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Research Article

PHYTOGEOLOGICAL PECULIARITIES OF THE WESTERN GHATS WITH SPECIAL REFERENCE TO KUDREMUKH NATIONAL PARK, KARNATAKA, INDIA

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ABSTRACT
Kudremukh National Park, Karnataka, India, is probably one of the largest reserves of high altitude grasslands in the Western Ghats with vast stretches of shoal grassland complexes and pristine evergreen forests provides a suitable habitat for the luxuriant growth of plant life. It has magnificent landscapes of least disturbed wet evergreen forests and shola-grassland biome. It is a sample of world's major habitats and eco-systems. In this Paper biological and geological richness of Western Ghats is discussed.

***Keywords*:** *Phytogeological Peculiarities, Western Ghats*

INTRODUCTION
The Western Ghats with a chain of mountains running parallel to the west coast covering 5% of the India's total geographical area with humid tropical forest and high diversity contain more than 27% of the country's total plant species and constitutes regions of high endemism in India (Rodgers and Panwar, 1988).
The hot and humid tropical climate in the Western Ghats region complimented by heavy precipitation create an ideal condition for the luxuriant growth of plant life, which can be seen only in a few parts of the world.
The Western Ghats is considered as one among the 34 biodiversity hotspots of the world (Mittermeier *et al.,* 2005) and Karnataka shares a major part of it. Kudremukh National Park is probably one of the largest reserves of high altitude grasslands in the Western Ghats with vast stretches of shoal grassland complexes and pristine evergreen forests provide a suitable habitat for the luxuriant growth of plant life. It has magnificent landscapes of the least disturbed wet evergreen forests and shola-grassland biome. It is a sample of world's major habitats and eco-systems. It is a signpost of tropical biological richness. It is a living museum and a natural laboratory.

Name and Location
Kudremukh National Park is located at the tri-junction of Dakshina Kannada, Udupi and Chikmagalur districts. It falls approximately at the middle of mid-Western Ghats (the stretch between Goa and Nilgiris).
It lies to the south - west of Karnataka state and is just 50 kms from the west-coast between the 750 01' to 75^0 25' east longitude and 13^0 01' to 13^0 29' north latitude (Figure 1). It derives its name from the Kannada word 'Kuduremukha' which means horse face due to the resemblance of the top of Kuduremukha Mountain to a horse's face.
The national park is rosetted by a host of holy places such as Dharmasthala, Udupi and Sringeri. The national park represents the lap of all the places. The tract is replete with fascinating natural beauty. It is clad with thick forests, rich flora and fauna, delightful dales, shining streams and brooks, narrow valleys and glades and abundant iron ore deposits.
The hills, which bear the brunt of the severe monsoon winds, preclude any tree growth added to that the region is known for its rich low grade magnetite soil which primarily inhibits plant growth. As a result, the landscape is covered with grass.
The valleys which are tucked in, have reasonable protection from wind and a deep soil profile, as a result of which stunted evergreen forests exist creating a unique microclimate, rich with mosses, orchids, etc.

The whole scenery of grassland interspersed with narrow strips of forests provides a fantastic vista (Figure 2).

The wet climate and the tremendous water retentive capacity of the shola grasslands and forests have led to the formation of thousands of perennial streams in the region converging to form three major rivers of the region, Tunga, Bhadra and Nethravathi which form an important lifeline for the people of Karnataka and Andhra Pradesh.

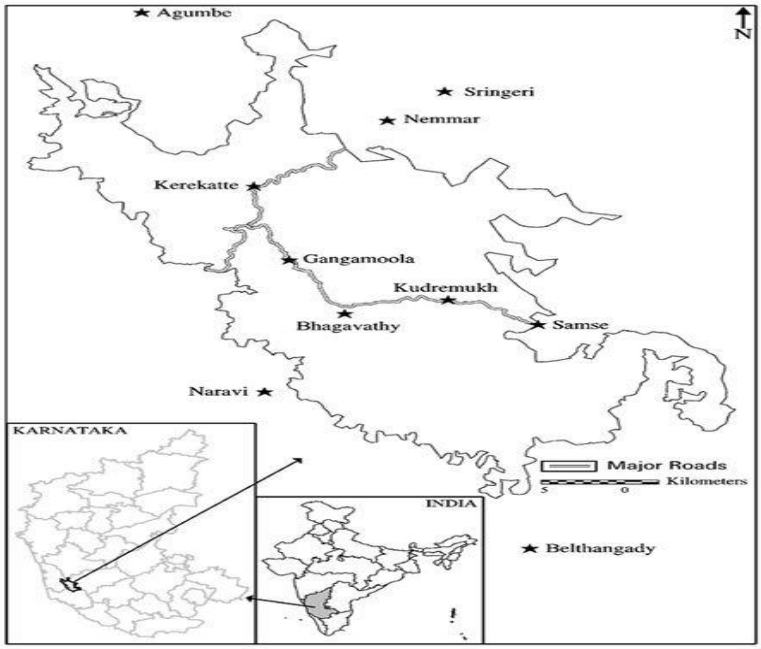

Figure 1: Location Map of Kudremukh National Park, Western Ghats and Karnataka

Figure 2: Scenery of Kudremukh National Park, Western Ghats, Karnataka

Kudremukh Iron ore Company Ltd

Discovery of iron ore deposit in these hill ranges was made by Late Sampath Iyengar, a geologist in the year 1913. The iron ore deposit in Kudremukh was estimated to be around 700 million tones (Annual reports of KIOCL).

Kudremukh Iron Ore Company Ltd. (KIOCL), a Government of India enterprise under the Ministry of Steel and Mines was established in the year 1976, operated for 30 years and closed its mining activities in 2006 due to environmental issues, as per court orders.

But practically, KIOCL has carried out very extensive afforestation within Mines lease areas (Figure 3). So far, about 75 lakh trees have been planted since the inception of the project. To protect and nurture rare medicinal plants in and around Kudremukh, a project has been launched with the help of Ayurvedic College, Udupi to grow valuable medicinal plants including endangered species for the benefit of the society.

With high quality practices adopted by KIOCL to mine, the flora and fauna remained intact, causing no adverse effects on the nature.

Figure 3: Afforestation at Kudremukh National Park, Western Ghats, Karnataka

Geology of the Study Area

The Western Ghat forests are principally of gneissic composition interspersed occasionally by quartzite, mica-schist and granite, outcrops of which occur in long stretches along the sharp edges of the Ghats. Rock formation in the entire region belongs to the earliest period of the earth's history – the Archaean epoch.

Older metamorphic rocks constitute mainly Dharwar schists, which occupy almost 80% of the area of national park. They are represented by banded ferruginous quartzites, which are highly folded and form a series of ridges (Radhakrishna, 1996).

Extensive beds of magnetite-quartzite ranging in thickness from 120 to 200 meters are found in the area. The magnetite-quartzites, which are seen overlying amphibolites are black in color and friable to a depth of 30 meters Beyond this depth, they are dark, compact, hard and massive.

This belt comprises hornblende schists, amphibolites, chlorite schists, mica schists and thick beds of magnetite-quartzites. The hornblende schist and amphibolites form the oldest units. Major parts of hornblende schists are dark and fine-grained and very often grade into dark chlorite and biotite schists. The amphibolites are entirely composed of matted aggregates of actinolite and tremolite, and are often intimately mixed up with fine-grained dark hornblende schist.

The chlorite schists are exposed prominently near Malleshwara, Sitabhume and Gangrikal ridges. The mica schists are usually found developed at the contact zones of the belt, with granite gneisses. The magnetite-quartzite forms a striking unit in the belt and is intricately folded (Figure 4).

Figure 4: Intricately Folded Magnetite-Quartzite

Quartzite is frequently found as separate nodules or small crystals. The foothill portions on the coastal side are characterized by soft laterite formed by the decomposition of original gneissic rock. The brownish friable loam found in the valleys often reaches to a considerable depth and is an indication of the suitability of the soil to support good deciduous or semi-evergreen forest. The underlying rock is invariably gneiss, sometimes outcropping in the form of boulders.

Flora of the Study Area

Tropical forests are celebrated for their diversity. They constitute less than 10% earth's land surface but contain 90% of all plant and animal species.

Millions of years of evolutionary pressures shaped these ecosystems into the most complex in the world. Kudremukh National Park has an estimated number of 2,500 species of flowering plants, one third of which are endemic to the Western Ghats. There are 400 species of known medicinal plants, 180 species of edible plants and 70 species of Orchids. The national park has around 700 to 750 species of mushrooms (Figure 5).

Figure 5: Flora of the Study Area

For an untrained eye, the forests are of evergreen type throughout the national park. The plantation includes the wild relatives of many economically important species, such as grains (including rice and barley), fruits (mango, banana and jackfruit), and spices (black pepper, cinnamon, cardamom and nutmeg), as well as numerous medicinal plants such as the highly threatened white damor (*Veteria indica)*. The fragrant resin and seed oil of this large evergreen tree can be used in medicines, as well as in soap and candle manufacturing.

All the available literature sources documenting the presence of flowering plants have been analyzed for the present study (Gamble, 1915-1934; Gowda, 2004; Pascal, 1982; 1986; Ramesh *et al.*, 1997; Saldanha, 1984; 1996; Yoganarasimhan *et al.*, 1982). Floristic diversity of the national park revealed six broad vegetation types (primary evergreen forests, secondary evergreen forests, semi-evergreen forests, moist deciduous forests, 'shola' forests and high altitude grasslands) in Kudremukh National Park with 897 species including 12 sub species and 34 varieties (Sringeswara, 2006) (Plate 1).

Plate1: Vegetation types of Kudremukh National Park:
a. Primary Evergreen
b. Secondary Evergreen
c. Semi Evergreen
d. Moist Deciduous
e. Shola and
f. Grass Lands

A study of the floristic diversity of the national park revealed that the plants belong to ten largest families namely Fabaceae, Orchidaceae, Rubiaceae, Asteraceae, Malvaceae, Poaceae, Apocynaceae, Acanthaceae, Lamiaceae and Euphorbiaceae (Sringeswara *et al.*, 2014). Some of the important species occurring in the park are given in the Plate 2.

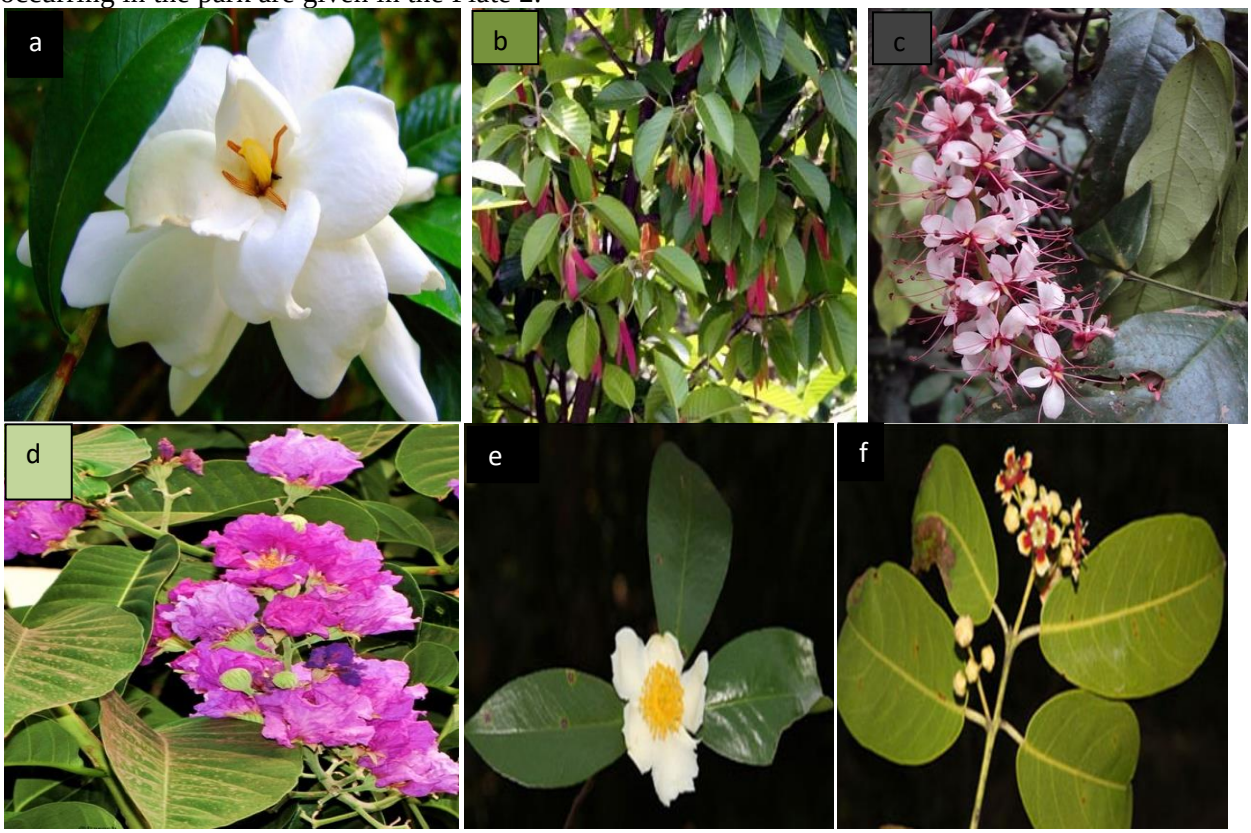

Plate 2: Important Plants of Kudremukh National Park:
a. *Gardinia Obtusa*
b. *Dipterocarpus Indicus*
c. *Humboldtia Brunonis*
d. *Lagerstroemia Microcarpa*
e. *Hopea Camarensis*
f. *Lophopetalum Wightianum*

Conclusion

Understanding the floristic diversity of an area is a prerequisite for proper conservation efforts. Species need to be conserved along with the habitat for which proper understanding the diversity of the species and their association is very essential.

The National park was a place of experimentation for raising plantations of very unconventional species such as *Hopea parviflora*, *Veteria indica* and today there is an impressive stand of *Hopea* and Veteria on the northwest of the park. Greatest value of these evergreen forests lies in its unknown flora and fauna and the immense possibilities of bio-engineering in future. Man has only been successful in simplifying rather than reconstructing this kind of complex eco-system.

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