its rectum and sprays a pungent smelling liquid from its anal glands Its eyesight is acute, though its senses of smell and hearing are weak.

The skull is entirely typical of the genus, having a very high sagittal crest, a shortened facial region and an inflated frontal bone. The skull of the striped hyena differs from that of the brown and spotted hyena by its smaller size and slightly less massive build. It is nonetheless still powerfully structured and well adapted to anchoring exceptionally strong jaw muscles which give it enough bite-force to splinter a camel's thigh bone. Although the dentition is overall smaller than that of the spotted hyena, the upper molar of the striped hyena is far larger.

Fur: The winter coat is unusually long and uniform for an animal its size, with a luxuriant mane of tough, long hairs along the back from the occiput to the base of the tail. The coat is generally coarse and bristly, though this varies according to season. In winter, the coat is fairly dense, soft, and has well-developed underfur. The guard hairs are 50–75 mm long on the flanks, 150–225 mm long on the main and 150 mm on the tail. In summer, the coat is much shorter and coarser, and lacks underfur, though the mane remains large.

In winter, the coat is usually of a dirty-brownish grey or dirty gray colour. The hairs of the mane are light grey or white at the base, and black or dark brown at the tips. The muzzle is dark, greyish brown, brownish-grey or black, while the top of the head and cheeks are more lightly coloured. The ears are almost black. A large black spot is present on the front of the neck, and is separated from the chin by a light zone. A dark field ascends from the flanks ascending to the rear of the cheeks. The inner and outer surface of the forelegs are covered with small dark spots and transverse stripes. The flanks have four indistinct dark vertical stripes and rows of diffused spots. The outer surface of the thighs has 3-4 distinct vertical or oblique dark bands which merge into transverse stripes in the lower portion of the legs. The tip of the tail is black with white underfur.

Range and population: The striped hyena's historical range encompasses Africa north of and including the Sahel zone, eastern Africa south into Tanzania, the Arabian Peninsula and the Middle East up to the Mediterranean shores, Turkey, Iraq, the Caucasus (Azerbaijan, Armenia, Georgia), Iran, Turkmenistan, Uzbekistan, Tajikistan, Afghanistan (excluding the higher areas of Hindukush) and the Indian Subcontinent. Today the species' distribution is patchy in most ranges, thus indicating that it occurs in many isolated populations, particularly in most of west Africa, most of the Sahara, parts of the Middle East, the Caucasus and central Asia. It does however have a continuous distribution over large areas of Ethiopia, Kenya, and Tanzania. Its modern distribution in Pakistan, Iran and Afghanistan is unknown.

Tame ability: The striped hyena is easily tamed and can be fully trained, particularly when young. Although the Ancient Egyptians did not consider striped hyenas sacred, they supposedly tamed them for use in hunting. When raised with a firm hand, they may eventually become affectionate and as amenable as well trained dogs, though they emit a strong odour which no amount of bathing will cover. Although they kill dogs in the wild, striped hyenas raised in captivity can form bonds with them.

Tragopan melanocephalus

Scientific Name : ***Tragopan melanocephalus***

Family : Phasianidae

Common name : Western Tragopan

Vernacular name : *Jujurana* (Himachali-Kullu, Mandi), *Fulgar, Fulgari* (Himachali-Chamba), *Pyara* (Kinnaur), *Jyazi* (Bushahr) *Sonalu, Solalee* (Kashmiri), *Jewar* (Garhwali), *Sing monal* (Pahari-N.W. Himalaya)

Distribution: Resident and rare. Distributed in the northwestern and western Himalayas (Jammu & Kashmir, Himachal Pradesh and Uttarakhand), mostly between 2,400-3,600 m (down to 2,000 m in winter). Inhabits dense undergrowth and montane bamboo clumps in undisturbed temperate and subalpine oak, coniferous, and mixed forests. In Uttarakhand birds have been sighted in Panwali Kantha alpine meadow in 2007 by researchers of Wildlife Institute.

Description: A brightly coloured, white-spotted, red and black pheasant. The male is strikingly different from male Satyr Tragopan, by having

bright orange foreneck and upper breast, white-spotted black underparts, and deep scarlet hindneck contrasting with intricately patterned black and grey-brown upper parts. It also has red facial skin, bluish throat, and bluish lappets and horns which are erected in display. The female is dull grayish-brown in colour, intricately patterned with dark browns, greys and buffs. It has slight rufescent tinge to crown and neck, and irregular white spotting on underparts. Very similar to female Satyr Tragopan, but has dark grey-brown coloration to underparts. When in flight, it could be confused with females of Koklass pheasant and Himalayan Monal. The former has broad, rounded tail and stockier appearance, darker and more uniform coloration, and lack of white on throat. The latter is heavily streaked on upper parts and underparts, has white throat and 'horseshoe' patch on rump, and has a loud shrieking flight call.

Special features: Usually found singly or in pairs. It is very shy, extremely wary and skulking, but sometimes forages in forest glades or on open slopes. Feeds on the ground, mainly in early mornings and late evenings. It roosts in trees, where it is well concealed. Territorial during breeding season. While displaying, males repeatedly expand and contract their horns and colorfully patterned lappets. The call is a nasal, wailing *khuwaah*, repeated in bouts of 7-15 calls, uttered by male and female, usually at dawn and dusk, and is very similar to the wailing of a child or goat. When alarmed, a more abrupt and anxious *waa, waa, waa*.

The **Western Tragopan or Western Horned Tragopan** (*Tragopan melanocephalus*) is a medium-sized brightly plumaged pheasant found along the Himalayas from Hazara in northern Pakistan in the west to Uttarakhand within India to the east. The species is highly endangered and globally threatened.

The male is very dark, grey and black with numerous white spots, each spot bordered with black and deep crimson patches on the sides and back of the neck. The throat is bare with blue skin while the bare facial skin is red. They have a small black occipital crest. Females have pale brownish-grey upper parts finely vermiculated and spotted with black, and most of the feathers have black patches and central white streaks. Immature males resemble females, but are larger in size with longer legs and variable amount of black on head and red on neck.

Males weigh 1,800–2,200 g and females 1,300–1,400 g. The males vary in length from 55–60 cm while the females are 48–50 cm.

Habits: It inhabits upper temperate forests between 2,400 and 3,600 m in summer, and in winter, dense coniferous and broad-leaved forests between 2,000 to 2,800 m elevations. The Western Tragopan is mostly arboreal but feeds on the ground. They feed mostly on leaves, shoots, seeds, but also consume insects and other invertebrates. Like most of the pheasants, they roost in trees singly or in pairs except during nesting.

The males during display show the throat inflated into lappets that appear purple with pink margins. They also display blue horns with a fancied resemblance to those of the Greek mythological god Pan, whence the name *Tragopan* (*Tragos* goat + *Pan*). During the display they call and the song is a loud two-note ringing *wou-weee* which is repeated every second for long periods. The breeding season is May–June. They build their nests in low tree hollows.

Status: The Western Tragopan is considered the rarest of all living pheasants. Their range is very restricted. In Kullu District of Himachal Pradesh, this bird is locally called *Jujurana* which means King of Birds.

Threats: The degradation of the alpine habitat of the Western Tragopan as a result of intensive grazing by livestock has lead to its decline in numbers.

Population of C is threatened by several anthropogenic factors throughout its range. The world population is estimated at less than 5,000 individuals, including a captive population of less than five at the moment. CITES has listed this species in Appendix I in order to discourage selling of its feathers. Representing the endemic bird area D02 of Western Himalaya, the Western Tragopan has been described as a range-restricted species.

Tragopan satyra

Scientific Name : ***Tragopan satyra***

Family : Phasianidae

Comman name : Satyr Tragopan

Vernacular Names : *Lungi* (Hindi, Garhwali, Kumaoni), *Bop* (Bhotia), *Tarrhyak* (Sikkim-Lepch

Conservation Status	Size, Habitat & Altitude Range	Reproduction & Life Cycle
IUCN : Near threatened	**Body Length :** 67-72 cm	**Call :***wah, waah! oo-aaaa! , wah, wah, wak, wak, wak, wak*
IWPA : Schedule I	**Weight :** 1,000-2,100 g	**Breeding Season :** May-June
CITES : III	**Habitat :** moist oak & rhododendron forest with dense undergrowth and bamboo clumps, shrubberies on steep hill sides, narrow ravines, & mixed coniferous/ broad leaved forest	**Nest Site/ Type :** a rough nest of sticks in branches of a forest tree
	Altitude: 2,000-3,800 m	**Clutch Size :** 2 to 4
		Incubation Period: unknown

Distribution & Habitat: Resident and rare. Distributed in the western, central and eastern Himalayas (eastern Uttarakhand, northern West Bengal, Sikkim and western Arunachal Pradesh), mostly between 2,400-4,500 m (down to 2,000 m in winter). Inhabits dense undergrowth or montane bamboo clumps in temperate and subalpine oak-rhododendron, coniferous or broad leaved forests, scrub in steep hillsides, and narrow ravines.

Morphology: Male is a brightly coloured unmistakable pheasant. It has red neck, mantle and underparts that have black-bordered white spots. It has intricately patterned olive-brown back, rump, uppertail-coverts and wing coverts, spotted with white and mottled with red. It also has blue facial skin and throat, and bluish lappets and horns which are erected in display. The female varies from rufous-brown to ochraceous-brown in colour, and is vermiculated, mottled and spotted with black and buff. Like other female tragopans, the underparts are generally brighter and more rufescent.

Special features: Similar to those of Western Tragopan. Usually found singly or in pairs. It is very shy, extremely wary and skulking, but sometimes forages in forest glades or on open slopes. Feeds on the ground, mainly in early mornings and late evenings. Roosts in trees, where it is well concealed. Territorial during the breeding season. While displaying, males repeatedly expand and contract their horns and colorfully patterned lappets. It gives a deep, wailing drawn-out call, mainly at dawn, *wah, waah! Oo-oh! Oo-aaaaa*! uttered 12-14 times, the series rising in volume and becoming more protracted until it becomes almost a shriek. Also a *wah,wah* call uttered at any time of the day. When alarmed, or flushed, a more anxious *wak, wak* call.

Threats: Degradation of habitat is a serious threat to this species.

When it is mating season, male satyr tragopans grow blue horns and a gular wattle. When ready to display, they will inflate their horns and hide behind a rock, waiting for females to pass by. When one does, they will perform an elaborate and attractive display in front of the females. At the end of the display, the male will stretch to his full height and show off all of his ornaments. Females are brown. Males are usually red with blue, black, and white spots and freckles.

Although the least threatened of the tragopans, Satyr Tragopans still face many threats. The species is thought to have a moderately small population that is subject to hunting and habitat loss throughout most of its range.

Ophrysia superciliosa

Scientific Name : ***Ophrysia superciliosa***

Family : Phasianidae

Common name : Himalayan Quail

Vernacular Names : *Chota kala teetar*

Conservation Status	Size, Habitat & Altitude Range	Reproduction & Life Cycle
IUCN : critically endangered **IWPA :** Schedule I **CITES :** not listed	**Body Length :** 25 cm **Weight :** unknown **Habitat :** long grass and brushwood on steep hill sides **Altitude :** 1,650-2,100 m	**Call :** A shrill whistle when disturbed

Distribution & Habitat: Former status unknown, occurred in Western Himalayas in Uttarakhand, at 1,650-2,100 m; now presumed extinct, last confirmed sighting in 1890, but may still be surviving. Old records are from Jharipani, Banog and Bhadraj (near Mussoorie) and Sher-ka-danda (near Nainital). Reported to occur in long grass and brushwood on steep hillsides.

Description: A relatively small, long-tailed slaty brown galliforme with red bill and legs. Male has a complex black-and-white head pattern with black-bordered grayish-white supercilium, grayish-white eye-patch and patch on ear-coverts, and black throat with grayish-white border. The above and below are dark slaty olive-brown with black streaks, except for under tail-coverts, which are black with grayish-white barring. Female does not have striking head pattern like male, but with narrow white eye-patch, pale vinaceous-grey supercilium and ear-coverts, and black sides of crown and stripe behind eye. Above are cinnamon-brown and marked with black; below pale vinaceous-brown, streaked with black.

Special features: Historical records indicate that it was usually seen in pairs or in parties of three to six. Being greater skulker, it rarely flushed from thick cover. If flushed, birds flew slowly and heavily, soon dropped into vegetation, and reunited by using shrill whistles.

The **Himalayan Quail** (*Ophrysia superciliosa*) is a medium-sized quail belonging to the pheasant family. It was last reported in 1876 and is feared extinct. This species was known from only 2 locations (and 12 specimens) in the western Himalayas in Uttarakhand, north-west India. The last verifiable record was in 1876.

The red bill and legs of this small dark quail and white spots before and after the eye make it distinctive. The male is dark grey with bleak streaks and a white forehead and supercilium. The female is brownish with dark streaks and greyish brow. Like the male it has a white spot in front of the eye and a larger one behind the eye. It is believed to fly only when flushed at close quarters and was found in coveys of five or six. The habitat was steep hillsides covered by long grass. The genus name is derived from *Ophrys* which refers to the brow.

This quail has long tail coverts and the 10 feathered tail is longer, nearly as long as the wing, than in most quails. The feathers of the forehead are bristly and stiff.

The species was described in 1846 by J. E. Gray from living specimens in the collection of the Earl of Derby at Knowsley Hall, and he gave the locality as "India" with a query. It was not until 1865 that it was first found in the wild by Kenneth Mackinnon who shot a pair in November, in a hollow between Budraj and Benog, behind Mussoorie, at about 6,000 feet (1,800 m) elevation. Two years later, again in November, five specimens were

obtained by a group near Jerepani. In December 1876, Major G. Carwithen obtained a specimen from the eastern slopes of Sher-ka-danda, close to Nainital, at an elevation of 7,000 feet (2,100 m). Frank Finn suggested that it was a migratory bird, arriving in winter, although expressing doubts on account of the short wings. The birds near Mussoorie as observed by Hutton and others occurred in small coveys of six to ten, that kept to high grass and scrub, fed on seeds of grass, were difficult to flush, and had a shrill whistling note when flushed. They appeared to arrive about November, but in one case stayed as late as June, after which they disappeared.

Ecology: All records of the Himalayan Quail are in the altitude range of 1,650 to 2,400 m. They were seen in patches of tall grass ("high jungle grass", "tall seed-grass", see terai) and brushwood on steep hillsides, particularly on the crests of south- or east-facing slopes. It probably bred around September. The June specimen is a yearling male in moult.

A. O. Hume (*Stray Feathers* 9 [1880 or 1881]: 467-471) suggested that it was similar in habit to the Manipur Bush-quails. *Perdicula manipurensis* in that it was seen very rarely, except at dawn or dusk, keeping to tall grassland, relying on its legs rather than its wings for escape and only flying when closely approached. The fluffy, soft plumage suggests it was adapted for low temperatures; it has been suggested that the birds migrated north and uphill in the summer months to the higher mountains, but the shape and size of its wings do not suggest a bird capable of flying long distances. Recent Indian records seem unlikely given that the area is well populated, the habitat extensively altered by human activity, and recent surveys have not located birds. Tourism is a key economic factor of the region, so it seems unlikely that these birds could escape the eyes of observers. However there is no evidence and the habitat available here is no longer suitable due to the population pressure. The early 1990s "sightings" seem to have been based on a misidentification; the habitat type in the area in question is different (conifer forest) anyway.

Judging from the species' known distribution and habitat requirements, it is entirely possible that it was present in Nepal too or even still is. As most of the local population is vegetarian for religious reasons and habitat destruction has not been as pronounced as in neighboring India, Western Nepal is the most likely place for a remnant population of the Himalayan Quail to exist today.

Moschus chrysogaster

Scientific Name : *Moschus chrysogaster*

Family : Moschidae

Common name : Himalayan Musk Deer

Local name : Kasturi mrig

Distribution: The Himalayan musk deer inhabits the forested areas between 2,500 m and the treeline. The average elevation of the treeline is about 3,300 m in Uttarakhand. Unlike other ungulates of the Himalaya, which need to migrate to lower elevations in winter, the musk deer is well adapted for living in alpine, subalpine and upper temperate habitats (>2500 m) even during winter. In Uttarakhand, it occurs in PAs such as the Nanda Devi NP & BR, Valley of Flowers NP, Gangotri NP, Kedarnath WS, Govind WS, Askot WS and many other Reserve Forest Divisions in the high Himalaya.

Density estimates for Himalayan musk deer in Uttarakhand range from 0 to 4 animals per km^2. Areas that are well protected the musk deer density estimates ranged between 3 and 4 per km^2, whereas in highly degraded and disturbed areas, the density estimate was < 1 per km^2.

Morphology: The Himalayan musk deer is a small solitary forest ruminant that inhabits forested and alpine scrub habitats of the Himalaya and has been exploited for its musk for centuries. Musk deer differ from other deer in not having antlers and facial glands. It has a gall bladder, caudal gland and musk gland, which other deer do not possess. It has only one pair of teats, whereas the other deer have two. The upper canines are greatly developed in musk deer, especially in males. In females, the upper canines are small, and never protrude below the lip of the lower jaw. Therefore, musk deer are not true deer, but primitive deer-like ruminants. It measures about 50 cm high at the shoulder, and weighs about 13-15 kg. The hind legs are about 5 cm longer than the forelegs. This, along with greatly enlarged lumbar region and pronounced curvature of vertebral column, has led to the bounding gait in musk deer. Musk deer have long pointed central hooves and enlarged lateral hooves (dew claws). This helps to provide a firm grip on steep ground, even on slanting tree trunks that they climb for forage, and minimizes sinking in soft snow. In males, the upper canines range from 7-10 cm in length, whereas in females they are small (1 cm). The general body colour ranges from grey-brown to light brownish-yellow or dark brown with two white throat stripes. The colour of ear tips ranges from dark brown to ivory-yellow or white. Rump and thighs are darker and the belly pale brown. The genital regions are white and the tail is naked except for a tuft of hair at the tip.

Special features: Electron micrographs show that the medulla of the hair consists of air-filled compartments arranged like a honeycomb, which enhance the effects of insulation. Only males possess caudal gland and musk gland (preputial gland). The caudal gland is situated below the tail, and has pores on each side, through which a yellow viscous secretion with an offensive odour is secreted. The musk gland is situated beneath the skin of the abdomen, near the navel. It has an outer glandular region, concerned with the production of early (immature) musk with an unpleasant odour, and a central sac in which the secretion matures into a powerfully scented, granular, red-brown substance. Himalayan musk deer feed on a variety of food, including leaves of woody plants, forbs, lichens, mosses, ferns and grasses. Graminoids seldom exceed 10% of their diet, and they select forbs and woody plant leaves at all times of the year. In winter, when vegetation is least available due to snow cover, lichen (*Usnea* spp.) and moss formed the major proportion of their diet. They also selected particularly Oak (*Quercus semecarpifolia*), Rhododendron (*Rhododendron campanulatum*),

montane bamboo (*Arundinaria* spp.), *Gaultheria nummularioides* and *Rubus* spp. in winter.

Threats: Himalayan musk deer that was once continuously distributed all along the southern side of the Greater Himalaya, between 2500 m and the treeline is now restricted to a few isolated pockets throughout its former range as a result of human habitations, habitat alterations and poaching. Poaching for musk, and extensive habitat degradation, have led to the decline of musk deer populations and local extinctions in many parts of its once continuous distribution range.

Increased protection to musk deer and its habitat, creating general awareness about musk deer, wildlife research and management are absolute necessities for the conservation of this species. Musk deer communicates chiefly by olfaction and the musk secreted in males is believed in influence the oestrous cycling in females. Young are born in spring after a gestation period of about six months. Twins are common.

Other information: Himalayan musk deer is the 'State Animal' of Uttarakhand. Captive populations are present Musk deer Breeding Centre, Kanchulakharakh (near Tungnath in Chamoli District) and at the Research Center of Central Council of Research in Siddha & Ayurveda at Dharamgarh, Bageshwar District.

Uncia uncia (snow leopard)

Scientific Name : *Uncia uncia*

Family : Felidae

Common name : Barhal he (Pahari), Barfani cheetah (Urdu), Shan (Ladakhi), Burhel haye (Bhotia), Sheen-e-suh (Kashmiri)

IUCN Status/WPA : Endangered / I

LOCAL Status : Rare

Distribution: The Snow leopard occupies Alpine steppe, grassland, and scrub habitat above the tree line. In Uttarakhand it is found in the alpine areas of Uttarkashi, Tehri, Chamoli and Pithoragarh districts. However, it is best seen at Hemis NP, Ladakh (J&K).

Morphology: It is marginally smaller than the Common Leopard, with a more luxuriant coat. It has black spots on its limbs and face, and its pale smoky-grey coat, with ghostly, dark grey rosettes, allows for excellent camouflage. The Snow Leopard's paws are massive in comparison to its body, and help to fell the larger prey that it often needs to hunt. An enlarged nasal cavity which warms the air that it breathes, and dense, long fur enable this cat to live in places where the temperatures can dip to -40° C. It has a body length varying between 100-130 cm and may weigh between 35 – 55 kg.

Special features: The Snow Leopard is adapted completely to live in snow-covered areas. Despite being a large carnivore, the harsh terrain and climate that it lives in forces the Snow Leopard to have a wide dietary range, including rodents, birds, and wild goats. During the lean season,

small alpine mammals such as pikas and hare comprise a fair share of its diet. In February and March, during its peak breeding months, it is known to feed on a shrub, *Myricaria germanica*.

Threats: Poaching, human-animal conflict, and decline in prey.

Snow leopards show several adaptations for living in a cold mountainous environment. Their bodies are stocky, their fur is thick, and their ears are small and rounded, all of which help to minimize heat loss. Their paws are wide, which distributes their weight better for walking on snow, and have fur on their undersides to increase their grip on steep and unstable surfaces; it also helps to minimize heat loss. Snow leopards' tails are long and flexible, helping them to maintain their balance, which is very important in the rocky terrain they inhabit. Their tails are also very thick due to storage of fats and are very thickly covered with fur which allows them to be used like a blanket to protect their faces when asleep.

The snow leopard has a short muzzle and domed forehead, containing unusual large nasal cavities that help the animal breathe the thin, cold air of their mountainous environment.

Snow leopards cannot roar, despite possessing partial ossification of the hyoid bone. This partial ossification was previously thought to be essential for allowing the big cats to roar, but new studies show that the ability to roar is due to other morphological features, especially of the larynx, which are absent in the snow leopard. Snow leopard vocalizations include hisses, chuffing, mews, growls, and wailing.

The snow leopard was first described by Schreber in 1775, in the Kopet-Dagh Mountains near Iran. In the past, many taxonomists included the snow leopard in the genus *Panthera*, together with the other largest extantfelids, but later it was placed in its own genus, *Uncia*. It was thought not to be closely related to the leopard (*Panthera pardus*). However, a recent molecular study placed the species firmly within the genus *Panthera*, its closest relative being the tiger (*Panthera tigris*). Its exact position remains unclear, and many sources still treat it as *Uncia* pending further studies.

A few subspecies have been proposed for animals living in different geographical regions. With the possible exception of *U. u. baikalensis-romanii*, which requires further evaluation, these subspecies were generally not considered valid. The Handbook of the Mammals of the

World recognizes two subspecies: *U. u. uncia*, from central Asia northwest wards to Mongolia and Russia; and *U. u. uncioides* in western China and the Himalayas.

Biology and behavior: In summer, snow leopards usually live above the tree line on mountainous meadows and in rocky regions at an altitude from 2,700 to 6,000 m (8,900 to 20,000 ft). In winter, snow leopards come down into the forests to an altitude of around 1,200 to 2,000 m (3,900 to 6,600 ft). Snow leopards prefer broken terrain and can travel without difficulty in snow up to 85 centimeters (33 in) deep, although snow leopards prefer to use existing trails made by other animals.

The snow leopard leads a largely solitary life, although mothers may rear cubs in dens in the mountains for extended periods.

An individual snow leopard lives within a well-defined home range, but does not defend its territory aggressively when encroached upon by other snow leopards. Home ranges vary greatly in size. In Nepal, where prey is abundant, a home range may be as small as 12 km^2 (5 sq mi) to 40 km^2 (15 sq mi) and up to five to ten animals are found here per 100 km^2 (40 sq mi); whereas in habitats with sparse prey, an area of 1,000 km^2 (400 sq mi) supports only five of these cats.

Like other cats, snow leopards use scent marks to indicate their territory and common travel routes. These are most commonly produced by scraping the ground with the hind feet before depositing urine or scat, but they also spray urine onto sheltered patches of rock.

Snow leopards are crepuscular, being most active at dawn and dusk. They are known for being extremely secretive and well camouflaged.

Snow leopards are carnivores and actively hunt their prey, though, like all cats, they are opportunistic feeders, eating whatever meat they can find, including carrion and domestic livestock. They can kill animals three times their size, such as the Bharal, Himalayan Tahr and Markhor but will readily take much smaller prey such as hares and birds. Unusually among cats, snow leopards also eat a significant amount of vegetation, including grass and twigs.

The diet of the snow leopard varies across its range and with the time of year, and depends on prey availability. In the Himalayas, it preys mostly on bharals (Himalayan blue sheep) but in other mountain ranges such

as the Karakoram, Tian Shan, and Altai, its main prey consists of Siberian ibex and argali, a type of wild sheep, although this has become rarer in some parts of the snow leopard's range. Other large animals eaten include various types of wild goats and sheep (such as markhors and urials), other goat-like ruminants such as Himalayan tahr and gorals, plus deer, boars, and langur monkeys. Smaller prey consists of marmots, woolly hares, pikas, various rodents, and birds such as the snow cock and chukar.

The snow leopard is not averse to taking domestic livestock, which brings it into direct conflict with humans. Herders will kill snow leopards to prevent them from taking their animals. Snow leopards have not been reported to attack humans, and appear to be among the least aggressive of all the big cats. As a result, they are easily driven away from livestock; they readily abandon their kills when threatened and may not even defend themselves when attacked.

Snow leopards prefer to ambush prey from above, using broken terrain to conceal their approach, and can leap as far as 14 meters (46 ft). They will actively pursue prey down steep mountainsides, using the momentum of their initial leap to chase animals for up to 300 metres (980 ft). They kill with a bite to the neck, and may drag the prey to a safe location before feeding. They consume all edible parts of the carcass, and can survive on a single bharal for two weeks before hunting again.

Conservation status: There are numerous agencies working to conserve the snow leopard and its threatened mountain ecosystems. These include the Snow Leopard Trust, the Snow Leopard Conservancy, the Snow Leopard Network, and the Panthera Corporation. These groups and numerous national governments from the snow leopard's range, non-profits and donors from around the world recently worked together at the 10th International Snow Leopard Conference in Beijing. Their focus on research, community programs in snow leopard regions and education programs are aimed at understanding the cat's needs as well as the needs of the villagers and herder communities affecting snow leopards' lives and habitat.

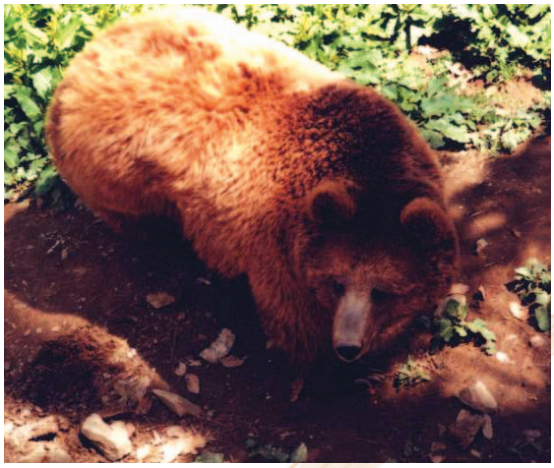
Snow leopard in heraldry: Snow leopards have symbolic meaning for Turkic people of Central Asia, where the animal is known as *irbis* or *bars*, so it is widely used in heraldry and as an emblem.

Ursus arctos isabellinus

Scientific Name : *Ursus arctos isabellinus*

Family : Ursidae

Common Name : Himalayan brown bear (English), Lal bhalu or Burra bhalu (Hindi)



Distribution: The Himalayan brown bear is reported to be found in rolling alpine meadows (>3,000 m) ecologically separated from the Asiatic black bear that inhabits forested habitats below treeline. There are very few areas where the ranges of brown and black bears overlap. The brown bear is found in low densities in the alpine regions of Uttarakhand and therefore is very rare. In Uttarakhand, it occurs in PAs such as the Valley of Flowers NP, Kedarnath WS, Gangotri NP, Govind WS, parts of Nanda Devi Biosphere Reserve in Chamoli district and a few other alpine regions in Rudraprayag and Uttarkashi districts. It is not reported from Pithoragarh, Bageshwar and Almora districts of Uttarakhand.

Morphology: The Himalayan brown bear is the largest bear in India that is found in the high altitudes of the Himalaya. It can be easily distinguished by its brown coat that varies seasonally from dark to light, and the white tips to the fur may give the coat a silvery tinge. Usually the coat is dark, rich brown in summer and long, heavily furnished with underwool before the onset of winter. Brown bear has a large head, prominent hump on the shoulders, a snout that rises more abruptly into the forehead, longer pelage and longer claws. Male average body length is about 1.7 m while a female is about 1.4 m. Large males measuring 2.1 m to 2.4 m from nose to rump have been recorded.

Special features: The long fore claws of brown bears are not adapted for climbing trees, but for digging insects, tubers and digging out the small

mammals out of their burrows. It has excellent senses of hearing and smell but relatively poor eye sight. Brown bear goes under hibernation in winter. Himalayan brown bear feeds largely on alpine vegetation. It digs for tubers, small mammals such as marmots, pikas, other rodents and insects. It occasionally kills livestock and scavenges on dead animals.

Threats: Poaching for bear parts (gall bladder, bear paws) and retaliatory killings to reduce livestock depredation by herders are major threats to brown bear. Agriculture and horticulture crops near natural habitats attract bears leading to occasional brown bear-human interactions. Degradation of alpine habitats due to increasing anthropogenic pressures and habitat loss due to developmental activities, are the major threats to black bear.

Cervus duvaucelii (Cuvier)

Scientific Name : *Cervus duvaucelii;*

Family : Cervidae

Common Name : Barasingha

Distribution: Barasinghas used to inhabit the basins of the Indus, Ganges and Brahmaputra Rivers, as well as central India as far as the Godavari River. Bones over a thousand years old have been found in the Langhanj site in Gujarat. Today, Barasinghas have disappeared entirely from the western part of their range. In 1964, the total population in India was estimated at 3000 to 4000 individuals.

In the Terai, they mainly live in marshland. In central India, they live in grasslands in the proximity of forests. In North-Eastern India, the surviving animals are found in Assam. The swamp deer's main concentration in Assam is in Kaziranga National Park with a few survivors in Manas National Park. It is in all probability extinct in Arunachal Pradesh.

In central India, the barasingha disappeared from all but the Kanha National Park. Even here, from an estimated 3000 individuals in the early 1950s, within a decade less than 100 survived. The number reached an all-time low of 66 in 1970.

Morphology: This is a fairly large deer species. It may stand 119 to 135 cm at the shoulder and 180 cm in head-and-body length. Stags (male deer) are

notably heavier, at 170 to 283 kg, than does (female deer), at 130 to 145 kg. Average antlers may measure 75 cm round the curve with a girth of 13 cm at mid beam. A record antler measured 104.1 cm round the curve.

The Barasingha is a long-legged, long-bodied, medium sized deer with large, scythe shaped antlers and large, spreadable hooves. The head-body length is about 180 cm, the height at the shoulder is 115-125 cm. The antlers grow up to a length of 104 cm. The weight is 230-283 kg for an adult male, females are smaller and lighter.

The ears are medium-sized, wide but pointed and well-haired on the inner surface. The coat is moderately fine and often woolly in texture. The neck of the male is maned. The summer coat is often with pale spots. Males are reddish brown, females yellowish brown, and they both have a dark dorsal line. The winter coat is darker brown, shading to yellowish brown on the lower parts.

Behaviour: In central India, the herds comprise on average about 8–20 individuals, with large herds of up to 60. There are twice as many females than males. During the rut they form large herds of adults. The breeding season lasts from September to April, and births occur after a gestation of 240–250 days in August to November. The peak is in September and October in Kanha National Park. They give birth to single calves. They are basically crepuscular. They are less nocturnal than the Sambar deer. When alarmed, they give out shrill, baying alarm calls. Captive specimens live up to 23 years.

During the breeding season which runs from September to April, Barasingha are found in large mixed herds within which the males fiercely compete for harems of around 30 females; a loud 'roaring' call is often heard during this time, as well as a '*hee-haw*' roar. Females come into oestrus once a year - they give birth to their usually single young between August and September. Fawns become independent at around 6-8 months of age and the life span of the Barasingha is thought not to exceed 20 years.

These deer graze mainly on grasses although the wetland Barasingha (*Rucervus duvaucelii duvaucelii)* feeds commonly on aquatic plants, which it may obtain by completely submerging its head in the water.

Threats: Hunting, poaching and more important, diversion of the bulk of grassland to agriculture are considered the main causes of their reduced

numbers. Tall grass is not only their food, but also provides security for young fawns during the birthing season.

George Schaller wrote in *The Deer and The Tiger*, "Most of these remnants have or soon will have reached the point of no return." The warning, however, was heeded in time. Concerted efforts at saving this species from extinction were made and have now borne fruit. The causes of the Barasingha's decline and present threats include destruction or modification of its habitat for wetland reclamation, grass and timber cutting, illegal gathering of fuel wood and other resources in reserves, and cultivation or tree plantations; poaching; and shooting for (allegedly) crop protection? Diseases introduced by cattle are also a factor.

Conservation status: Classified as Vulnerable (VU C1) on the IUCN Red List 2002, and listed on Appendix I of CITES. Subspecies: Wetland Barasingha (***Ruc****ervus duvaucelii duvaucelii*) classified as Vulnerable (VU C1); upland Barasingha (*R. d. branderi*) classified as Endangered (EN D); *R. d. ranjitsinhi* classified as Critically Endangered (CR C2b).

Measures taken for conservation: The Barasingha persists in a number of National Parks, including Dudhwa in northern India, Mana Kaziranga in northeastern India and Kanha and Idnravati in central India. The species is listed on Appendix I of the Convention on International Trade in Endangered Species (CITES), which bans international trade in this species. It is also protected under the Indian Wildlife Protection Act of 1972.

Melursus ursinus

Scientific Name : *Melursus ursinus*

Family : Ursidae

Common Name : Sloth bear (English), Reech (Hindi).

Distribution: Sloth bear is found throughout India, Sri Lanka, and further north into Bangladesh, Nepal, and Bhutan. In Uttarakhand, a small population (<30 individuals) may occur between Chilla range of Rajaji and Corbett TR.

Morphology: Sloth bears have a shaggy black coat, especially over the shoulders. Brown and grey hairs found on the coat give the appearance of a cinnamon color on some bears. This heavy coat may be an adaptation to deal with cold. These bears have long snouts. The molars are broad and flat, representing a trend away from carnivory. The body structure of *M. ursinus* is awkward with huge feet and enormous claws. Sloth bears are nevertheless capable of galloping fast. Compared to the body, the face appears naked and grey. They have extremely large tongues, a mobile snout, and they can voluntarily open and close their nostrils, all of which prove helpful with their diets. These bears have a light "U" or "y" shaped patch on their chests. The color of these markings varies from white to yellow to chestnut brown. Females can weigh between 55 and 95 kg. Males are 30 to 40% heavier than females and can weigh between 80 and 140 kg. Adults measure 60 to 90 cm at the shoulder.

Special features: Sloth bears are omnivorous, although their diet typically includes a large proportion of insect foods. Their diet includes leaves, honey, flowers, and fruits. They are mainly nocturnal. Their sense of smell is well developed but their sight and hearing are poor. These bears

are generally not aggressive, but their poor eyesight and hearing allows humans to draw near, and when feeling threatened these bears will defend themselves. They live in the tropics but have long, dark, shaggy coats suggesting they are susceptible to cold stress. They are excellent climbers, but do not climb trees to escape danger. During the day they sleep in caves, especially caves by river banks. Not much is known about their social systems but evidence suggests they are solitary except for mothers with cubs. They do not hibernate, but do have a period of inactivity during the rainy season. Sloth bears tend to be very noisy during mating. Most births occur from September to January. Pregnancy lasts between 6 and 7 months. One to two offspring are usually born but rarely three. After birth (usually in a ground shelter of some sort), sloth bears are blind for about 3 weeks. Following a period of about 4 to 5 weeks the young leave the den. The cubs stay with their mother until they reach adulthood at about 2 to 3 years of age. Cubs often ride on the mother's back. Males are not reported to participate in parental care.

They were trained by Qualanders, a nomadic group that roamed India and entertained crowds with performing animals and circus acts, and were the original dancing bears.

Threats: Habitat degradation and loss. Conflict with humans and retaliatory killings.

The **sloth bear** (*Ursus ursinus, Melursus ursinus*), also known as the **labiated bear**, is a nocturnal insectivorous species of bear found wild within the Indian subcontinent. The sloth bear evolved from ancestral brown bears during the Pleistocene and shares features found in insect-eating mammals through convergent evolution. The population isolated in Sri Lanka is considered as a subspecies. Unlike brown and black bears, sloth bears have lankier builds, long shaggy coats that form a mane around the face, long sickle shaped claws, and a specially adapted lower lip and palate used for sucking insects. Sloth bears breed during spring and early summer and give birth near the beginning of winter. They feed on termites, honeybee colonies and fruits. Sloth bears sometimes attack humans that encroach on their territory. Historically, humans have drastically reduced their habitat and diminished their population by hunting them for food and products such as their baculum and claws. These bears have been used for as performing pets due to their tameable nature.

The breeding season for sloth bears varies according to location: in India, they mate in April, May and June, and give birth in December and early

January, while in Sri Lanka, it can be done all year. Sows gestate for 210 days near about 7 months, and typically give birth in caves or in shelters under boulders. Litters usually consist of 1–2 cubs, rarely 3. Cubs are born blind, and open their eyes after four weeks. Sloth bear cubs develop quickly compared to most other bear species: they will start walking a month after birth, become independent at 24–36 months, and become sexually mature at the age of 3 years. Young cubs will ride on their mother's back when she walks, runs or climbs trees until they reach a third of her size. Individual riding positions are maintained by cubs through fighting. Intervals between litters can last 2–3 years.

Dietary habits: Sloth bears are expert hunters of termites, which they locate by smell. On arriving at an ant-hill, they scrape at the structure with their claws till they reach the large combs at the bottom of the galleries, and will disperse the dirt with violent puffs. The ants are then sucked up through the muzzle, producing a hoovering sound which can be heard 180 meters away. Their olfactory senses are strong enough to detect grubs three feet below ground. Unlike other bears, they do not congregate in feeding groups. They rarely prey on other mammals. Sloth bears may supplement their diet with fruit and plant matter: in March and April, they will eat the fallen petals of mowha trees and are partial to mangoes, sugar cane, the pods of the Golden Shower Tree and the fruit of the jack-tree. Sloth bears are extremely fond of honey. When feeding their cubs, sows are reported to regurgitate a mixture of half digested jack fruit, wood apples and pieces of honey comb. This sticky substance hardens into a dark yellow circular bread-like mass which is fed to the cubs. This "bear's bread" is considered a delicacy by some of India's natives.

In India, their distribution is patchy, and mostly occur in areas of forest cover. They are absent in the high mountains of Himachal Pradesh and Jammu and Kashmir, the northwestern deserts of Rajasthan, and a broad non-forested swath in the south. Sloth bears are the most widespread bear species in India, being found in the Shiwaliks (also in Pakistan) , low hills bordering the outer range of the Himalayas from Punjab to Arunachal Pradesh, though they are no longer found as far west as Punjab. They are isolated from the sloth bear populations of Nepal, due to the connection being broken by agricultural lands. Sloth bears in Nepal are mainly restricted to the Terai, the southern strip of lowland forest and grasslands bordering India. A few isolated populations may still occur in the Chittagong and Sylhet regions of eastern Bangladesh.

Murina grisea

Scientific name : ***Murina grisea***

Common name : Peter's tube nosed bat

Family : Vespertilionidae

Distribution: Jharipani, Mussoorie, Kumaon, India, 5500 ft. Thomas (1915d) included grisea in a new genus Harpiola on account of its distinctive dentition. This view was not followed by Ellerman & Morrison-Scott (1951) or the Corbett & Hill (1992) who reassigned Harpiola to sub generic status.

Murina grisea is only known by the holotype collected from Jeripani,Uttar Pradesh,India. It inhabits montane forests in the foothills of the Himalayas (approx. 1,692 m altitude). The species may possibly be extinct.

Morphology: *Murina cyclotis* that is considered a close look-alike of Peter's tube nosed bat. The tubular nostrils are a key characteristic of *Murina.*

This is a small *Murina* with a forearm length of 32.8 mm (description based on the holotype). The ears have a relatively narrow rounded tip and a conspicuous emargination on the posterior border. The dorsal pelage is dark brown with the tips of the hairs yellowish brown on the ventral surface; the tips are ashy grey (Blanford, 1888-91). The size including head and body length is approx. 33-60 mm and the tail is approx. 30-42 mm. Weight of Peter's tube nosed bat is 2-3.5 g. This small bat has thick brownish fur. The tips of the hairs are yellowish-brown on the animal's back and ashy grey on the underside. The nostrils are located at the ends of tubes.

Special features: Nothing is known of the biology or ecology of this species. Related bats appear to fly relatively low over crops and grass when feeding. They have been observed roosting in groups in the dead dry leaves of cardamom plants and in caves. This is an endemic species to India. It is only known from the type locality and is included on List 1 "Threatened Species" in the 1996 IUCN Red List of Threatened Animals with the notation EN B1+2C: Endangered with a small distribution and a continuing decline in area, extent and/or quality of habitat (Baillie & Groombridge, 1996).

Threats: The species has an extremely restricted range. There has been extensive loss of habitat due to human interference, housing and tourism.

Conservation Underway: There are no conservation measures in Peter's Tube-nosed Bat

Peter's Tube-nosed Bat (*Murina grisea*) is a species of vesper bat in the Vespertilionidae family, found in South Asia. They have tube-shaped nostrils (hence the name) which assist them with their feeding. They are brown with white-yellow and underparts and have specks of orange around their neck. While they are roosting, their fur, which seems to look like a dead plant, camouflages them from predators. They are 3.3-6.0 cm in length and have round heads, large eyes and soft fur. This bat is found in India. They are endangered due to clearing of the rain forests in which they live in and are not protected by the World Conservation Union. They feed on rain forest fruit and blossoms.

Amblonyx cinereus

Scientific name : ***Amblonyx cinereus***

Family : Mustelidae

Common name : Asian small clawed otter (English).

Distribution: *Amblonyx cinereus* has been reported from Bangladesh, Bhutan, Borneo, Brunei, south China, southern India, Indonesia, Java, Karimon Islands, Laos, Malay Peninsula, Myanmar, Palawan, Philippines, Sumatra, Thailand, and Vietnam. In Uttarakhand this species is extremely rare and so far only one or two localities have been recorded. It is known to inhabit shallow pools of hill streams up to 1500 m.

Special features: Prepuce is pendulous and lacks hair. Short claws are known to enhance dexterity. In captivity, females come into estrus every 28–30 days that lasts 3 days. Gestation is about 60 days. 2 litters are produced in a year with up to 7 pups in each litter. *A. cinereus* is known to feed primarily on crabs, shellfish, fish, snakes, and insects. Asian small-clawed otters coexist with *Lutra lutra, L. sumatrana*, and *Lutrogale perpicillata.* Asian small-clawed otters are nocturnal. Resting sites often show signs of scat smearing. Asian small-clawed otters are monogamous, and both parents contribute to raising their offspring.

Characteristics: Otters have long, slim bodies and relatively short limbs, with webbed paws. Most have sharp claws on their feet, and all except the sea otter have long muscular tails. They have a very soft, insulated underfur which is protected by their outer layer of long guard hair. This traps a layer of air, and keeps them dry and warm under water. Many otters live in cold waters and have very high metabolic rates to help keep

them warm. In summer, in the Himalayas many otters go up the streams and torrents ascending to altitudes of 12,000 ft or more. Their upward movement probably coincides with the upward migration of carp and other fish for purposes of spawning. With the advent of winter they come down to the lower streams. For most otters, fish is the primary staple of their diet. This is often supplemented by frogs, crayfish and crabs. Some otters are expert at opening shellfish, and others will feed on available small mammals or birds. Prey-dependence leaves otters very vulnerable to prey depletion. Otters are very active, chasing prey in the water or searching the beds of rivers, lakes or the seas. Most species live beside water, entering it mainly to hunt or travel, otherwise spending much of their time on land to avoid their fur becoming waterlogged. The sea otter does live in the sea for most of its life. Otters are playful animals and appear to engage in various behaviors for sheer enjoyment. Different species vary in their social structure, with some being largely solitary, while others live in groups – in a few species these groups may be fairly large.

Major Threat(s): The aquatic habitats of otters are extremely vulnerable to man-made changes. Canalisation of rivers, removal of bank side vegetation, dam construction, draining of wetlands, aquaculture activities and associated man-made impacts on aquatic systems are all unfavourable to otter populations (Reuther and Hilton-Taylor 2004). In South and South East Asia, the decrease in prey species from wetlands and water ways had reduced the population to an unsustainable threshold leading to local extinctions. The poaching is one of the main causes of its decline from South and South East Asia, and possibly also from the North Asia. (IUCN Red List).

Morphology: Oriental small-clawed otters are the smallest of all otters in the world. The overall length can range from 70 to 100 cm (28–39 in), about 30 cm (12 in) of which is comprised by the tail. Weight can range from 1 to 5.4 kg (2.2-11.9 lbs). Their body shape is typically slender, streamlined and serpentine, and its flexibility allows grooming of almost all their fur. Dark, grayish-brown fur covers most of the dorsal surface with a lighter cream coloration on the ventral surface, especially on their face and neck. The fur has relatively short hairs less than 2.5 cm in length, and it is fine, dense and velvety. Otters have two types of fur: long, stout guard hairs and a short, fine undercoat.

Oriental small-clawed otters have flattened heads and short, thick necks; eyes are located toward the front of the head. Their ears are small and

rounded, and a valve-like structure enables closure when swimming underwater. Nose pads are dusky or pinkish in color. They have vibrissae (whiskers) on their muzzle. The vibrissae are sensitive to touch and to underwater vibrations, and are important in detecting the movements of prey.

Similar to other otters, oriental small-clawed otters have relatively short legs, which are used to swim, walk, groom and manipulate prey. Feet are very narrow and only webbed to the last joint — not all the way to the end of the toe. Thus, they have only partially webbed paws, which distinguishes them from all other otters. These partially webbed paws give them an excellent sense of touch and coordination, providing them with more dexterity than other otters with full webbing. Unlike other otters, they catch their prey in their paws instead of with their mouth. Their small, blunt, peg-like claws are extremely reduced and rarely extend past the digit.

The oriental small-clawed otter's tail is long, about one-third of total body length. The tail is thick at the base, muscular, flexible, and taper to a point. Subcutaneous and scent glands are located at the base of the tail. The tail is used for propulsion when swimming at high speed, to steer when swimming slowly and for balance when standing upright on hind legs.

Distribution: This species could be found distributed in coastal regions from Southern India to South China, South-east Asia, Sumatra, Java, and Palawan. It is known from all regions of Sabah and Sarawak, Brunei, and in Central of Kalimantan. It could be found in almost all other parts of Borneo.

Habitat: They commonly could be found in freshwater wetland systems such as freshwater swamps, meandering rivers, mangroves and tidal pools. They also dominated irrigated rice fields and wandering in area between patches of reeds and river debris where many crab species (Brachyura) were more likely to be found. They dislike bare and open areas that do not offer any shelter. Thus, they prefer pond areas and rice fields more than the rivers. However, in the riverine systems they would only chose the area with low vegetation. Their nesting burrows dug into the muddy banks where they live. This species spend most of their time on land unlike any other otters.

Reproduction: The oriental Small-clawed otter form monogamous pairs for life. The estrous cycle in the female is 28 days with 3 days period of estrus. The mated pairs can have two litters of 1 to 6 young per year. Their gestation period is about 60 days. The newborn are relatively undeveloped. When they are born, they weigh around 50 g, are toothless, practically immobile and their eyes are still closed. They remain in their birthing dens and spend their first few weeks nursing and sleeping. The pups nurse every 3 to 4 hours for 10 to 15 minutes at a time. They are fully weaned at 14 weeks. The newborn will only open their eyes after 40 days. In the next 40 days, the young can start to eat solid food and can swim three months later. All the young otter will stay with their mother until the next litter is born. The male otter assists the female building the nest before birth and in food procurement after parturition. Life span of this species is around 11 years to 16 years.

Behavior: They are diurnal animals. They are very active during daytime in remote areas which are free of human disturbance. They continually groom their fur to maintain their insulating qualities. They spend most of their time grooming and usually could be seen on land grooming and drying their fur. They dry themselves by rolling on the ground or rubbing against logs or vegetation. They are excellent swimmers too. They swim by moving their hind legs and tail. They 'dog-paddle' with all four feet while swimming or floating. When swimming at a high speed, they undulates the entire body including their tail up and down while their hind feet steer. They can dive under water for about 6 to 8 minutes. They produce small amounts of feces which are well-known as spraint by otter researchers. The spraints are one of important way for communication among the otters. Other otter could indicate the presence of other individual based on the olfactory and visual of the spraints. Generally, they sleep and resting on land either above ground or in the dens. They often sleep in areas with moderate disturbance. Oriental small-clawed otters are most social animals. They live in extended family groups of about 12 individuals. They are often seen playing and sliding on muddy banks and in the water in regions where they frequently visit or live. They defend their territories by working, scratching and occasionally fighting.

Communication: There are few ways for this species to communicate such as vocalizations, scent markings and sign heaps. They often produce sounds and communicate vocally. This species has at least 12 different types of vocalization. Meanwhile, scent is the most important sense for communication especially for marking territorial boundaries. Their tail

has scent glands where they deposit their musky scent on their spraint. The spraint is deposited either in tree trunks, boulders, trails and pool edges. Finally, they also have signed heaps which is visual indicator of an otter's presence. The sign heaps is small mounds of sand, gravel, grass or mud scraped up by the otters. Besides that, their communication also occurs with chemical and tactile cues such as social grooming, hormonal changes and posturing.

Diet and eating habits: Oriental Small-clawed otter feed mainly on invertebrates such as crab and other crustaceans, molluscs and amphibians. This is evident from the last two upper teeth (pm4 and m3) which are larger in size for crushing the exoskeleton of crabs and other hard shelled prey. They also feed on insects and small fish such as gouramis and catfish. They supplement their diet with rodents, snakes and frogs too. Apart from crabs, the major prey items for them are the mudskipper (Gobioidei). Only the relatively rare dietary component of rodents, snails and snakehead fish (*Clarius* spp.) showed no significant difference among seasons. They hunt food by using their vibrissae to detect movements of prey in the water. They use their forepaws to locate and capture items rather than their mouth. Their incomplete webbing gives them a great deal of manual dexterity. They dig in sands and mud for shellfish such as clams and mussels and crabs as well. To get at the meat they crush the shell manually or let heat from the sun open the shells. Therefore, there teeth are broad and robust very suitable for crushing shells.

Economic importance for humans: They consume small crabs which are considered as agricultural pests. However, they may uproot plants in the paddy fields. Thus, they benefit as pest population controller for the farmer.

Ecosystem roles: They influence the population of shellfish and crustaceans and crabs in their living area.

Panthera tigris tigris

Scientific Name : ***Panthera tigris tigris***

Family : Felidae

Common Name : Royal Bengal Tiger

Distribution: In the Indian subcontinent, tigers inhabit tropical moist evergreen forests, tropical dry forests, tropical and subtropical moist deciduous forests, mangroves, subtropical and temperate upland forests, and alluvial grasslands. Latter tiger habitat once covered a huge swath of grassland and riverine and moist semi-deciduous forests along the major river system of the Gangetic and Brahmaputra plains. Today, the best examples of this habitat type are limited to a few blocks at the base of the outer foothills of the Himalayas including the Tiger Conservation Units like Rajaji-Corbett, Bardia-Banke, and the transboundary Chitwan-Parsa-Valmiki, Dudhwa-Kailali and Sukla Phanta-Kishanpur where the Tiger densities are high.

Good tiger habitats in subtropical and temperate upland forests include the *Tiger Conservation Units* (TCUs) Manas-Namdapha. TCUs in tropical dry forest include Hazaribagh National Park, Nagarjunsagar-Srisailam Tiger Reserve, Kanha-Indravati corridor, Orissa dry forests, Panna National

Park, Melghat Tiger Reserve and Ratapani Tiger Reserve. The TCUs in tropical moist deciduous forest are probably some of the most productive habitats for tigers and their prey, and include Kaziranga-Meghalaya, Kanha-Pench, Simlipal and Indravati Tiger Reserves. The TCUs in tropical moist evergreen forests represent the less common tiger habitats, being largely limited to the upland areas and wetter parts of the Western Ghats, and include the Tiger Reserves of Periyar, Kalakad-Mundathurai, Bandipur and Parambikulam Wildlife Sanctuary.

During the tiger census of 2008, the Shivaliks–Gangetic flood plain landscape having Rajaji and Corbett national parks, Dudhwa-Kheri-Pilibhit, Suhelwa Tigrer Reserve, Sohagi Barwa Sanctuary and Valmiki National Park had an estimated population of 259 to 335 individuals. In Central Indian landscapes of Kanha-Pench, Satpura-Melghat, Sanjay-Palamau, Navegaon-Indravati; Bandhavgarh, Tadoba, Simlipal and the national parks of Panna, Ranthambore–Kuno–Palpur–Madhav and Saranda; there are approximately 437 to 661 Tigers. In Eastern Ghats landscape having Srivenkateshwara National Park, Nagarjunasagar Tiger Reserve and the Gundla Brahmeshwara area, there are approx. 49 to 57 individuals. In Western Ghats landscape there are is estimated population of 336 to 487 Tigers.

Morphology: The Bengal Tiger's coat is yellow to light orange, with stripes ranging from dark brown to black; the belly and the interior parts of the limbs are white, and the tail is orange with black rings. Male Bengal tigers have an average total length of 270 to 310 cm including the tail, while females measure 240 to 265 cm on average. The tail is typically 85 to 110 cm long, and on average, tigers are 90 to 110 cm in height at the shoulders. The average weight of males is 221.2 kg , while that of females is 139.7 kg.

Behaviour: The Bengal tiger is a carnivore. It eats boars, wild oxen, monkeys, and other animals. The Bengal tiger can catch big animals, but prefers killing either young or old animals because they don't run as fast. The Bengal tiger is a nocturnal and greatly feared predator. It eats wild oxen and other animals, which eat plants , which are part of the food web. So it helps balance the web.

The basic social unit of the tiger is the elemental one of mother and offspring. Adult animals congregate only on an *ad hoc* and transitory basis when special conditions permit, such as plentiful supply of food. Otherwise they lead solitary lives, hunting individually for the dispersed forest and

tall grassland animals, upon which they prey. They establish and maintain home ranges. Resident adults of either sex tend to confine their movements to a definite area of habitat within which they satisfy their needs, and in the case of tigresses, those of their growing cubs. Besides providing the requirements of an adequate food supply, sufficient water and shelter, and a modicum of peace and seclusion, this location must make it possible for the resident to maintain contact with other tigers, especially those of the opposite sex. Those sharing the same ground are well aware of each other's movements and activities.

The home ranges occupied by adult male residents tend to be mutually exclusive, even though one of these residents may tolerate a transient or sub-adult male at least for a time. A male tiger keeps a large territory in order to include the home ranges of several females within its bounds, so that he may maintain mating rights with them. Spacing among females is less complete. Typically there is partial overlap with neighbouring female residents. They tend to have core areas, which are more exclusive, at least for most of the time. Home ranges of both males and females are not stable. The shift or alteration of a home range by one animal is correlated with a shift of another.

The tiger in India has no definite mating and birth seasons. Most young are born in December and April. Young have also been found in March, May, October and November. In the 1960s, certain aspects of tiger behaviour at Kanha National Park indicated that the peak of sexual activity was from November to about February, with some mating probably occurring throughout the year.

Males reach maturity at 4–5 years of age, and females at 3–4 years. A tigress comes into heat at intervals of about 3–9 weeks, and is receptive for 3–6 days. After a gestation period of 104–106 days, 1–4 cubs are born in a shelter situated in tall grass, thick bush or in caves. Newborn cubs weigh 780 to 1,600 g (1.7 to 3.5 lb) and they have a thick wooly fur that is shed after 3.5–5 months. Their eyes and ears are closed. Their milk teeth start to erupt at about 2–3 weeks after birth, and are slowly replaced by permanent dentition from 8.5–9.5 weeks of age onwards. They suckle for 3–6 months, and begin to eat small amounts of solid food at about 2 months of age. At this time, they follow their mother on her hunting expeditions and begin to take part in hunting at 5–6 months of age. At the age of 2–3 years, they slowly start to separate from the family group and become transient — looking out for an area, where they can establish

their own territory. Young males move further away from their mother's territory than young females. Once the family group has split, the mother comes into heat again.

Threats: Over the past century tiger numbers have fallen dramatically, with a decreasing population trend. None of the *Tiger Conservation Landscapes* within the Bengal tiger range is large enough to support an effective population size of 250 individuals. Habitat losses and the extremely large-scale incidences of poaching are serious threats to the species' survival.

The most significant immediate threat to the existence of wild tiger populations is the illegal trade in poached skins and body parts between India, Nepal and China. There are well-organized gangs of professional poachers, who move from place to place and set up camp in vulnerable areas. Other factors contributing to their loss are urbanization and revenge killing. Farmers blame tigers for killing cattle and shoot them. Their skins and body parts may however become a part of the illegal trade. The illicit demand for bones and body parts from wild tigers for use in Traditional Chinese medicine is the reason for the unrelenting poaching pressure on tigers on the Indian subcontinent.

Conservation status: Since 2010, the Bengal tiger has been classified as an endangered species by IUCN. The total population is estimated at fewer than 2,500 individuals with a decreasing trend, and none of the *Tiger Conservation Landscapes* within the Bengal tiger's range is large enough to support an effective population size of 250 adult individuals.

Measures taken for conservation: An area of special interest lies in the Terai Arc Landscape in the Himalayan foothills of northern India and southern Nepal, where 11 protected areas comprising dry forest foothills and tall-grass savannas harbor tigers in a 49,000 square kilometres (19,000 sq mi) landscape. In Nepal a community-based tourism model has been developed with a strong emphasis on sharing benefits with local people and on the regeneration of degraded forests. The approach has been successful in reducing poaching, restoring habitats, and creating a local constituency for conservation.

In 1972, Project Tiger was launched aiming at ensuring a viable population of tigers in the country and preserving areas of biological importance as a natural heritage for the people.