



## Ecological notes on habitat and species diversity in Sikkim

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### Abstract

Diversity is the uniqueness of species, ecosystem and gene. It reflects diversity of organisms in terms of long time of time and space though variations exist between species and genes but in general exhibition of morphogenetic characters and their expression depends on environmental factors. In this communication a general notes on landscape diversity of Sikkim has been placed in connection with some probable explanations though it may be or may not be exactly fit with the same environment. Species diversity in general has been placed in connection with ecosystem diversity.

**Keywords:** *Sikkim, landscape diversity, species, ecological notes, management.*

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### Introduction

The Sikkim Himalaya exhibits as smallest but biologically significant and diverse Himalayan states in India. It is unique because of close proximity to both the Tibetan Plateau in one side and hilly part of West Bengal thereby having affinities with tropical moist forests in the south and cold desert in the north. It's uniqueness is due to its terrain and waterfalls intermingled with valleys. Heavy precipitation during winter as well as summer season has given rise to lush green vegetation. Therefore, the state has its own strong influence of both west and east Himalayan bio-geographic provinces. The west Himalayan elements found in the state are Himalayan tahr (*Hemitragus jemlahicus*) and blue sheep (*Pseudois nayaur*). Not only that, the state exhibits more affinities with the eastern Himalayan elements as evident from the presence of red panda (*Ailurus fulgens*) state animal of Sikkim, clouded leopard (*Neofelis nebulosa*), serow (*Capricornis milneedwardsii maritimus*). It shows a high diversity of orchid species including varieties of rhododendrons in sub-alpine as well as in alpine habitats. The ecological significance of these elements is immense though the prediction of composition is infinite. The state is act as a historical range of golden takin (*Budorcas taxicolor*). Colourful street dogs and yak (hairy cattle) are found in open valley sites like Nathang and Yumthang. Many bird species like Rufous-headed hornbill, Chestnut-crowned



Laughingthrush, Whit-crested laughing thrush, Barred Cuckoo-dove, Oriental Turtle-Dove, Green-billed Malkoha, Himalayan Cutia, Fire-tailed sunbird, Barn Swallow, Russet Sparrow, Yuhina, Fulvitta and black birds are available here. Species of angiosperms, gymnosperms, ferns, lichens, bryophytes and fungi make the ecosystem unique because of its physiognomic features and latitudinal difference. Snapdragons, Orchids, dwarf grasses, *Schima wallichii* and dwarf Rhododendrons are common at slopes. Aside the lakes many woody lianas are available.

Plants and animals exhibit high levels of endemism like other part of Eastern Himalaya. The present study reflects landscape diversity along with priority areas of research and conservation in connection with better management of ecosystem in near future.

### **Area under Study**

Present Study includes East and North Sikkim part of the State. It includes places like Rangpo, Rorathang, Rongli, Lingtham, Nimachen, Phadamchen, Dzuluk, Gnathang, Kupup, Gangtok, Mangan, Chungthang, Yulgang, Lachen, Kalapathar, Yathang, Thangu, Chopta, Gurudongmar, Lachung and Yumthang including Zero point. The highest peak of the place Gurudongmar is situated at 17100 ft. from mean sea level which is very close to Tibetan plateau.

### **Materials and Methods**

Field survey was done in a group (9 persons) for 9 Days and frequently visited all the places in the month of May and June, 2022 (26<sup>th</sup> May to 3<sup>rd</sup> June). We started our journey from New Jalpaiguri (NJP) Rly. Station and visited Eastern part and gradually visited northern part covering the places as per the direction mentioned in the area under study. Local people and field guide were taken and official help was taken in many places. Camera, GPS, binocular and field guide book for the identification of birds and plants were taken during study. GPS software map was taken through smart phone and a place was demarcated as per the plan prepared earlier. As high altitude Rhododendrons bloom at May, so the specific time was chosen for study because special attraction on habitat study was Rhododendron. Photographs were taken and questionnaires on sheet were prepared for each site to know the management strategy of the habitat. Culture and life style of the local people was studied during visit in village at some places. Literature studied <sup>1-24</sup> before and after the



study field and data was cross checked with other literature available time to time for species identification.

## Result and Discussion

Sikkim is a state for nature Lovers. Its uniqueness is due to varied floral and faunal elements with landscape diversity. Forests types of the state are mainly characterized by temperate coniferous forest to sub alpine forest. The highest canopy cover flooded by plant species such as *Abies densa*, *Acer campbellii*, *Betula utilis*, *Rhododendron arboreum*, *Taxus baccata*, *Tsuga dumosa*, *Larix griffithii*, etc., found mainly at Lachen and Lachung in temperate coniferous forest. A wide variety of *Rhododendron* species are recorded in this region. The ground vegetation such as *Paris polyphylla*, *Arisaema* spp., *Primula* spp., *Pedicularis* spp., *Potentilla* spp., *Juncus thomsonii*, *Euphorbia sikkimensis*, *Panax pseudoginseng*, *Cotoneaster* spp., *Berberis* sp., etc., were dense in the forest floor along with lichens and mosses.

Various types of tree species were recorded i.e. adult, sapling and seedling. Highest adult individuals were recorded is *Castanopsis tribuloides* followed by *Leucosceptrum canum*, *Symplocos lucida* and *Rhododendron arboretum*. The lowest adult tree individual was recorded in case of *Glochidion acuminatum* followed by *Rhododendron grande*. Highest saplings state was recorded for *Symplocos lucida* followed by *Cryptomeria japonica* and *Castanopsis hystrix* whereas from seedling the highest individual was recorded from *Castanopsis tribuloides* followed by *Symplocos lucida* and *Symplocos glomerata*. The relative density of tree species under higher girth were found for *Castanopsis tribuloides* followed by *Leucosceptrum canum* and *Symplocos lucida* but highest relative frequency of occurrence was recorded in case of *Castanopsis tribuloides* and *Symplocos lucida*. The frequency of occurrence in the saplings was lower compared to seedlings. So, highest value was observed in case of *Castanopsis hystrix* followed by *Symplocos lucida* and *Symplocos glomerata* in all study sites.

In case of shrubby species highest percent cover was recorded for *Rubus ellipticus* followed by *Dichroa febrifuga*, *Rosa* sp., *Viburnum erubescence*, *Polygonum molle*, *Daphne* sp. The lowest percent cover was recorded for *Rubia cordifolia* followed by *Rubus*



*paniculatus* and *Edgeworthia gardneri*. In the shrubberies near roadside and in the agricultural garden *Saurauia* sp., *Mussaenda* sp., *Clerodendrum japonicum*,

A large number of herbaceous species were recorded in the study site which includes species like *Polygonum molle*, *Arisaema intermedium*, *Asplenium Laciniatum*, *Boehmeria* sp., *Carex* sp., *Digitaria sanguinalis*, *Diplazium Dilatatum*, *Allantodia stoliczkae*, *Elatostema platyphyllum*, *Eragrostis cilianensis*, *Ageratina adenophorum*, *Girardinia diversifolia*, *Gleichenia longissima*, *Impatiens stenantha*, *Lycopodium japonicum*, *Monachosoram henryi*, *Nephrolepis cordifolia*, *Pilea stricta*, *Pilea umbrosa*, *Plagiogyria pycnophylla*, *Pouzolzia sanguine*, *Rumex Nepalensis*, *Selaginella biformis*, *Selaginella chrysocaulos*, *Selaginella monospora*, *Smilax aspera*, *Urtica dioica*, *Urtica parviflora*, *Oreocnide frutescens* and *Viola sikkimensis*. Subba et al. (2015) argued that Sikkim boosts ca. 4500 species within 7096 km<sup>2</sup> landscape. The life-form study under Raunkiaer's system (1934) was made for classifying plant entities within a community and understanding its adaptive manifestation to certain ecological condition (Mera et al. 1999). It is true in a natural landscape where no gradual change takes place due to change of land mass though other factors lead to change the ecosystem conditions. In true sense, the Raunkiaer's life-form shows the structural diversity of the plants in any place and is therefore important from the ecological point of view, where most of the time it reveals the change in the forest continuum. Therefore prediction and assessment is not possible because of the high rate of fragility in the ecosystem in case of hilly part of landscape.

## Conclusion

Sikkim shows a versatile uniqueness in terms of landscape though ecosystem not truly tuned in all the cases. High rate of fragility and high anthropogenic activates faster the rate of degradation which lead to loss of species in many areas so landscape diversity is altering its state due to threats. Landslides and surface runoff gradually diminishing the loss of land cover which ultimately causes loss of population of species even loss of species. It is urgently needed to make policy in high fragile area so that no permission allowed for tourists even to construction for local people. Census and species introduction or species protection for any kind of loss may be encouraged so that the natural cover fill the form of land cover automatically which could develop succession stages and establishment of species in such

area. Eco-restoration is highly recommended to stop the eco-degradation in many areas of hills.

### Photographs



Fig. 1 *Saurauia* sp. (Local Name-Gogan)



Fig. 2 *Mussaenda* sp. (Wild Mussaenda, Dhobi)



Fig. 3 *Clerodendrum japonicum* (Dhago phool)

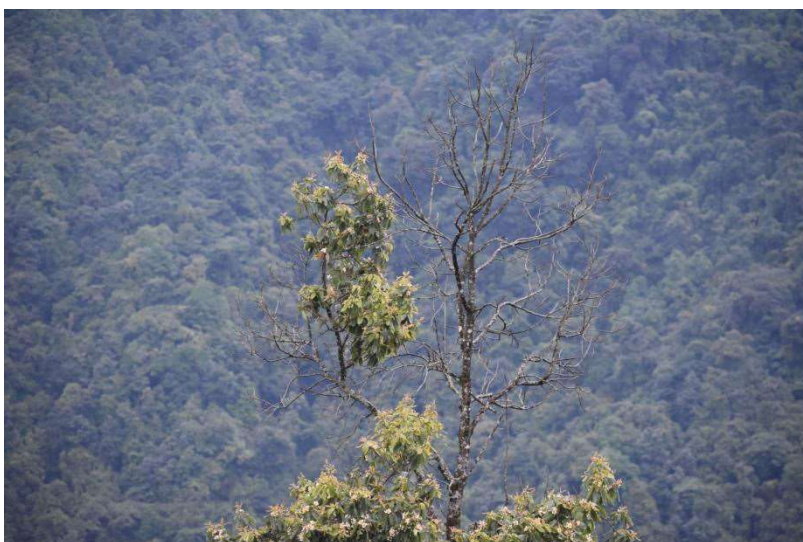


Fig. 4 Vegetation of Pangolakha Wildlife Sanctuary, Mankhim, Sikkim , May-2022

(The dominant visible plant is *Schima wallichii*- Locally called Chilouni)



Fig. 5 Chestnut-crowned Laughingthrush



Fig. 6 Barn Swallow (*Hirundo rustica*)



Fig. 7 Russet sparrow, Pangolakha WLS



Fig. 8 Snapdragon flowers in the wild (At Lachung)



Fig. 9. High altitude Rhododendron sp. (At Lachen)



Fig. 10 Nathang valley, Sikkim

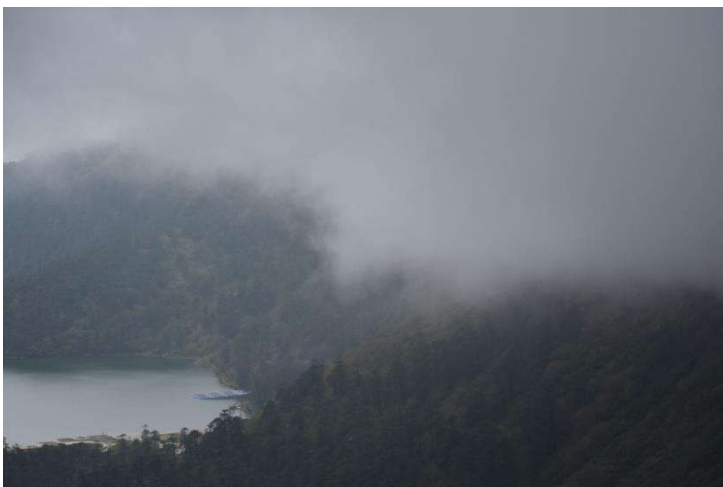


Fig. 11 Landscape beauty of Menmecho Lake, Sikkim during May, 2022





Fig. 12 Street Dog at Phadamchen, Sikkim



Fig. 13 Yak at Nathang Valley, Sikkim

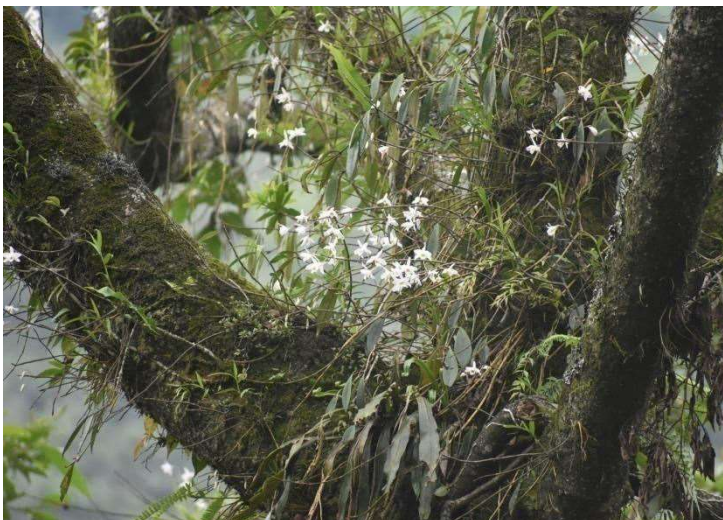


Fig. 14 Orchids in the wild, Pangolakha WLS



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