

■ ■ ■ Chapter 2



WILDLIFE & BIODIVERSITY

■ Biodiversity at a Glance

India is recognized as one of the 12 mega diversity centres of the world. Out of the 18 Biodiversity hot-spots in the world, India owns 2, namely the Western Ghats and the Eastern Himalayas. Sikkim covering just 0.2 % of the geographical area of the country has tremendous biodiversity and has been identified as one of the HOT-SPOT in the Eastern Himalayas.

- ✓ There are 10 bio-geographic zones & 25 biotic provinces--- which have 16 major forests types & > 200 sub types as per (Champion & Seth 1968).
- ✓ Sikkim falls under Himalayan (2) Bio-geographic zone & Central Himalaya (2c) biotic province---- having about 9 types of forests types (Champion & Seth).

The State is endowed with rich floral and faunal diversity. Species wise, the State harbors over 4500 flowering plants, 550 Orchids, 36 Rhododendrons, 16 Conifers, 28 Bamboos, 362 Ferns and its allies, 9 Tree Ferns, 30 Primulas, 11 Oaks, over 424 Medicinal plants, 144+ mammals, 550 Birds, 48 Fishes and over 600 Butterflies. While these figures are still not absolute, it may be kept in mind that this is only the mega-fauna and flora. The tremendous diversity of insects like beetles and moths as well as a host of other life forms is yet to be enumerated. Most of the high altitude medicinal plants are rare and endangered species. Sikkim also has 28 Mountains/Peaks, more than 38 Glaciers, 227 high altitude lakes/wetlands and over 104 rivers and streams.

Nature has been particularly generous in her gift of sylvan treasures to the state of Sikkim. Luxuriant forest, abound in all part of state and variety of medicinal plants, herbs, shrubs, bamboos and trees growing in state is truly rich. In the forest, there are number of plants whose medicinal values have been well recognized by local people as well as by different pharmaceutical, insecticidal and perfumery sectors. Medicinal plants ought to be given the status of a "National Resources" because their sustained availability is essential to sustain one of the world's oldest medicinal traditions, a priceless legacy of the Indian people. The local inhabitants for treatment of various ailments use numerous herbal remedies. Further more, modern medicines owes to the flora of these mountains. Many inhabitants for treatment of various ailments use numerous herbal remedies. Many species of Himalayan origin have revolutionized the allopathic systems of medicine. (*The Medicinal Plant found in Sikkim is listed in Annexure II*)

■ ECOREGIONS

Sikkim is a land of vast variation in altitude within very short distances ranging from around 300m to 8598m. Elevation plays a prime role in fashioning the ecoregions of the state. This is evident from the presence of Sal *Shorea robusta* forests in the Rangit Valley in the south to the temperate fir forests in the north, beyond which lie the trans-Himalayas and cold desert of the Tibetan plateau. *Broadly speaking there are five altitudinal zones of vegetation.* They are not clear-cut at their boundaries but merge into one another, often showing considerable local encroachments and recessions above and below the line depending upon physical configuration and exposure of the terrain and the resulting ecological factors.

The Tropical ecoregion extends roughly from the foothills of the outer Himalayas to an altitude of about 1200m. It contains steep sided valleys and gorges with well-drained flanking slopes. Various species of orchids, *Rhaphidophora*; wild banana, *Pandanus*; Nettles and giant bamboo are characteristic. The Rangit Valley Sal *Shorea robusta* in this region shows a unique association with the Chir Pine *Pinus roxburghii*. In patches of protected forest it is possible to see the weak Sal being slowly dominated by the Pine. These patches are however relatively poor in bird life. Lowland forests of Sikkim are home to several endangered species of birds like the Rufous-necked Hornbill *Aceros nipalensis*, Great Indian Hornbill *Buceros bicornis homrai* locally called ‘*Hongraio*’, Chestnut-breasted Partridge, Black-breasted Parrotbill, Grey-crowned Prinia and Ward’s Tropic. Other lowland fauna includes the Porcupine, Assamese Macaque, Barking Deer, Wild Boar, Tree Shrew, Peafowl (introduced), Python, Geckos, a host of butterflies and other invertebrates, riverine fish, frogs and toads. Several species of migratory water birds use the river systems during transit. *Lantana* is a major weed in this region. A small part of this ecoregion, a representative area of the Kitam Reserve Forests has recently been included in the wildlife protected area network of the state as the Kitam Wildlife Sanctuary. Forest fires are generally reported from this zone and there is an occasional problem of illegal removal of the Sal, Teak trees. New hydel projects have also been taken up in this zone. The important medicinal plants of this ecoregion are *Terminalia bellerica*, *Terminalia chebula*, *Embellica officinalis*, *Azadirachta indica*, *Aegle marmelos*, *Ocimum sanctum*, *Oroxylum indicum*, *Holarrhena antidysenterica*, *Murraya* sp. etc. However the wildly spreading alien invasive weed *Mikania micrantha* is fast manifesting as a serious threat to farmlands and young forests along with *Lantana camara*.

The Sub Tropical eco-region extends up from about 1200 m to 3000m. The rainfall in this zone is the heaviest and conditions remain humid throughout the year. The crop in the upper storey consists of mainly *Castanopsis hystrix* (Katus), *Machilus* spp. (Kawla), *Rhododendron* spp. (Chimal), *Symplocos spicata* (Kholme), *Symplocos theifolia* (Kharane), *Michelia excelsa* (Rani Champ), *Quercus lamellosa* (Buk), *Quercus lineata* (Phalant), *Leucoseptum canum* (Ghurpis), *Quercus pachyphylla* (Sungure Katus), etc. The other associates in the upper storey are: *Betula alnoides* (Saur), *Nyssa javanica* (Lekh Chilaune), *Bucklandia populnea* (Pipli), etc. In the undergrowth, *Engelhardtia spicata* (Mahuwa), *Eurya japonica* (Jhingni), *Rhododendron arboreum* (Guransh), *Viburnum* spp. (Asarey) etc. are the main species. In the upper reaches the upper storey consists of *Quercus lamellosa* (Buk), *Q. lineata* (Phalant), *Machilus* spp. (Kaula). The other associates in the upper storey are: *Cinnamomum* spp. (Sissi), *Michelia excelsa* (Rani Champ), *Quercus lancaefolia* (Patle Katus), *Acer campbelli* (Kapasi), *Magnolia campbelli* (Ghoge Champ), *Q. pachyphylla* (Sungure Katus), *Castanopsis hystrix* (Katus), *Elaeocarpus lancaefolius* (Bhadrase) etc. In the middle storey, *Symplocos theifolia* (Kharane) is the main species and *Litsea* spp. (Pahenle), *Rhododendron arboreum* (Guransh), *Bucklandia populnea* (Pipli) etc are other associate species. Dense tall evergreen forests with oaks and Rhododendrons predominate. The undergrowth consists of *Arundinaria maling*, dwarf Rhododendron, ferns, epiphytic mosses and orchids. This area also is probably the richest in birds such as the Rusty-bellied and Lesser Shortwings, Kalij and Satyr Tragopan; reptiles like Japalura lizards, Cobra, Krait and Himalayan Pit Viper; Himalayan Bullfrog; butterflies and leeches. *Eupatorium* is a major weed competing out *Artemesia* and other secondary growth. Large Cardamom under-planted in forest patches and a tea estate at Temi are dominant features of the landscape as much as the naturalized exotic *Cryptomeria japonica* patches. Fambong Lho Wildlife Sanctuary and part of Pangolakha Wildlife Sanctuary in East Sikkim and Maenam Wildlife Sanctuary in South Sikkim are the two wildlife protected areas in this ecoregion.



Rhododendron arboreum (Guransh)

Most of the human population of Sikkim resides in these two zones in an agricultural setting where terrace farmed rice, ginger, orange, cardamom are commercially grown while guava, banana, squash and marigold are common along with vegetables and herbs in homestead gardens. Forest produce like bamboo shoots, ferns and nettles are also collected during season. Soya bean, millet and cruciferous vegetables are grown and processed into fermented foods like ‘Kinema’, a specialty of the Subba community; ‘Gundruk’ and drinks like ‘Chang’. Exotic oyster mushroom cultivation is being popularized along with trial commercial cultivation of flowers like hybrid orchids, lilies and gladioli. Hybrid stall fed livestock is seen around villages while the local breed of ‘Siri’ Cow can graze on the hill slopes. Sericulture is practiced through schemes of the forest department while apiculture is more of a hobby with the bee species *Apis cerana*. The government encourages pisciculture of Common and Grass Carp. The important medicinal plants of this ecoregion are *Swertia chirata*, *Rubia cordifolia*, *Astilbe rivularis*, *Bergenia* spp., *Acorus calamus*, *Kaempferia rotunda*, *Costus speciosus*, *Viscum articulatum*, *Rhus semialata*, *Phytolacca acinosa*, *Litsaea citrata*, *Drymaria cordata* *Artemisia vulgari*s etc.

The Temperate ecoregion extends from 3000m to 4500m with mixed coniferous forests of Hemlock, Spruce, Pine, Fir and Junipers with shrubby undergrowth of Rhododendron and *Arundinaria* bamboo. Red Panda, Common Langur and Himalayan Black Bear, Lesser cats, Goral, Serow, Himalayan Monal, Fire-tailed Sunbird, Blue Magpie and few species of reptiles and amphibians are characteristic. Brown Trout *Salmo trutta fario* has been introduced in high altitude lake and river systems. Wild Seabuckthorn *Hippophae* sp. occurs some of which is collected for medicinal properties and as a dye. Potato and cabbage are grown as cash crops. Subsistence farming of wheat, barley and maize is carried out while beans, peas, some apple, peach and pear are grown on homesteads. Some amount of cattle rearing is practiced with stall fed hybrid milch cows with some trans-humance for local breeds in forest areas. Handloom cottage industry for making blankets, rugs and carpets uses some wool from sheep grazed at higher altitudes. The Alpine forests and scrub extend upto 4500 m with small crooked trees and large shrubs interspersed with fir and pine. The stunted forest is mainly of rhododendron of many species. Dominant wild fauna includes Musk Deer, Himalayan Tahr, Blue Sheep, Blood Pheasant, Ibisbill and a Snow toad. River systems harbour some of the (introduced) trout *Salmo trutta fario*. Most of the flora of this region attracts interest for medicinal purposes. Dwarf rhododendron leaves are used for burning as incense. This region has very little resident human population, mainly Bhutias and mostly pastoral, herding livestock like yak, dzo (cow-yak hybrid) and domestic cattle. Many wild edibles are collected from the forest floor like *Arisaema* sp. tubers, 'Khendu' *Cardamine* spp. and *Agaricus* spp. mushrooms.

The Temperate ecoregion is protected in three wildlife sanctuaries at Shingba (North Sikkim), Kyongnosla and part of Pangolakha (East Sikkim), Barsey (West Sikkim) and one national park namely Khangchendzonga National Park (North and West Sikkim). They harbour representative biodiversity of these ecoregions. The important medicinal plants of this ecoregion are *Aconitum ferox*, *Aconitum heterophyllum*, *Heracleum wallichii*, *Nardostachys grandiflora*, *Orchis latifolia*, *Panax pseudo-ginseng*, *Picrorrhiza kurooa*, *Podophyllum hexandrum*, *Ephedra gerardiana*, *Taxus baccata*, *Hippophae* spp. etc.



Ephedra gerardiana, North Sikkim



Hippophae salicifolia in Lachen, North Sikkim

The Trans-Himalayan ecoregion extends from 4500 m to 5500m with characteristic cold desert vegetation exclusively restricted to the north of Sikkim. This ecoregion has not yet been included in the protected area network of the state and is perhaps the most threatened as it contains mostly endangered species. Dominant among these are Kiang, Nayan or Argali, Tibetan Gazelle, Blue Sheep, Snow Leopard, Eurasian Lynx, Tibetan Wolf, Tibetan Snowcock, Lammergeier, Raven, Golden Eagle and Ruddy Shelduck breeding in the wetlands. The region has a short four-month growing season during which grasses, sedges and medicinal herbs grow abundantly supporting a host of insect fauna as well as the wild and domestic herbivores, larks and finches. There are no permanent settlements. Human population consists of a small number of nomadic Tibetan graziers or 'Dokpas' (who herd yak, sheep and pasmina-type goats) and large number of Defence personnel as the area forms the international border with Tibet Autonomous Region (TAR). Closure of the border to trans-humance over the last three decades has led to intense grazing pressure by both the domestic and wild herbivores on the land. The area also suffers from the presence of landmines causing casualties among Nayan, Kiang and Tibetan wolf. Existence of feral dogs is a major hazard in this region. This ecoregion needs to be urgently represented in the wildlife protected area network of the state. The important medicinal plants of this ecoregion are *Aconitum* spp., *Nardostachys grandiflora*, *Picrorrhiza kurooa*, *Gentiana* spp., *Rheum* spp. etc.

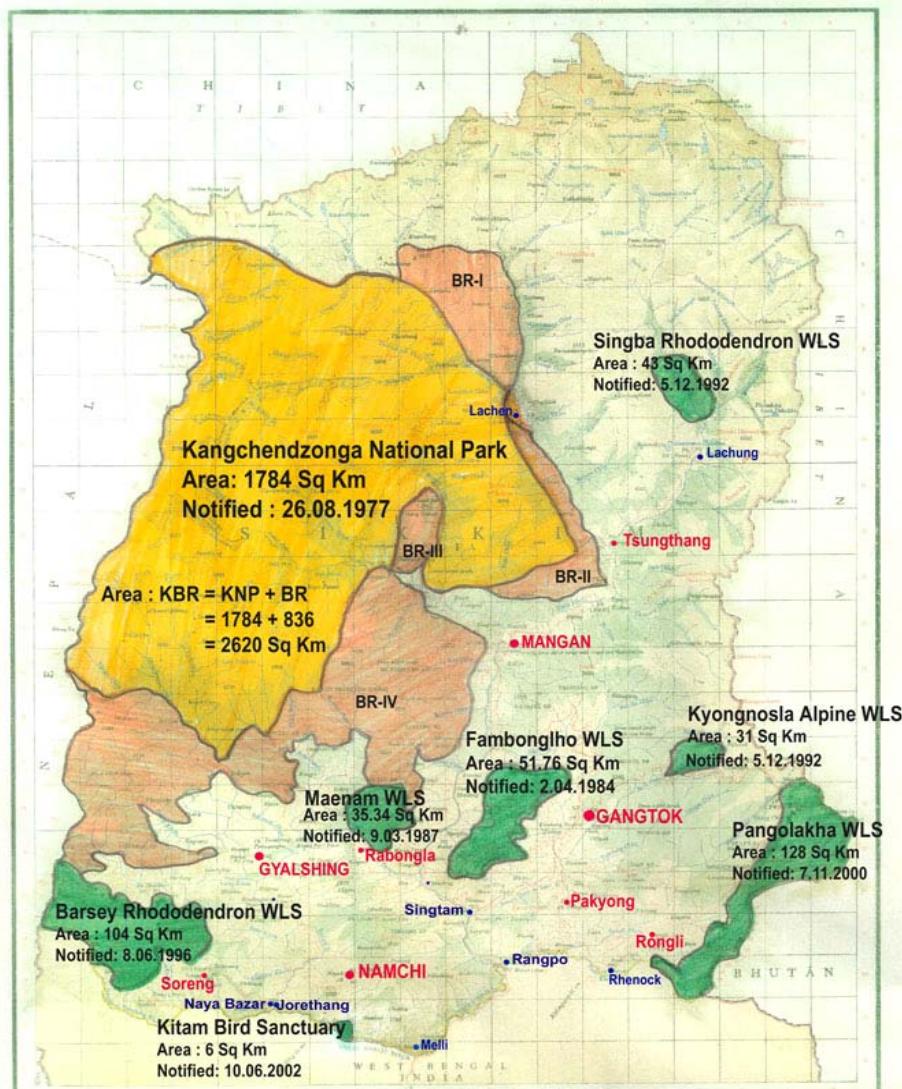


Yumesamdong, Transhimalayas, North Sikkim

There is a growing concern throughout the world that the natural resources essential for human development and survival are being depleted and destroyed at an alarming and ever increasing pace. In order to protect, propagate and develop this rich wilderness, the State has realized that only by bringing in more such areas under the Protected Area Network could save this fragile eco-system from being over exploited and depleted. Keeping this in mind almost 31% of the total geographical area of the state has been brought under this network and state has recently added one more feather in its cap by declaring the Pangolakha Range as a Wildlife Sanctuary which is another rich treasure house of biodiversity. The existing status of wildlife protected areas is described as follows.

Map 2.1 Protected Area in Sikkim

WILDLIFE PROTECTED AREAS IN SIKKIM



Source : CISMHE

Protected Area Network

Protected area network has been playing an important role in maintaining the natural resources of this fragile eco-system and to the economy of the State, providing a base for recreation and tourism. Existence of protected areas in the higher reaches sustains environment stability of the surrounding region and thereby reduces occurrence of landslides and droughts, protecting the soil from erosion etc. Further it helps in maintaining the productive capacity of eco-systems, thus ensuring the continuing availability of water for sustaining life down stream. Because of an extensive Protected Area Network, and with better protection and sustainable human use, habitats have recuperated and in 1999 Takin *Budorcas taxicolor* was reported at Kyongnosla Alpine Sanctuary which was once native to this eco-system and similarly Tiger *Panthera tigris* migration is often reported every year. Even Himalayan Tahr or 'Shapi' *Hemitragus jemlahicus*, Musk deer *Moschus chrysogaster* and other endangered Himalayan fauna thrive within Kahngchendzongs National Park at locations like Bikmatar, Satdharey, Kasturi Orar with healthy population. Snow leopard *Uncia uncia*, a highly endangered animal of Himalayan eco-system which is at the top of ecological pyramid has also shown remarkable population increase as reported although proper census has not been conducted for the last few years. People from far off places come to see this elusive animal and for research purposes. Protected area network of Sikkim has contributed a lot in respect to scientific research and monitoring of wild species with some students also having carried out PhD dissertations. The rich diversity of wild flora is also being protected and preserved in this network.

Table 2.1 Protected Area Network

Sl. No.	Name of Protected Area	Area in sq. km.	District	Biogeographic Province	Altitude
1	Barsey Rhododendron Sanctuary	104.00	West	2C	2200-4100 m
2	Fambong Iho Wildlife Sanctuary	51.76	East	2C	1524-2749 m
3	Kyongnosla Alpine Sanctuary	31.00	East	2C	3292-4116 m
4	Maenam Wildlife Sanctuary	35.34	South	2C	2400-3263 m
5	Pangolakha Wildlife Sanctuary	128.00	East	2C	
6	Shingba Rhododendron Sanctuary	43.00	North	1B	3048-4575 m
7	Kitam Bird Sanctuary	6.00	South		300-1000 m
8	Khangchendzonga National Park	1784.00	North/West	1B	
Total Protected Area		2183.10			
Total Geographical Area		7096.00			
9	Khangchendzonga Biosphere Reserve	2620.00	North/West	1B & 2C	2725-5537 m
10	National Park	1784.00	North/West		
11	Buffer area	836.00	North/West		

Note: 1. Protected Area Network does not include area under buffer zone of a biosphere reserve. 2. Total area under Protected Area Network of State is 2183.10 sq.km. (i.e.30.77% of the total geographical area) 3. Total area under Protected Area Network including the buffer zone of biosphere reserve in State is 3019.10 sq.km. (i.e. 42.55 % of the total geographical area). 4. Total protected area including the biosphere reserve area is 51.68 % of the total recorded forest area of the state.

Most of the Ecotourism potential is prevalent only in Protected areas and one of the most important destination is Khangchendzonga Massif itself which is considered as cultural heritage and deity of Sikkim people, which also fall within Protected area in the name of Khangchendzonga National Park, which is a nucleus center for attracting tourists off far and wide and some other important places of interest also do exist only inside the Protected areas such as Dzongri trail, Green Lake, different varieties of Rhododendron species, glaciers ,alpine flowers , grassland, high cliffs , waterfalls , caves and other small lakes which are considered sacred place for pilgrimage. In order to have glimpses of this natural landscapes, tourists from far off places used to visit Sikkim which is contributing economy at the local level as it stimulates profitable domestic industries – hotels , restaurants, transport systems , souvenirs and handicrafts and guide services. Without Government strategy and interest in preserving this rich bio-diversity and cultural heritage and without active people participation this fragile environment would not have been preserved and protected so far. Hence this protected areas network has contributed much to the economy of the State as well as in preserving the wilderness and providing sustainable livelihoods to the people living in the buffer.

AVIFAUNAL DIVERSITY

With in an area of 0.2% of India, the Sikkim harbors around 550 bird species representing around 30% of the aggregate bird species and subspecies found in the entire Indian subcontinent. This region of the Central Himalayas lies within the Eastern Himalayas Endemic Bird Area (EBA) and for several bird species such as Chestnut-breasted Hill Partridge *Arborophila mandelli*, Rusty-bellied Shortwing *Brachypteryx hyperythra* and White-naped Yuhina *Yuhina bakeri* this EBA is very important. It also has globally threatened species such as the Black-necked Crane *Grus nigricollis* and Lesser Kestrel *Falco naumanni*. There are eleven IBAs recognized by the Government of Sikkim in the State.

Table 2.2 List of Threatened Birds found in Sikkim

Critically Endangered	
Oriental White-backed Vulture	<i>Gyps bengalensis</i>
Slender-billed Vulture	<i>Gyps tenuirostris</i>
Vulnerable	
Baer's Pochard	<i>Aythya baeri</i>
Pallas's Fish-Eagle	<i>Haliaeetus leucoryphus</i>
Greater Spotted	<i>Eagle Aquila clanga</i>
Lesser Kestrel	<i>Falco naumanni</i>
Red-breasted Hill-Partridge	<i>Arborophila mandellii</i>
Blyth's Tragopan	<i>Tragopan blythii</i>
Black-necked	<i>Crane Grus nigricollis</i>
Wood Snipe	<i>Gallinago nemoricola</i>
Rufous-necked Hornbill	<i>Aceros nipalensis</i>
Rusty-bellied Shortwing	<i>Brachypteryx hyperythra</i>
Slender-billed Babbler	<i>Turdoides longirostris</i>
Black-breasted Parrotbill	<i>Paradoxornis flavirostris</i>
Hodgson's Prinia	<i>Prinia cinereocapilla</i>
Beautiful Nuthatch	<i>Sitta Formosa</i>
Near Threatened	
Satyr Tragopan	<i>Tragopan satyra</i>
Giant Babax	<i>Babax waddelli</i>
Endemic Bird Area 130 : Eastern Himalayas	
Rusty-bellied Shortwing	<i>Brachypteryx hyperythra</i>
Hoary-throated Barwing	<i>Actinodura nipalensis</i>
White-naped Yuhina	<i>Yuhina bakeri</i>
Red-breasted Hill-Partridge	<i>Arborophila mandellii</i>
Black-browed Leaf-Warbler	<i>Phylloscopus cantator</i>
Ward's Trogan	<i>Harpactes wardii</i>
Rufous-throated Wren-Babbler	<i>Spelaeornis caudatus</i>
Wedge-billed Wren-Babbler	<i>Sphenocichla humei</i>
Broad-billed Flycatcher-Warbler	<i>Tickellia hodgsoni</i>
Giant Babax	<i>Babax waddelli</i>
Endemic Bird Area 133 : Tibetan Plateau	
Hoary-throated Barwing	<i>Actinodura nipalensis</i>
Broad-billed Flycatcher-Warbler	<i>Tickellia hodgsoni</i>

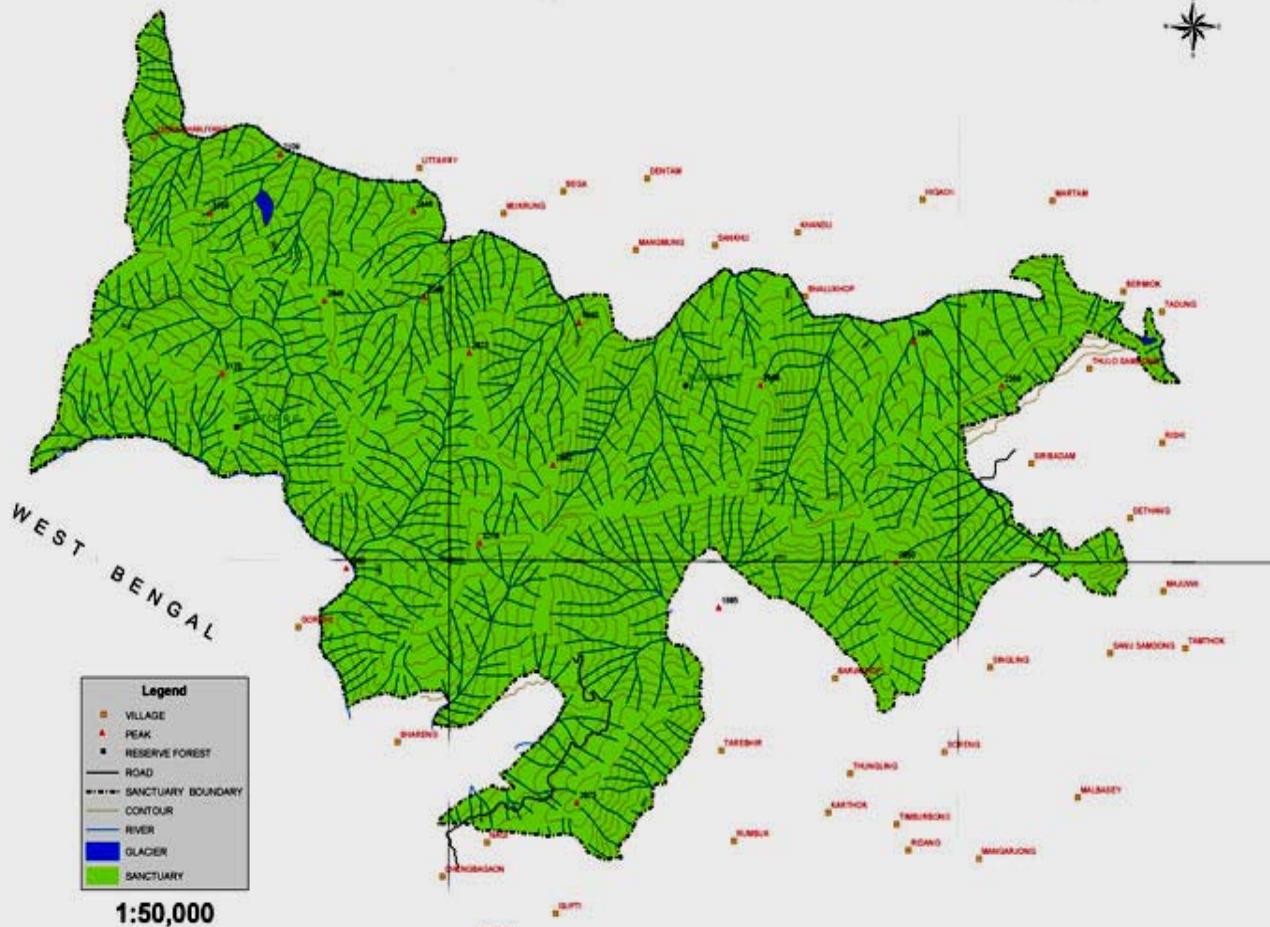
1. DOMBANG VALLEY-LACHUNG-LEMA-TSUNGHANG

A full checklist of this site is not available but the bird records maintained by the department show that this area could have significant populations of Vulnerable Beautiful Nuthatch *Sitta formosa* and Wood Snipe *Gallinago nemoricola*. The site lies in Eastern Himalayas Endemic Bird Area (EBA 130) where Stattersfield et al. (1998) have identified 21 restricted range species. Only one such species, White-naped Yuhina *Yuhina bakeri* has been noticed till now (U. Lachungpa pers. comm. 2002), but looking at the extent of pristine habitat still available in this site, more restricted range species are likely to be found here. This complex, with wide altitudinal variation, basically lies in Biome-7 (Sino-Himalayan Temperate Forest), but avian elements of Biome-5 (Eurasian High Montane - Alpine and Tibetan) and Biome-8 (Sino-Himalayan Subtropical Forest) are also found as these biomes merge with Biome-7, and secondly, many birds show seasonal altitudinal movement. Seventeen out of the 48 species listed in Biome-5 (BirdLife International, undated) are found in this site. Similarly, 47 out of 112 species listed in Biome-7 are found here. As this site also has Montane Mixed Broadleaf- Coniferous Forest, Broadleaf Evergreen Forest and Deciduous Forest, many species of Biome-8 are also found here. Thus, this site perhaps has the most numerous biome restricted species among all the sites of Sikkim. The important birds of the valley are Himalayan Griffon *Gyps himalayensis*, Wood Snipe *Gallinago nemoricola*, Snow Pigeon *Columba leuconota*, Grandala *Grandala coelicolor*, Plain Mountain-Finch *Leucosticte nemoricola* and Hill Partridge *Arborophila torqueola*. A specimen of Tibetan Horned Owl (Eurasian Eagle-Owl) *Bubo bubo* from Lema was collected and deposited with BNHS.

TSO LHAMO PLATEAU-LASHAR-SEBU LA-YUMESAMDONG COMPLEX

A total of around 227 birds have been recorded from this c. 500 sq. km area, including four globally threatened species, three Restricted Range species and 93 Biome-restricted species (Ganguli-Lachungpa and Rahmani 2003). One of these, *Babax waddelli*, is reported only from extreme northeast Sikkim from 2,700-4,400 m in the Tibetan Plateau facies (EBA-133) in *Hippophae* thickets. It is found in dense deciduous scrub above tree-line and edge of coniferous forest (Stattersfield et al. 1998). It is reported as 'locally common' (Ali and Ripley 1987). This site in the Eastern Himalayas Endemic Bird Area is the highest altitude eco-region in Sikkim spanning two biomes, Sino- Himalayan Temperate Forest (Biome-7) and Eurasian High Montane (Alpine and Tibetan) (Biome-5) as described by BirdLife International (undated). Of the 48 Biome-5 (Eurasian High Montane - Alpine and Tibetan) species, 35 occur here and of the 112 Biome-7 (Sino-Himalayan Temperate Forest) species, at least 12 are from here. More are likely to be found after detailed investigations. The important breeding bird species recorded here are Tibetan Snowcock *Tetraogallus tibetanus*, Black-necked Crane *Grus nigricollis*, Brahminy Shelduck *Tadorna ferruginea*, Common Redshank *Tringa totanus*, Tibetan Sandgrouse *Syrrhaptes tibetanus*, Snow Pigeon *Columba leuconota*, Robin Accentor *Prunella rubeculoides*, Guldenstadt's Redstart *Phoenicurus erythrogaster*, Plain Mountain Finch *Leucosticte nemoricola*, Black-headed Mountain Finch *Leucosticte brandti*, Mandelli's Snowfinch *Pyrgilauda taczanowskii*, Tibetan Snowfinch *Montifringilla adamsi*, Plain-backed Snowfinch *Pyrgilauda blanfordi*, Rufous-necked Snowfinch *Pyrgilauda ruficollis*, Hume's Groundpecker *Pseudopodoces humilis*, Yellow-billed Chough *Pyrrhocorax graculus*, Lesser Sand Plover *Charadrius mongolus*, Golden Eagle *Aquila chrysaetos* and Little Owl *Athene noctua*. Some of the non-breeding birds are Lesser Kestrel *Falco naumanni*, Bar-headed Goose *Anser indicus* and Common Hoopoe *Upupa epops*.

Map 2.2 Barsey Rhododendron Sanctuary, West Sikkim

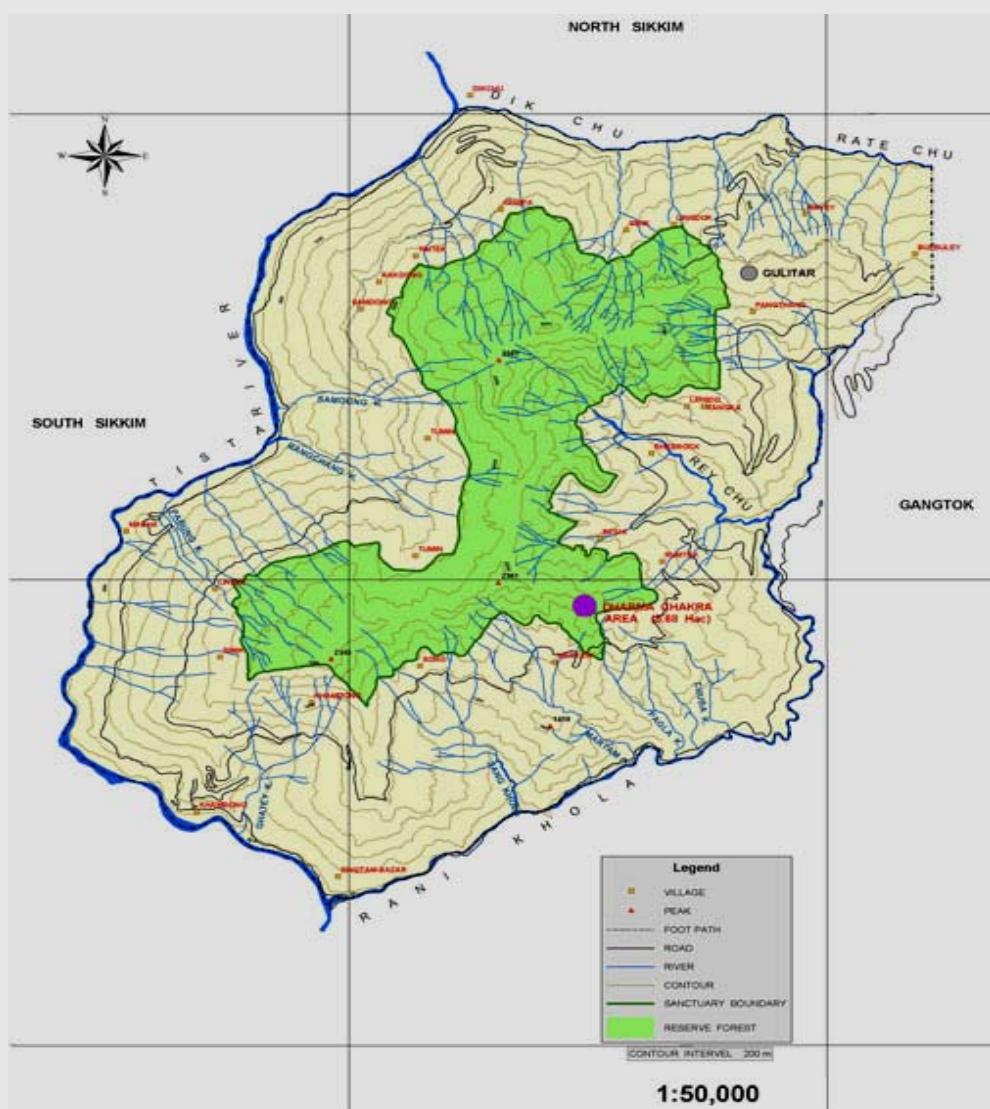


Source: Wildlife Division, Forest Department

■ BARSEY RHODODENDRON SANCTUARY

This is an important IBA on the southeast corner of Sikkim with Nepal as its western border and contiguity with KBR and Singalila, stretching from alpine meadows down to subtropical forests. Birds from biomes 5, 7, 8 and 9 have been recorded here including at least three globally threatened species, two restricted range species, five out of 48 Biome-5 species, 38 out of 112 Biome-7 species, 21 out of 96 Biome-8 species and three out of 9 Biome-9 species. However, much more research input is needed. During a brief survey in September 1996, Biome-7 birds such as White-browed Tit- Babbler *Alcippe vinipectus*, Rufous Sibia *Heterophasia capistrata*, Grey-faced Leaf-Warbler *Phylloscopus maculipennis*, Orange-gorgeted Flycatcher *Ficedula strophiata*, Rufous-bellied Niltava *Niltava sundara*, Rufous-bellied Crested Tit *Parus rubidiventris* and Red-headed Bullfinch *Pyrrhula erythrocephala* were ringed with BNHS rings.

Map 2.3 Fambong Lho Wildlife Sanctuary, East Sikkim

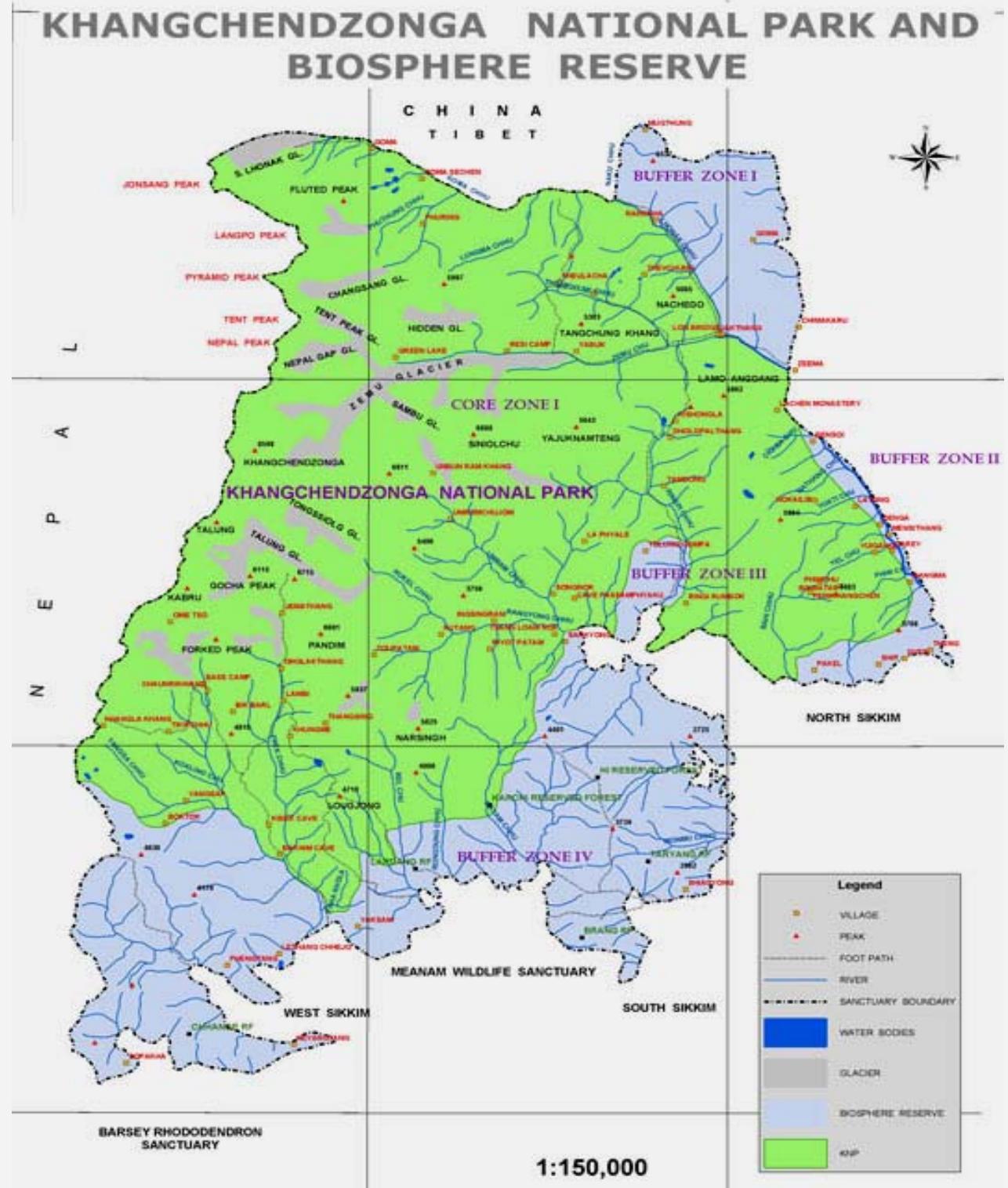


Source: Wildlife Division, Forest Department

FAMBONG LHO WLS - HIMALAYAN ZOOLOGICAL PARK - RATEY CHU RESERVE FOREST COMPLEX

Over 281 species of birds have been reported from this area, opposite the bustling township of Gangtok. Of these, the Oriental White-backed Vulture *Gyps bengalensis* not seen since the slaughterhouse at Gangtok was shifted to south to Rango almost a decade ago. The Rufous-necked Hornbill *Aceros nipalensis* reported by Ali (1962) from Gangtok has not been sighted lately. The Beautiful Nuthatch *Sitta formosa* a globally threatened is still found, while the Rusty-bellied Shortwing *Brachypteryx hyperythra* was remarkably easily netted and ringed both in Fambong Lho and Himalayan Zoological Park in the 2001 BNHS Bird-Banding Programme. The Red-breasted Hill-Partridge *Arborophila mandellii* was reported by Ali (1962) from Gangtok but not heard or sighted recently unlike the commoner Hill Partridge *Arborophila torqueola*. The Hoary-throated Barwing *Actinodura nipalensis* and the White-naped Yuhina *Yuhina bakeri* are restricted range species reported from this IBA (Anon 2002). In this Eastern Himalayas Endemic Bird Area, four out of 21 restricted range species, at least five out of 48 Biome-5 species, 49 out of 112 Biome-7 species, 38 out of 96 Biome-8 species and three out of 19 Biome-9 species are found (U. Lachungpa pers. comm. 2003). Other bird species include the biome-restricted Mountain Imperial Pigeon *Ducula badia*, Slaty-headed Parakeet *Psittacula himalayana*, Red-winged crested Cuckoo *Clamator coromandus*, Large Green-billed Malkoha *Phaenicophaeus tristis*, Blue-naped Pitta *Pitta nipalensis*, Orange-bellied Chloropsis *Chloropsis hardwickii*, Brown Dipper *Cinclus pallasii*, and Spotted Forktail *Enicurus maculatus*.

Map 2.4 Khangchendzonga National Park and Biosphere Reserve



Source: Wildlife Division, Forest Department

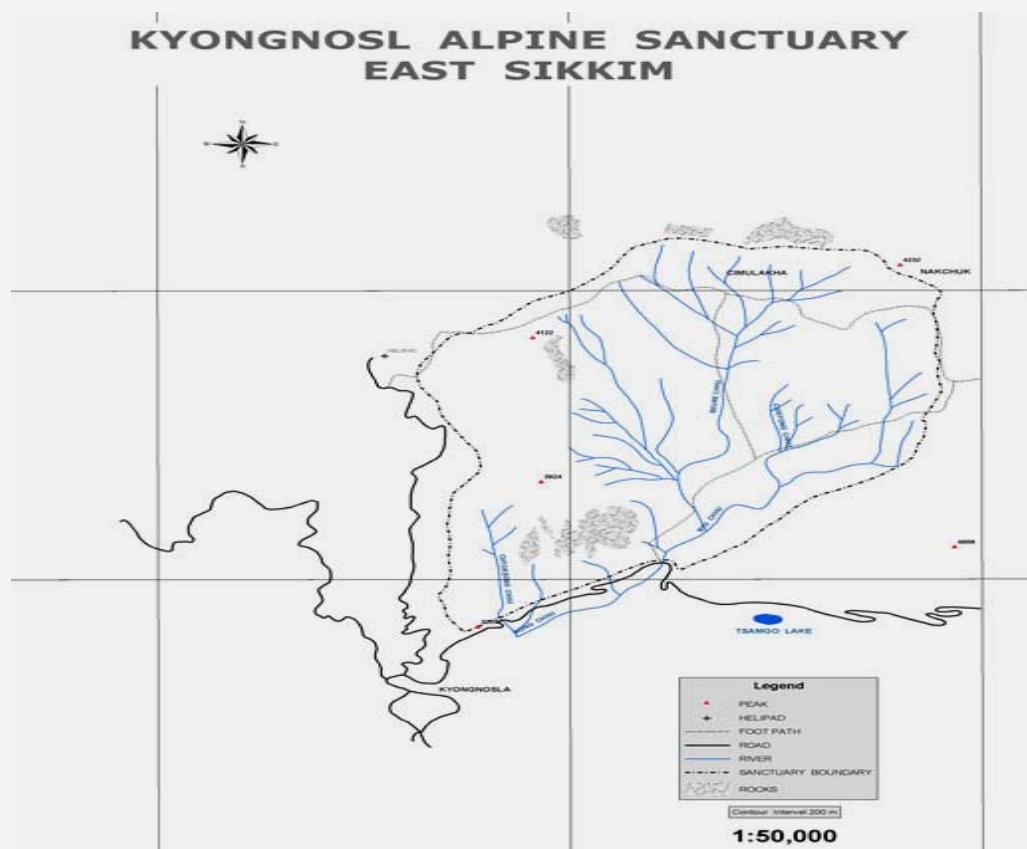
KHANGCHENDZONGA NATIONAL PARK AND BIOSPHERE RESERVE

Some important birding habitats here are Dentam-Uttarey-Chitrey-Chewabhanjyang, the Rathong Chu Valley along the Yoksum- Dzongri-Goecha La trekking trail, Tashiding, Rabdentse, Dubdi, Khecheopalri all in West Sikkim; Tholung Valley in Dzongu, Tsunghang-Menshithang-Lachen- Thangu, the Muguthang-Green Lake route including the Zemu Glacier-Zemu Chu Valley, all in North Sikkim. Due to the size and altitude elevations in this IBA, birds recorded are from at least four biomes. Thus this IBA has at least 127 bird species of conservation concern including seven globally threatened and restricted range species, 24 species of Biome-5, 67 of Biome-7, 26 of Biome-8 and three listed in Biome-9. Birds like Lesser Kestrel *Falco naumannii* have been recorded from northern Trans-Himalayan part of the IBA while Baer's Pochard *Aythya baeri* has been sighted in Lake Khecheopalri along with wintering Mergansers *Mergus merganser* and Little Grebe *Tachybaptus ruficollis* (Ganguli-Lachungpa 1991), Mallard *Anas platyrhynchos*, Common Teal *Anas crecca* and Tufted Pochard *Aythya fuligula*. The Osprey *Pandion haliaetus*, protected under Schedule-I of the Indian Wildlife (Protection) Act 1972, was killed at Yoksum while fishing in the State Forest Department's fishpond (Ganguli-Lachungpa 1990). Black-necked Crane *Grus nigricollis* has been recorded from the Muguthang area of Lhonak Valley IBA contiguous to the north (Ganguli-Lachungpa 1998). A large loose flock of dark eagles (unidentified) was videographed, during a trek to Dzongri in December 1999, flying southwards along with Himalayan Griffon *Gyps himalayensis* and Lammergeier or Bearded Vulture *Gypaetus barbatus* (U. Lachungpa pers. comm. 2003). Local Lepcha people at Tholung report a unique phenomenon of congregations of either Ashy Wood-Pigeon *Columba pulchricollis* or Common Wood-Pigeon *Columba palumbus* near the Tholung hot-springs (a day's trek from jeepable road) in summer (Chumden Nangpa pers. comm. 2000), an annual event that has got disrupted due to development of the area for tourism (U. Lachungpa pers. comm. 2003). High altitude lakes at Kishong La are important stopover sites not only for migratory waterfowl but also for resident breeding birds like Brahminy Shelduck *Tadorna ferruginea* ducklings collected from here in 1986 survived for around five years at Gangtok's Deer Park enclosure at Tashiling Secretariat (C. B. Bhujel pers comm. 2000).

KYONGNOSLA ALPINE SANCTUARY– TSOMGO- TAMZE-CHOLA COMPLEX

Outside Khangchendzonga National Park, this is the site where the State Bird of Sikkim, the Blood Pheasant *Ithaginis cruentus*, is found, probably in significant numbers. Among the globally threatened species of this site, the most prominent one would be the Wood Snipe *Gallinago nemoricola*, as it possibly breeds here (U. Lachungpa pers. comm. 2003). Satyr Tragopan *Tragopan satyra* at the upper limit of its range, and Himalayan Monal *Lophophorus impejanus*, the former considered as Near Threatened (BirdLife International 2001), are also residents. The Snow Pigeon *Columba leuconota* come down here in winter. Other species of interest are the Fire-tailed Sunbird *Aethopyga ignicauda* and Gold-naped Black Finch *Pyrrhoplectes epaulettta*, birds of temperate forest. Golden Eagle *Aquila chrysaetos* and Greater Spotted Eagle *Aquila clanga*, Brown-headed Gull *Larus brunnicephalus* with Tufted Pochard *Aythya fuligula* were seen occasionally in Tsomgo Lake during the winter Asian Waterfowl Census (AWC). Pallas's Fish-Eagle *Haliaeetus leucoryphus* was once seen in the forest patch below Tamzey during a survey for Red Panda in 1998 (U. Lachungpa pers. comm. 2003). The site is located in the Eastern Himalayas Endemic Bird Area (EBA-130) where 21 species have been listed of which only one species, the Hoary-throated Barwing *Actinodura nipalensis*, has been found till now but more are likely to occur. Perhaps the most important reason for selection of this site as an IBA is the presence of large number of biome restricted species of three biome types. Although, this site lies chiefly in Biome-7 (Sino- Himalayan Temperate Forest), birds of Biome -5 (Eurasian High Montane - Alpine and Tibetan) and Biome-8 (Sino-Himalayan Subtropical Forest) are also seen, mainly due to their altitudinal movement. In winter, birds of Biome-5 move down, so we see species such as Rosy Pipit *Anthus roseus*, Snow Pigeon *Columba leuconota*, Alpine Accentor *Prunella collaris* and others in this site. Thirteen out of 48 species of this biome have been seen in this IBA. Expectedly, the largest number of biome restricted species is from Biome-7: 35 out of 112 species but more are likely to be present. As the boundary between Biome-7 and Biome-8 is very diffuse (like all other biomes), some species are likely to be present in both the biomes. Till now, U. Lachungpa (pers. comm. 2003) has been able to locate only two biome restricted species, Grey-winged Blackbird *Turdus boulboul* and Black-spotted Yellow-Tit *Parus spilonotus*, of Biome-8 in this IBA. Lhonak Valley is the famed flyway of migratory waterfowl (Ali 1962). Many Vulnerable and Biome-5 restricted species breed here such as the Tibetan Snowcock *Tetraogallus tibetanus*, Black-necked Crane (unsuccessful nesting attempt at Tebleh Tso, Muguthang), the Tibetan Sandgrouse *Syrrhaptes tibetanus*, the Güldenstädt's Redstart *Phoenicurus erythrogaster*, the Hume's Groundpecker *Pseudopodoces humilis*.

Map 2.5 Kyongnosla Alpine Sanctuary, East Sikkim



Source: Wildlife Division, Forest Department

Map 2.6 Maenam Wildlife Sanctuary, South Sikkim



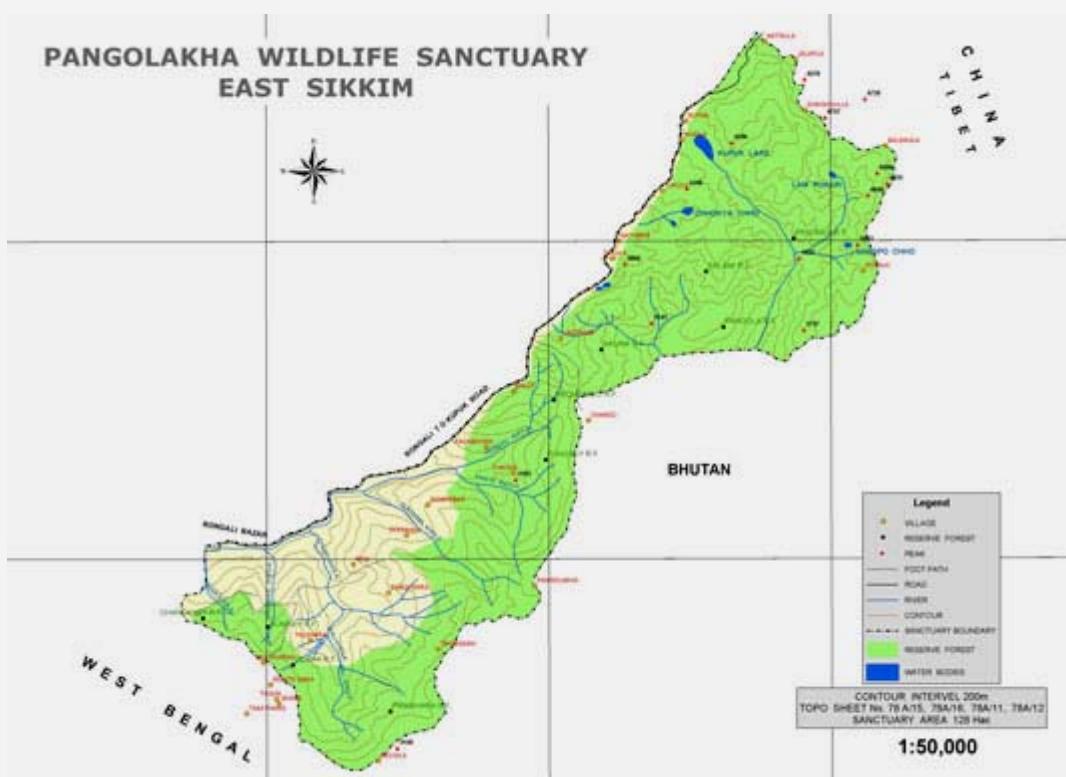
Source: Wildlife Division, Forest Department

Despite being the lowest altitude IBA in Sikkim, this site has records of birds restricted to biomes 9, 8, 7 as well as 5, perhaps due to seasonal altitudinal migration as well as the telescoping effect of the Sikkim Himalaya, where in a distance of c. 100 km, habitats ranging from lowland subtropical forests to high cold desert can be seen (Ali 1962). Hence, as many as 14 globally threatened and restricted range species and at least four Biome-5 species, 15 Biome-7 species, 33 Biome-8 species and seven Biome- 9 species have been recorded from this IBA. The lowland forests of Sikkim are home to several species identified as Near Threatened by BirdLife International (2001): Great Pied Hornbill *Buceros bicornis* now restricted to few sightings over tea estates, Red-breasted Partridge *Arborophila mandelli* (not recorded recently) and Ward's Trogon *Harpactes wardi*. The Nepal Wren-Babbler *Phoepyga immaculata* could also occur here. During a survey conducted here in 1996, no potential habitat was found for the Rufous-necked Hornbill *Aceros nipalensis*. Biome-5 species like Ibisbill *Ibidorhyncha struthersii* are regularly recorded in winter on the banks of the Great Rangit river; Wallcreeper *Tichodroma muraria* recorded from Trans-Himalayan Lhonak Valley (at Green Lake) and other high altitude sites is also recorded from this IBA. The Collared Falconet *Microhierax caerulescens* was found breeding in 1996 very close to human habitation, hawking dragonflies around the Fisheries Department pond at Baguwa but cleverly avoiding the mist-nets set around it. Ward's Trogon was sighted at Baguwa and Jorethang in October 1996 (Ganguli-Lachungpa 1996). All these records make this IBA a very interesting bird watching and conservation area.

MAENAM WILDLIFE SANCTUARY –TENDONG RF

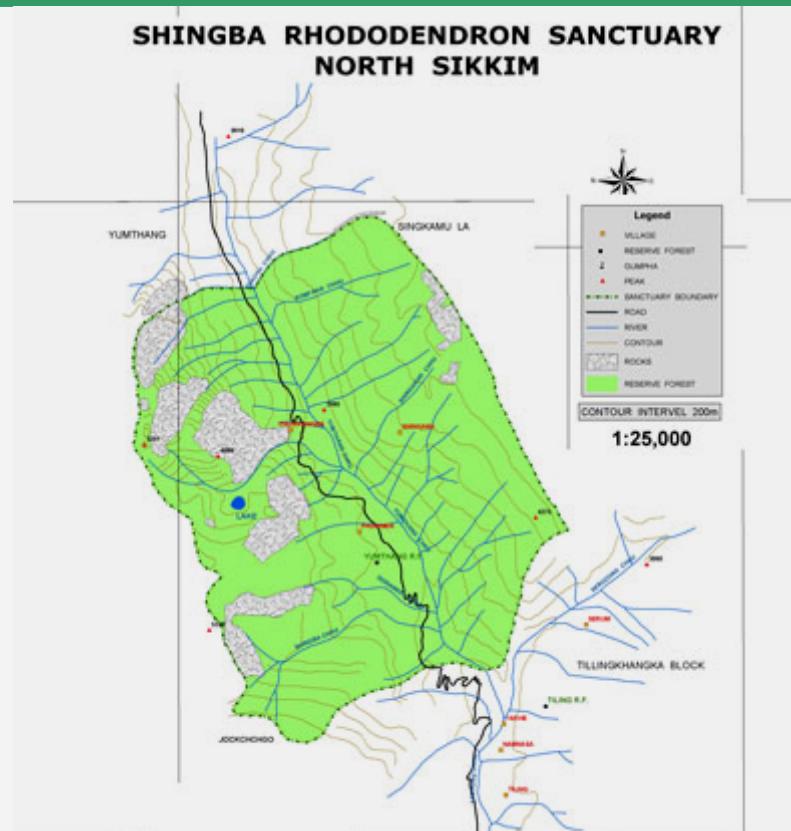
There are several villages fringing this IBA due to which the habitat is open in several places. This open habitat coupled with patches of dense forest provides ideal bird habitats in the IBA. The Hodgson's Frogmouth *Batrachostomus hodgsoni* was observed in Pabong area (Ganguli-Lachungpa and Lucksom 1998). The site lies in the Eastern Himalayas Endemic Bird Area (EBA- 130), in which Stattersfield et al. (1998) have listed 21 restricted range species. Eight of these have been seen here (U. Lachungpa pers. comm. 2003). This mid-altitude IBA falls mainly in Sino-Himalayan Temperate Forest (Biome-7). BirdLife International (undated) has listed 112 species in this biome, of which 53 are found here. The higher reaches of this IBA, above 3,000 m show some birds of Biome-5 (Eurasian High Montane - Alpine and Tibetan) where 48 species are listed and seven are seen in this site. At lower reaches, Biome- 7 merges with Biome-8 (Sino-Himalayan Subtropical Forest) where 95 species are listed. Almost half of them (42 species) have been found here. Some areas of this IBA, especially in the valleys also show some faunal elements of Biome-9 (Indo-Chinese Tropical Moist Forest). Four species of this biome are also found here. They are Grey Peacock Pheasant *Polyplectron bicalcaratum* (unconfirmed), Pale-headed Woodpecker *Gecinulus grantia*, Greater Necklaced Laughingthrush *Garrulax pectoralis* and Sultan Tit *Melanochlora sultanea*.

Map 2.7 Pangolakha Wildlife Sanctuary, East Sikkim



Source: Wildlife Division, Forest Department

Map 2.8 Shingba Rhododendron Sanctuary, North Sikkim



Source: Wildlife Division, Forest Department

PANGOLAKHA WILDLIFE SANCTUARY-ZULUKBEDANG TSO – NATU LA COMPLEX

The mountain passes of Natu La and Jelep La (La = Pass) form the routes for migratory waterbirds many of which stop over at the various wetlands in the area, especially Bedang Tso Lake. The Himalayan Monal *Lophophorus impejanus* (locally called as Feydong) used to be found here (Chezung Lachungpa pers. comm. 1996), hence the name *Bedang Tso*. Sometimes there is mass migration of birds of prey such as Red Kites *Milvus milvus* and (unidentified) eagles. The Sherathang marshes are one area where the Brahminy Shelduck *Tadorna ferruginea* breeds. Some birds of this complex are Eurasian Woodcock *Scolopax rusticola* and Wood Snipe *Gallinago nemoricola*, a globally threatened species (BirdLife International 2001) occasionally seen on the banks of the Bedang Tso. Hill Pigeons *Columba rupestris* are seen on smoking chimneys of local houses in snowy winters. The Snow Pigeon *Columba leuconota*, Snow Partridge *Lerwa lerwa*, Himalayan Monal and Gold-naped Black Finch *Pyrrhoplectes epaulette* are common on the alpine slopes. The Pallas's Fish-Eagle *Haliaeetus leucoryphus* was once seen in the forest patch over the Pangolakha range in 1994. Large Cormorant *Phalacrocorax carbo* and Bar-headed Geese *Anser indicus* were sighted at Bedang Tso in 1992 (U. Lachungpa pers. comm. 2003). The Tibetan Eared Pheasant *Crossoptilon harmani*, a Near Threatened species, has been reported from Kupup (near Bedang Tso) below the Jelep La. This area falls under Pangolakha Wildlife Sanctuary and is adjacent to the Chumbi Valley of Tibet. This pheasant is one of the two endemic birds in Southern Tibet (EBA-133). It is reported from the edge of mixed Broadleaf Coniferous forest; Rhododendron, Juniper and deciduous scrub and grassland (Stattersfield et al. 1998). Another Near Threatened species found in this IBA is the Giant Babax *Babax waddelli*. Due to great altitudinal variation from 1300 m to above 4,000 m, three biomes occur in this IBA: Biome-5: Eurasian High Montane (Alpine and Tibetan), from above 3,600 m; Biome-7: Sino-Himalayan Temperate Forest, between 1,800 m and 3,600 m; and, Biome-8: Sino-Himalayan Subtropical Forest, occurring between c. 1,000 m to 2,000 m (BirdLife International, undated). In Biome- 5, 48 species are found, out of which 11 are found at this site.

YUMTHANG-SHINGBA RHODODENDRON WILDLIFE SANCTUARY

The globally threatened Wood Snipe *Gallinago nemoricola* is occasionally seen in the Rhododendron-Fir forest of Shingba, and Ibisbill breeds on the shingle beds of the Yumthang Chu in small numbers, usually not more than two pairs. Grandala *Grandala coelicolor*, a local altitudinal migrant, is seen sometimes in apparently all-female flocks. Blood Pheasant *Ithaginis cruentus* and Himalayan Monal *Lophophorus impejanus* breed in the higher reaches of the Sanctuary while the Himalayan Griffon *Gyps himalayensis* is a resident of the cold desert. Gould's Shortwing *Brachypteryx stellata*, Rufous-bellied Crested Tit *Parus rubidiventris* and the restricted range Hoary-throated Barwing *Actinodura nipalensis* are common in forest patches. The Fire-tailed Sunbird *Aethopyga ignicauda* is conspicuous when Rhododendrons are in bloom. Rufous-bellied Eagle *Hieraetus kienerii* was sighted in Yumthang in June 1984. Jungle Crows are now resident at this altitude of c. 4,000 m with increasing tourist pressure (U. Lachungpa pers. comm. 2003). This IBA lies at the interface of Biome-5 (Eurasian High Montane: Alpine and Tibetan) and Biome-7 (Sino-Himalayan Temperate Forest). Therefore, species of both biomes are represented. It has alpine meadows and scrubs, so we get Tibetan Partridge *Perdix hodgsoniae*, Tibetan Snowcock *Tetraogallus tibetanus* and Hume's Short-toed Lark *Calandrella acutirostris*, while at slightly lower altitude where Montane Broadleaf Evergreen and Mixed Broadleaf-Coniferous Forest are found, species representing Biome-7 predominate. BirdLife International (undated) has listed 48 species in Biome-5, out of which 19 have been seen in this IBA. The Biome-7 has a long list of 112 species, of which 19 are found here. Looking at the intact habitat and the fact that no one has conducted detailed study on the avifauna of this site, more species of this biome are likely to be found here.