



# Ecological and Biogeographical Features of Khed Tahsil, Pune District, MS, India

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## Abstract

Western Ghats with unique habitat from origin of Gondwana land. Now days these Western Ghats are biodiversity hotspot and world heritage. The Khed Tahsil is also one of part of Northern Western Ghats, in this region the Bhimashankar wild life sanctuary, famous for *Ratufa indica elphistoi*, sub species of the Indian Giant squirrel which is endemic in status. Khed Tahsil is located in the Northern part of Pune District, at altitude 626.015 MSL in Western Ghats. The landscape of Khed Tahsil is distributed triangularly in Western Maharashtra at foot hills of the Sahyadri Mountains and divide into three part Ghatmatha, Mawal and Desh. Present study carried out for biogeographic and ecological features of study area.

**Keywords:** Biodiversity hotspot, Western Ghats, Indian Giant squirrel, endemic.

## Introduction

The Western Ghats regions are the specimens of breakup of ancient Gondwana land at the time of Jurassic period. This Ghats represent favorable weather patterns as a high gradient with high speciation, it also an evolutionary Ecotone with respect to out of Africa and out of Asia on species dispersal and variance. It is also with outstanding universal value (IUCN, 2012).

An ecosystem is a higher level of organization of life that includes all biotic and abiotic factors, the term "ecosystem". In short, a key as habitat encompasses the physical environment within biome exist<sup>1</sup>. The biotic and abiotic components interact and develop a clearly defined trophic structure with biotic diversity reported<sup>2</sup>. Ecosystem to be as geographic distribution of species and their diversity; interaction of the species in terms of population dynamics and energy flow in various ecological communities from primary producer to consumer with higher tropic levels this ecosystem mostly affected and that determine by factors like geographic location, climatic condition and it control the faunal distribution<sup>3</sup>. The forest has been a storehouse of natural resources accounting for almost 30% of earths total land area; the biosphere which help in stabilization of natural system<sup>4</sup>.

About 160 million years ago Indo- Madagascar region separated from Africa and distributed the ancient Gondwana land<sup>5</sup>. Formation of the Indian subcontinent in an about 96 million in these period of isolation results in evolution of high level of endemism with unique fauna in Madagascar, but researchers find some endemic in Indian subcontinent<sup>6</sup>.

## Material and Methods

**Study Area:** Study area is selected from Pune district, because Khed Tahsil has been done mainly due to a study regarding the reptile diversity has not been attempted since independence and also faunal surveys have been attempted for many years. The area under detailed investigation which is a part of Western Ghats ranges is located in district Pune, Maharashtra. The study area forms a part of the middle Bhima and Bhama basins present in north western corner of Sahyadri region in Khed Tahsil. The study area covers part of Khed Tahsil in which area is dividing in industrial development, reserve forest, civilization and cultivation of crop with irrigation with respect to three dams Chas-Kaman, Bhama-Askhed and Kalmodi dam. The western Ghats of study area constituting three well marked physiographic region running parallel to Bhima, Bhama and Indrayani rivers in west-east direction of Khed Tahsil. This region has been shown the present of number of narrow plains and rolling rocky hills.

Geographically study area is part of Western Ghats, lithologically it belongs to Deccan trap region and geomorphologically it is polycyclic land scape. The western part of study area is rugged comprising of Sahyadri ranges with many peaks rising above 1000 meters. The tributaries of rivers forms a valleys and flat-topped interfluvial topography dissect slopes. Geological formation consisting of basalt. it consists of basic igneous rocks of lava. Lava flows horizontally there for step like topography is formed. The rocks are varied with specific gravity and colours like gray, dark gray and grayish pink.

This region belongs to sub-humid in the west to semi-arid in the east with different seasons like summer, rainy and winter. The western to eastern regions has annual rainfall decreases from 2200 mm to 700 mm marked with July maximum. In this region rainfall is due to the south-west monsoon. Soil in this area like black cotton with varying depth which is developed from basalt rocks, very shallow (< 8.0 cm); shallow (8.0-30cm); medium deep (30-60cm) and very deep (>100cm) soils roughly corresponds to mid slope and valley fills. This soil types are topographic variants of gray and black soil. Due to changing slope, soil and rainfall natural vegetation of Khed Tahsil vary from evergreen, deciduous forest to scrub land and grass land.

The forest in this region dominant in hills and hilly slopes while in grass lands wide spread on foot slopes. Agriculture is the most common land use with well irrigated land. Changes are from west paddy field to normal agricultural field. In the study area in present day industrialization cover a land mostly in eastern and southern region of Tahsil.

**Survey of Khed Tahsil:** Field survey had carried out through Tahsil, for study of locality during three different seasons in year 2012 and 2013. The instruments use for field survey are Olympus Binocular with camera for photograph, thermometers for calculation of temperatures, hygrometer for humidity and GPS for accuracy of positions of area cited. The Photographs are also taken in the respective regions by field camera Sony cyber shot.

**Collection of Topographic plates and GIS mapping of study area:** The topographic plates are collected from Geography Department of Hutatma Rajguru Mahavidyalaya, Rajgurunagar. The maps of Khed Tahsil had made with the help of GIS mapping software's; these are Global Map and Arch 2010.

## Results and Discussion

**Soil features:** Soil profiles in Bhima and Bhama basin were studied and soil samples were analyzed at 40 locations widely distributed through geomorphic units within the study area. Clayey soils are medium deep occupying the Bhima and Bhama basin. They occur on moderate to moderately steep sloping mesa land units and are subject to moderate to severe erosion hazards. Organic matter content of clayey soils is observed from 0.3 to 1.8%.

Clay loam soils are medium deep and occur on moderate to moderately steep sloping mesa are moderately drained and are subjected to moderate to severe erosion hazard covering study area. Loam soils are deep to very deep located in pockets (~800 ha) on gently to moderately sloping low piedmont zones and are characterized by moderate drainage. Sandy loam soils are deep to very deep associated with gently to moderately sloping low piedmont geomorphic units and are subjected to gentle to moderate erosion hazards. These are well-drained soils with

high permeability. Silt clay loam is observed on moderate to moderately steep sloping pediments and is subjected to moderate to severe erosion Bhima and Bhama basin area. These are moderately high drained soils with moderately rapid permeability. Silt loam soils covers found on steep hill slopes and undulating areas and are subjected to very severe erosion hazard. These soils are very shallow to shallow, coarse loamy developed from weathered basalt.

Forest soils are very shallow occupying steeply sloping escarpments, hill slopes and undulating areas and are subjected to very severe erosion hazards. They are dark brown and directly underlain with weathered basaltic material. The type of soil in a particular area is the product of withering of parent rocks giving it a distinct morphological, physical and chemical characteristic. The biotic community give food chain along with basic soil features in the agricultural field insects are present on the field, so the food chain forms like, Insects-frog-Reptiles-tertiary consumer like owl, eagle and paradise<sup>7</sup>.

**Habitat Diversity:** In the study area various habitats are observe. The word habitat is most important word to describe ecology of living environment of given organism by factors related to geology, vegetation and geographic location of given area. The habitat compose of physical factors like temperature, humidity, light intensity and abiotic factors that collective make up in which organism live<sup>8</sup>. The conservation of variety of species and variation in natural forest or environment depends on maintenance of essential functional component of ecosystem<sup>9</sup>.

Floral and faunal diversity is generally maintained and regulated by the environmental factors like topography and climate that determine the vegetative cover. The climate and geographical location are related to the latitudinal differences and other organic factors which are ranging from seasonal grasses herbs shrubs are affected by leaf fall during winter. The western region of study area remain green throughout the year even though the grasses become dry during summer season. In the rainy season greenery observe with all kinds of green plant from the group of algae to the angiosperms, die to presence of this flora a shelter to number of animal communities including insects and other like reptiles. The forest area is affected by human activities like tree falling, shifting of cultivation, forest fires and industrialization.

**Vegetation pattern and forest types:** The forested area of Sahyadri ranges of Khed Tahsil show denser vegetation on the basis of vegetated, relatively less densely vegetated, thinly vegetated and cultivated areas. Geologically hill tops, valley flats, shows dense vegetation, relatively less density, thinly vegetated area at steeply sloping grounds and valley floor. Surrounding hilly tracts exhibit various categories of forest like fairly dense forest, low dense forest, shrubs, cultivated area scattered trees and denuded areas. Being part of the dry deciduous forest in the moist deciduous forest, the study area

shows variety of natural forest, dry forest is observed in hilly tract, moist deciduous forest in Bhima River basin. The categories of forest types observed from satellite images and aird Photographs. The occurrence of high density of vegetation on higher altitude areas die to the fact, these areas have rugged features and steep slopes , making accessible and so these areas not suitable for agriculture. The forest density in Khed, Chakan and Pimpalgaon is low, so most of the land is under agriculture in these areas.

Residual mulches and stems from close-growing vegetation are more effective than equivalent percentage of canopy cover. In the double cropped area the proportion of crop residue in soils is relatively large. Long-term residue incorporation through continuous cropping over the years changes the soil structure, detachability, density, organic matter content, and biological activity. The residual effects are most apparent during seedbed and establishment period. Plugging residues down in the soils is less effective than leaving them on the surface. Plant residues would intercept falling raindrops so near the surface that the drop regains on fall velocity, and they would also obstruct runoff flow and thereby reduce its velocity and transport capacity. The mountain chains of Western Ghats host of most bio divers, threatened and unique species distribution in tropical, subtropical, forest as well as hilly Indian regions<sup>10</sup>.

**Agricultural and farming practices:** Human uses the land to satisfaction of his all needs that leads to clearing of the land off its vegetation for such activities like mining, irrigation projects, road construction etc. so there is fragmentation of forest ecosystem causes great harmfulness to habitat of various plants and animals, the major part of country is under agriculture, so major business of people is agriculture. The land utilization of country statistic shows mountain terrain, desert, aquatic systems and River planes. More than fifty percent area of country underutilization of agriculture to satisfy, the first and for most needs of country. As the result forest areas have been reduced to greater extent due to human activities that change of damage of environmental factor balance. The crop cultivation practices in the Bhima basin and Bhama basin are that during rainy season paddy seedlings are first nurtured in a nursery; after their growth of 3 weeks, during July the seedlings are transplanted in the puddled field. Field planted with sorghum crop is left exposed to the erosive rains of the monsoon season.

**Tribal community life:** The tropical forest plays an important role in the life and economy of the tribal. The largest concentration of tribes found in India. These tribal communities use a forest resource for various purposes like food medicines<sup>11</sup>. Khed Tahsil is located in northern part of Pune District. Khed Tahsil having 11.94 % house hold of tribes and total population is 38634 (2001) so it is important for understand the causing change in social, cultural and empowerment of tribes need to be monitored. A data base for an area, major tribe is Hindu Mahadev Koli, Thakar and Katkari. The languages of communication of these tribes are thakari and katkari.

Mahadev Koli, cultivate cereals like maize (*Zea mays*), rice (*Oryza sativa*), jowar (*Andropogone sorghum*), pulses like moong (*Phaeolus radiatus*), karal (*Carvia colasa*)<sup>12</sup>. Thakar community is totally depending on forest resources because the tradition of them is hunting, so fauna of reptile's mostly affected threated species of reptile is common Indian monitor. This is showing medicinal features i.e. cure arthritis. Bird fauna is also affected by hunting in these study area.

Katkari tribes also consume liquor extracted from fruits of Mahua plant (*Madhuka indica*) on the occasion of festivals and fairs. The collection of fire wood, medicinal plants some tribes have even develops small scale business like making a house hold material like baskets, winnowing paly and variety of other grasses instruments. The houses of them are also made up of plant Karvi.

**Shifting of cultivation and deforestation:** Deforestation is a global phenomenon, which results in continues deterioration of the natural ecosystem and resources like forests. The main cause of deforestation in India is timber extraction. South Asia seems to have the largest percentage of reduction in forest area in last few decades<sup>13</sup>. Large areas of the forest have been affected by reservoir and dams constructions for multipurpose water projects, leading to loss of flora and fauna<sup>14</sup>. Bhima and Bhama tributaries are sub tributaries of Krishna River basin and so many dams are constructed within it. Due to this major of forest land threatened the natural resources of Sahyadri mountain ranges of Western Ghats. These conditions are definitely led to an irreversible loss of flora and fauna with displacement of over million people, mostly tribal. The major causes of deforestation in India has been shifting agriculture, which is widely practiced in the study area and has had led to drastic changes in the forest ecosystem. The local population in the western region of study area completely depends on the forest for live hood and thus, firewood collection, shifting agriculture and settlement, are common practices in the Sahyadri ranges.

Agriculture is generally practiced near a river, streams and on the hill slopes. The practice shifting agriculture on steep slopes, the local people traditionally clear small patches of forest cutting, burning the vegetation. Afterword plant crops using digging instruments. After two to three years weeds proliferate in the patches and soil become exhausted of the store hummus and yield of crops and fertility of patches decreases. The soil erosion will take place the soil became infertile, so cultivation shifted to new location and clearing more forest. These are resulting in the more destruction of natural vegetative cover and are depend upon flora and fauna. The study area has escaped from these activities. Earlier shifting agriculture in the tropic is use to a cycle of 30 years, harmony with the forest environment. But this cycle now reduced to 3 to 5 years due to high pressure on resources causes population increase, resulted in to deforestation of land<sup>15</sup>.

The other activities like cattle grazing, which is usual practiced in peripheral hilly tract and Tasubai depressions. These activities also cause soil erosion, degradation of soil fertility and water holding capacity; further depletion of productivity of the land<sup>16</sup>. The Southern-Eastern region of Khed Tahsil is now days became auto-mobile hub means that industrial zone of India. For the development of various factories and companies are also causes damage to natural habitat. The Chakan, Wasuli and Rajgurunagar are major growing industrial areas of study area. The Western region of Khed Tahasil indicates that, there are rare and endemic species were occurred and also agricultural species are found<sup>17,18</sup>.

**Plant Resources – The Flora:** The floral study area is being a powerful unit of ecology. Which play vital role in natural environment with significant faunal component in the western regions of study area observe dense forest, where fairly good humidity is maintained especially along River basins as well as on hill and plateau tops. The study area showed a presence of dominant plant species like Ain (*Terminalia tomentosa*), amba (*Mangifera indica*), apta (*Bauhinia racemosa*), avala (*Emblica Officinalis*), babul (*Acacia arabica*), behada (*Terminalia bellerica*), bhoker (*Cordia myza*), biba (*Smecarous anacadium*), bor (*Zizypus mauritiana*), chinch (*Tamarindus indca*), hirda (*Terminalia chebula*), Khair (*Acacia leucophloea*), moha (*Madhuka indica*), neem (*Azaderictica indica*) and vad (*Ficus bengalensis*).

The plant species used by local people for making their house include *Butea*, *Phoenix*, *Denrocalamus*, *Bamboos*, *Carvia* and *Tectona*. The seasonal vegetation include variety of grasses like *Atylosia*, *clitorea*, *Tephrosia*, *Cassia*, *Indigofera* etc. the flora show a mixture of dry and moist deciduous species of which *Boswelia* and *Butea* were dominant in dry hilly tracts specially the Bhima and Bhama River basins. Many of the plant above mentioned medically and economically important and form a very strong base for Ayurvedic medicine practiced In India. The important medicinal plants were used in Koraput district, Odisha were recorded with several ethno-medical information<sup>19</sup>. The Rocky sandy coast of Saurashtra makes a uniform species distribution<sup>20</sup>.

**Animal Resources – The Fauna:** The animals reported from study area, the Indian leopard, hyaena, jackal, hare and civet belonging to mammalian group. Avian fauna is widely observed as the area provide shelter and food in respective forest areas the most common birds observed in the area like kite, swallows, black drongo, tailer bird, wagtail, myna, pon heron, doves, cattle egret, wood pecker, robin, shikra and kingfisher etc. the diversity and abundance of birds were occurred in the canopy of forest habitats which are mostly endemic in nature<sup>21</sup>.

The varieties of animals are present in study area like variety of bat (*Pteropus giganteus*), Langur (*Presbytis entellus*), Jacal (*Cannis aureus*), civet (*Paradoxurus sp.*), magoose (*Herpestes edwardsi*), hyaena (*Hyaena hyaena*), jungle cat (*Felis chause*),

leopard (*Panthera pardus*), giant squirrel (*Ratufa indica elphistoi*). The rich occurrence of fauna of variety of species including mammals, reptiles and birds in the study area show rich vegetation or forest cover that provides the wild life shelter to live and food to survive.

## Conclusion

The biodiversity and ecology in Khed Tahasil is with unique habitat, but due to human interfere and change in cultivation pattern this uniqueness disturb in early Years. Clearing forests for agriculture, ruthless exploitation of forest for timber, construction of major dams and development of holyday resort. They are playing a role in deterioration of the ecosystem of forest. Impact of such practices has increased the rate of fragmentation of forest ecosystems, which decreases richness of various species and biodiversity, ultimately making, maintain and forest extinction prone areas for every floral and faunal species. The present study suggested that, the biogeographical and ecological management resources are change the human needs.

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