

1. The Himalayas are less than 25 million year old, amongst the youngest mountains in the world!
2. The chain of mountains lying in between the Brahmaputra and the Indus constitute the Himalayas.
3. Himalayas stretch 1900 Miles long and between 50-200miles wide
  - a. The Himalayas are divided into three zones depending on their altitudes
  - b. Outer or lower Himalayas: Not more than 3000Feet above MSL these are known as the Siwaliks
  - c. Middle or greater Himalayas: Extend from Kashmir to Bhutan and China between 6000 feet to 14000Feet high
  - d. Inner Himalayas: Consist of Zanskar, Ladakh, Hindu Kush and Karakoram
4. The Indian Himalayas consists of, Arunachal Pradesh (Also known as the Assam Himalayas), Sikkim, Kumaun, Garhwal, Kinnaur, Spiti, Kullu, Lahaul, Kishtwar, Kashmir, Zanskar, Ladakh and the Eastern Karakoram.
5. The Eastern Himalayas are considerably wetter than the Western because the rain clouds coming from Bay of Bengal drain themselves in the southern section losing moisture quickly as they move northwest.
6. In general the temperature drops about 1 degree C for every 300Mtrs rise in altitude.
7. Even in winters, one may see grasshoppers and agamid Lizards feeding or basking in the sun on one side of the slope, while a few meters away the ground is covered by deep snow and all animals are hibernating.
8. Ladakh: A region of harsh and bleak winters, daily winds, notable paucity of rainfall or even winter snow
9. The alpine zone in Ladakh has very little plant life and virtually no trees, except those that have been planted by people and the odd stunted Juniper that grows in protected places. All plants in this region are adapted to conditions of extreme dryness.

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**SIKKIM**

Sikkim is the least populous state in India and the second-smallest state after Goa. In Hindu religious texts, Sikkim is known as Indrakil, the garden of Indra. Nature has been particularly generous in her gift of sylvan treasures to the state of Sikkim. With luxuriant forest abounding in all part of state, Forestry has been the major land use in the State and nearly 82% of the total geographical area of the State is under the administrative control of the State Forest Department. The forest cover of the State is 46% of the total geographical area of the state. This proportion is one of the largest in the country.

Over the whole length of the Himalaya, Schaller (1977) observed that the Sikkim Himalaya are the steepest and rise from the Indian plains to the crest over an extremely short distance (80 km), thereby resulting in telescoped or narrow ecozones. Geographically, in fact, Sikkim Himalaya is the drainage basin of the mighty river Teesta, which is fed by numerous watersheds in the region.

Sikkim has several ethnic groups, the natives being Lepchas. There are others who have settled later like, the Nepalis, Indian Sherpas,. There are other groups like Gurungs, Bhotiasetc who are resident here. Monsoons arrive in Sikkim by mid-May.

Zemu glacier in Northern Sikkim is at the base of Kanchenjunga (8586Mtrs/28170ft), the third highest peak in the world and is the prime attraction of Sikkim. This mountain can be seen from Darjeeling, Goecha La, Sandakphu or GreenLake on North Sikkim. The Himalayan ranges surround the northern, eastern and western borders of Sikkim in a crescent. The Lower Himalayas in the southern reaches of the state are the most densely populated. The state has 28 mountain peaks, more than 80 glaciers, [23] 227 high-altitude lakes including the Tsongmo Lake, Gurudongmar and Khecheopalri Lake, 5 hot springs, and more than 100 rivers and streams. Eight mountain passes connect the state to Tibet, Bhutan and Nepal. The earlier expeditions to Everest passed through Sikkim.

Although Sikkim is very small in size as there are around 500 species of avi fauna, 600 species of butterflies and a delightful species of mammals. Some of the most attractive birds here include emerald dove, woodpeckers, cuckoos, kingfishers and fairy blue bird. Surprisingly you are ducks and wild asses flourishing at such high altitudes. You can visit some of the wild life sanctuaries here to have an in depth view of this animal life here. The area included the habitat of Snow leopard (*Panthera uncia*), Blue Sheep and Musk Deer, while the entire region served as the habitat of the Southern kiang (*Equus kiang polydon*), Great Tibetan sheep or nayan (*Ovis ammon hodgsoni*), Tibetan Gazelle (*Procapra picticaudata*), Bharal or Blue sheep (*Pseudois nayaur*), Red Panda (*Ailurus fulgens*), Red fox (*Vulpes montana*), Himalayan tahr (*Hemitragus jemlahicus schaferi*), Tibetan wolf (*Canis lupus chanco*), Himalayan mouse hare or pika (*Ochotona roylei*), Woolly hare (*Lepus oiostolus*), Himalayan marmot (*Marmota caudata*), Yellow-throated marten (*Martes flavigula*), Indian wild dog or dhole (*Cuon alpinus*), Himalayan Black bear (*Selenarctos thibetanus*), civets, etc. Recently the pugmarks of Himalayan Brown bear (*Ursus arctos*) have been re-recorded from here.

NO.	PARTICULARS OF FLORA AND FAUNA	NO. OF SPECIES / SUB-SPECIES	NAME OF PRINCIPAL ENDANGERED SPECIES
1	Mammals	144	Bharal, Clouded leopard, Fishing Cat, Golden Cat, Himalayan Tahr, Leopard Cat, Lesser or Red Panda, Marbled Cat, Musk Deer, Nayan or Great Tibetan Sheep, Pangolin, Snow leopard, Spotted Lingsang, Tibetan Fox, Tibetan Gazelle, Tibetan Wild Ass, Tiger, Tibetan Wolf.
2	Birds	Over 450	Blacknecked Crane (Migratory), Blood Pheasant Lammergeier, Large Falcon, Monal Pheasant, Peafowl, Tibetan Show Cock, Tragopan Pheasant, Snow Partridge.
3	Butterflies & Moth	Over 400	Most of the butterflies and moths found in Sikkim are endangered species
4	Orchids	Over 450	N. A.
5	Rhododendrons	Over 40	N. A.
6	Flowering Plant	Over 4000	N. A.
7	Ferns & Its Allies	300	N. A.

#### Describing Few Animals

**Snow Leopard; (Bhotiaikar, zig, sachak):** Somewhat smaller than a panther. Head and body 3ft 3 inches, Tail 3ft. The ground colour of its coat is soft grey to pure white on the underside. The spots are unbroken on the head, nape and lower parts of the limbs. The spots are broken into larger, paler rosettes. Main prey is wild sheep, goats, musk deer, hares, marmots and other rodents.

**Clouded Leopard; (Lepchapungmar, satchuk; Bhotiakung):** The animal has a long body and tail and short limbs, rounded black ears. The markings of the clouded leopard give it a beauty and distinction equalled by few other cats. The general colour of the body varies from grey or earthy brown to pale or rich yellowish brown fading to white or pale tawny on the under parts. The face is marked with usual cheek stripes and head is spotted. Two broad bands, with narrower bands or elongate spots between them run from between the ears to the shoulders and extend more or less regularly in the form of large oval or elongate marks on the back.

The cat is mostly arboreal and hunts by night. Its prey includes deer, goat and pigs. The cat is sometimes known to visit villages to pick wild stock.

**Himalayan Black Bear (Bhotiadom; Nepali sanar):** Varies from 4ft 8 in to 5ft 5 in from nose to rump. Can weight about 180kgs. Typically black and has a "v" mark on its chest that may be white, yellow or buff.

Feed on fruits, honey, berries, pears, apricots and nuts. Their diet also includes insects, termites and larvae. Also known to feed on sheep and goat.

**Red Panda (Nepalese *wah, ye, nigalvaponva*; Bhotiaoakdonga, wakdonga; Lepchasankam)**: Rounded head, large erect pointed ears, stumpy muzzle, short hairy-soled legs, combined with bright chestnut colouring and ringed tail. The face and lower lips are white and there is a vertical red stripe from just above the eye to the gape.

Live above 5000Ft. Spends most of the day sleeping in the trees. Feeds mostly on roots, succulent grasses, eggs, insects and grubs.

**Serow (Sikkimesegya)**: About 1Mtr tall at the shoulder and may weigh well over 90Kgs. Horns are 9-10 inches long. Large head, donkey-like ears, thick neck and short limbs. Coat is coarse with colour varying from black to red. There is a varying amount of white on the muzzle, throat and chest.

**Bharal or Blue Sheep (Nepali *nervati*; Bhotianaao, knao)**: 3Ft tall at shoulder weighing 55-70Kgs. Horns are rounded and smooth and curve backward over the neck. The head and the upper parts is brownish grey mixed with slaty blue or gray in winter. The colour of the coat blends with the blue shale of the rock where the bharal lives. A black stripe runs along the middle of each flank and down the front of the legs.

**Himalayan Tahr (Nepali *jhara*)**: Males stand 36-40inches at shoulder. And can weigh upto 90kgs. Horns 12-15 inches. This is a wild goat with narrow erect ears, heavy body and long robust limbs. Body is covered with tangled masses of coarse flowing hair. The coat is deep reddish brown with dark mod-dorsal streak.

**Goral (Bhotiaragiya)**: The goral stand upto 28 inches at shoulder and can weigh upto 30kgs. The brown goral that is found in Sikkim is distinguished by its golden or rufous brown coat, speckled with black spinal stripes that reach the root of the tail. Goral have short horns, which diverge slightly, curve backward and are marked with rings or ridges.

**Musk Deer**: This is a little creature not more than 20 inches at shoulder. The musk deer wears a coat of thick and bristly hair. The general colour is a shade of rich dark brown speckled with grey. The tail is almost absent and so are the horns. However the musk deer has large canine teeth.

**Other fauna** in Sikkim includes **marbled cat**, golden cat, spotted Linsang or tiger civet, **Binturong**, red fox, stone marten, Himalayan weasel, **marmots** etc.

#### **AVIFAUNA**

**Blood Pheasant**: Crested head and red orbital skin and legs/feet. Males have grey upperparts, streaked with white and greenish underparts and plumage is splashed with red. Female has grey crest and nape, rufous-orange face, dark brown upperparts and rufous brown underparts.

**Satyr Tragopan**: Male has underparts with black bordered white spots and olive colouration to upperparts. Facial skin is blue. Females generally have rufous tone to underparts.

**Osprey**: Breeds in the Himalayas. Long wings, typically angled and short tailed. Has whitish head and black stripe through eyes, white underbody.

**Lammergeier**: Huge sized bird with long and narrow pointed wings and large wedge shaped tail. Adult has black upperparts, wings and tail and cream or rufous orange underparts.

Other avifauna includes: Great Himalayan barbet, Himalayan jay, **Yellow billed blue magpie**, Himalayan tree pie, minivets, blue whistling thrush, rock thrush, scarlet finch etc.

#### **Important Birding Area of Sikkim**

1. Barsey Rhododendron Sanctuary
2. Dombang Valley – Lachung – Lema – Tsungthang
3. Fambong Lho Wildlife Sanctuary – Himalayan Zoological Park – Ratey Chu Reserve Forest

4. Khangchendzonga National Park and Biosphere Reserve
5. Kyongnosla Alpine Sanctuary – Tsomgo – Tamze – Chola Complex
6. Lhonak Valley
7. Lowland Forests of South Sikkim
8. Maenam Wildlife Sanctuary – Tendong Reserve Forest
9. Pangolakha Wildlife Sanctuary – Zuluk – Bedang Tsho – Nathula Complex
10. Tsho-Lhamo Plateau – Lashar – Sebu La – Yumesamdong Complex
11. Yumtang – Shingba Rhododendron Wildlife Sanctuary

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## FLORA IN SIKKIM

Sikkim is situated in an ecological hotspot of the lower Himalayas, one of only three among the Ecoregions of India. The forested regions of the state exhibit a diverse range of fauna and flora. Owing to its altitudinal gradation, the state has a wide variety of plants, from tropical to temperate to alpine and tundra, and is perhaps one of the few regions to exhibit such a diversity within such a small area. The flora of Sikkim include the rhododendron, the state tree, with a wide range of species occurring from subtropical to alpine regions. Orchids, figs, laurel, bananas, sal trees and bamboo grow in the lower altitudes of Sikkim, which enjoy a subtropical-type climate. In the temperate elevations above 1,500 metres, oaks, chestnuts, maples, birches, alders, and magnolias grow in large numbers. The alpine-type vegetation includes juniper, pine, firs, cypresses and rhododendrons, and is typically found between an altitude of 3,500 to 5 000 m. Sikkim has around 5,000 flowering plants, 515 rare orchids, 60 primula species, 36 rhododendron species, 11 oak varieties, 23 bamboo varieties, 16 conifer species, 362 types of ferns and fern allies, 8 tree ferns, and over 424 medicinal plants. A variant of the Poinsettia, locally known as “Christmas Flower”, can be found in abundance in the mountainous state. The orchid *Dendrobium nobile* is the official flower of Sikkim.

### Forest types

The area around Sikkim reveals broad types of forests, such as (i) temperate broad-leaved forests, (ii) temperate conifer forests, (iii) sub-alpine scrubs, (iv) temperate grasslands and (v) alpine meadows or rangelands.

#### (i) Temperate broad-leaved forests

These were not very extensive but existed in patches along the wet areas and revealed tendency to get mixed with scattered conifers like *Tsuga sp.* and *Abies densa*. The main tree species were *Alnus nepalensis*, *Prunus cerasoides*, *Populus ciliata*, *Erythrina arborescens*, *Juglans regia*, *Quercus sp.*, *Prunus nepalensis*, *Rhus succedanea*, *Symplocos theifolia*, *Michelia sp.*, *Terminalia myriocarpa*, *Quercus lineata* and *Acer sp.* Mingled with these tree species were many shrub like *Hippophae salicifolia*, *Arundinaria sp.*, *Edgeworthia gardneria*, *Maesa rugosa*, *Oxyspora paniculata*, *Rhus semialata*, *Berberis sp.*, *Artemesia vulgaris*, *Rubus ellipticus*, *Hydrangea sp.*, wild palms, *Musa sp.*, *Elaeagnus sp.*, *Buddleja sp.* and others. An array of herbaceous flora was found associated with them, which included among others *Anaphalis sp.*, *Rumex sp.*, *Satyrium sp.*, *Correa nepalensis*, *Prunella sp.*, *Valeriana sp.*, *Potentilla sp.*, *Impatiens sp.*, *Corydalis sp.*, *Selinum sp.*, *Rubia sp.*, *Galium sp.*, *Urtica sp.*, *Elsholtzia sp.*, *Plantago sp.*, *Halenia sp.*, *Lycopodium sp.*, *Geranium sp.*, *Polygonum sp.*, *Swertia sp.*, *Hydrocotyl sp.* and *Drymaria cordata*, etc. These were especially plenty and crowded areas of slight clearance forming a thick ground cover. Certain strong climbers such as *Crawfordia sp.*, *Clematis sp.*, and *Schizandra sp.* were also observed. The trees were covered thickly with lichens of both foliose and fruticose type. Some ferns were also noticed as epiphytes on tree trunks. On moist trunks there was thick moss cover too. These forests were found mainly nearby Chungthang, Lachen, Lachung and Yumthang.

#### (ii) Temperate conifer forests

These forests were quite extensive and appeared concentrated over hill slopes. Silver fir (*Abies densa*) was the most dominant species. Amongst the fir forests, pockets of Indian willow (*Larix sp.*) with distinct lanky branches and pale green colour were recorded, either in pure patches or scattered. Strong layer of shrubs comprised *Hippophae sp.*, *Salix sp.*, *Viburnum sp.*, *Artemesia vulgaris*, wild palms, *Rhododendrons*, *Berberis sp.*, *Heracleum sp.*, *Rosa sp.*, *Arisaema sp.*, *Aconogonum sp.* and others. Herbaceous flora was well developed and consisted of *Anaphalis sp.*, *Corydalis sp.*, *Rhodiola sp.*, *Polygonatum sp.*, *Epipogon sp.*, *Halenia sp.*, *Urtica sp.*, *Juncus sp.*, *Pedicularis sp.*, *Bistorta sp.*, *Persicaria sp.*, *Prunella sp.*, *Plantago sp.*, *Swertia sp.*, *Rumex sp.*, *Primula sp.*, *Gentiana sp.* etc. There was a good representation of temperate climbers.

#### (iii) Temperate grasslands

Patches of grassy vegetation were observed among exposed steep rocky slopes. Tall grasses were the only plant representation in such areas. Factors other than strong winds such as chilling winters and fire may result in the development of such high altitude grasslands. In Yumthang valley, these grassy slopes were characteristic.

#### **(iv) Sub-alpine scrubs**

Above the temperate conifer forest was the timberline at an altitude of 3900m amsl. The vegetation, which lacked tall tree species, exhibited dwarf shrubs and tall herbs growing in open clusters. These were observed along riverbanks, slopes and bouldery plains upto 4500m amsl. Very conspicuous sites were noticed above Yangdi, Giagong and near Gochung bridge. Rhododendrons were the naturally dominating species. Amongst others Salix sp., Gaultheria sp., Cotoneaster sp., Berberis sp., Juncus sp., Myricaria sp., Geranium sp., Pedicularis sp., Aster sp., Inula sp., Erigeron sp., Senecio sp., Berginia sp. and others were recorded. These species grew in random fashion mingling with the taller Rheum nobile, Saussurea sp., Heracleum sp., Ligularia sp., Aconitum sp., etc. The dwarf Juniperus sp. Was the only most important conifer species.

#### **(v) Alpine meadows**

These were the most remarkable vegetation features of North Sikkim beyond altitude c.4800m amsl on the geomorphologic landform of the Tibetan plateau. There was no tall vegetation and most were either cushionoid or rosetted. These were the modifications that they had undergone to adapt to the extremely hostile climate prevailing there as short photo periods, low to very low (cryic to pergillic regimes) temperatures and high velocity winds (40 -50 knots per hour). From a distance the landscape appeared dry, dull brown landmass but from close quarters, vegetation actually comprised of dry grasses, cushionoid growths of Gentiana sp., Cynanthus sp., Arenaria sp., Parnassia sp., Saxifraga sp., Sedum sp., Stellaria sp., Thylacospermum sp., tall plants of Urtica hyperborea and the like. Incidentally, the later appeared as the tallest in the plateau with its height of 30cm. This harmless looking plant protected its flowers by its own detlexed imbricate leaves. Gentiana sp., Delphinium sp., etc., added blue colour to the otherwise drab landscape. The soil was rocky and skeletal. In such surroundings, the spreading of four-leaved Phlomis rotata was an unforgettable sight! The abundance of Crassulaceae, Ranunculaceae, Gentianaceae and Asteraceae representatives made the plateau unique. In a 1m quadrat, 5-11 species were noticed in the plateau depending on the site surveyed (Haridasan, 1996).