

Nature Watch

Decline of a Montane Ecosystem

Kartik Shanker

The Montane Ecosystem, its decline through numerous human activities and its relevance to the development of conservation strategies are described in this article.

The Montane Ecosystem

The Nilgiris or the Blue Mountains are located at the junction of the Western and the Eastern Ghats, the two prominent hill ranges of peninsular India. Perched at the top of the Nilgiris and the other ranges in the Western Ghats is an ecosystem that is both scientifically interesting and aesthetically appealing. This is the montane ecosystem, and features tropical montane evergreen forests (called 'sholas') set in a matrix of grassland.

The sholas have evergreen trees which are more stunted than those in lowland evergreen forests. This becomes clear if one walks down from the upper plateau of the Nilgiris to the Silent Valley, which is at its foothills to the southwest. As one goes lower and lower through a vast stretch of forest, the trees gradually get taller and quite gigantic. Sholas may have two or three woody strata. They are usually rich in epiphytes like mosses, orchids and ferns. The herbaceous cover on the ground varies according to soil moisture. The ground is usually covered with leaf litter.

The sholas have often been referred to as living fossils. This is essentially because of their inability to expand, due to the nature of the climatic conditions in the area. The action of the frost and the sun in the morning prevents any saplings from surviving in the grassland. However, the temperature in the sholas remains remarkably constant and therefore there is regeneration within



Kartik Shanker spent two years in the Upper Nilgiris studying small mammal and herpetofaunal communities. His interest in snakes was inspired by the 'snake catching' Irula tribe near Chennai.



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the sholas. This has been reflected in the studies that show that the relative extents of the sholas and the grasslands have varied over geological time. In fact, during periods of higher temperature, the sholas have been more widespread and during the ice ages they have contracted.

Whether the sholas are contracting or expanding today as a result of global change is irrelevant, considering that substantial damage has already been done by human impact in the upper reaches of the Western Ghats. Apart from the few areas that are today protected as sanctuaries, national parks and reserve forests, the remaining areas have been deforested or replaced with plantations of various sorts.

The importance of the montane ecosystems of the Nilgiris need barely be emphasised. These are unique habitats found only at the higher reaches (1500 metres and above) of the Western Ghats. Apart from the singular nature of the habitat itself, they support several species of endangered animals, many of which would live only there. The Western Ghats as a whole support a high diversity of plant and animal life. Generally considered a hotspot of diversity in the world, they are also believed to be the richest in amphibian species in Asia.

Decline of the Habitat

The flora and fauna of the montane systems have suffered greatly due to various direct and indirect causes. One of the key factors in the decline has been habitat destruction. The process began more than hundred and fifty years ago when the British discovered the Nilgiris. The cool climate and the landscape was remarkably similar to the Europe they knew. They subsequently attempted to set up a neo-Europe atop the hills, but this was not entirely successful. However, the planters stayed on and planting of tea, coffee and cinchona began about 150 years ago. Today, large areas of the Upper Nilgiris are under tea cultivation.



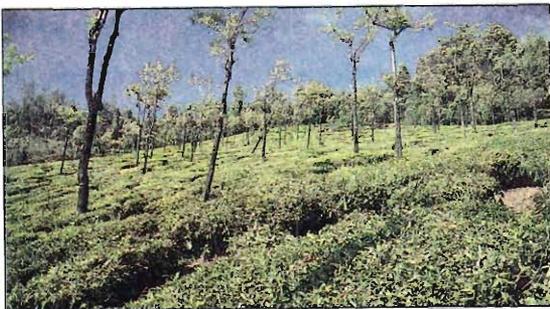
There was some concern about the destruction of the sholas by the late nineteenth century. Large areas of forest tract were reserved after the Madras Forest Act of 1882. Wattle and Eucalyptus plantations, which had been initiated in the mid-nineteenth century to fulfill fuelwood requirements were turned over to the Forest Department. Though these initial efforts to preserve the sholas met with some degree of success, the same concern was not shown to the grasslands. This was largely because the grasslands were not considered particularly important. The reason for this was that the grasslands were said to have been induced by the arrival of man in the Nilgiris. The assumption

Figure 1 A 'shola' or a montane stunted evergreen forest, bordered by a grassland. Sholas usually occur in small patches in valleys and are surrounded by grassland. (top left)

Figure 3 Tea estates have replaced the natural vegetation over much of the Upper Nilgiris, and elsewhere in the Western Ghats. The grasslands were long considered to be of little importance and they have been converted to a variety of plantations. (bottom left)

Figure 2 Sholas have perennial streams running through them. This stream which has two large sholas on either side, will be joined by streams from both sholas. All the streams from the Upper Bhavani region eventually join the Bhavani river. (top right)

Figure 4 A shola bordering cultivation. Sholas in many areas are protected as reserve forests or in sanctuaries. However, there is still a large amount of illegal logging for timber and fuelwood. Plantations also slowly encroach into sholas in areas where the protection is lax. (bottom right)



Strobilanthes kunthianus, a small shrub, blooms once in twelve years, covering the hillsides with bluish flowers, giving the Nilgiris its name (nil- blue; giri-hill).

was that the entire upper plateau had been covered with forests and the arrival of the tribal groups had through fire and grazing by cattle, created the grasslands. They would then have been preserved by the occurrence of frost which prevents the survival of shola saplings in the grasslands.

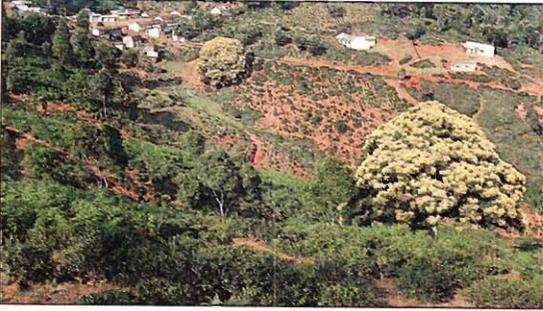
However, there was another school who maintained that the shola-grassland system was a climax community.¹ This was recently borne out when radio isotope studies demonstrated that grasslands had existed at least 40,000 years B.P., long before people came to the Nilgiris. This meant that the grasslands had to be treated with more respect from an ecological perspective and not just as a poor relative of the sholas. While some state Forest Departments have taken this view and have stopped planting on grasslands, others continue to wipe the grasslands out. It is of course, a temptation since wattle plantations are a good source of revenue for the department.

Much of the shola-grassland habitat has been lost to plantations in the Nilgiris. The Mukurthi National Park, 70 square kilometers in size, contains some of the only undisturbed habitat in the Nilgiris. The southern part of the sanctuary is accessed through the Upper Bhavani, a small Electricity Board camp about 60 kilometers from Ooty. The Bhavani river has been dammed at the source here and the large reservoir covers much of the area. The Bhavani flows down to the Attapadi plateau to the south and then runs east, joining the Siruvani and eventually the Kaveri.

Flora and Fauna

The vegetation in the sholas include trees which are very similar to those in lowland evergreens. Many of them belong to the family Lauracea; the genera *Litsea* and *Cinnamomum* are very common. *Syzygium spp.* are also abundant. *Strobilanthes kunthianus*, a small shrub, blooms once in twelve years, covering the hillsides with bluish flowers, giving the Nilgiris its name (nil-

¹ A climax community is the end point of a successional sequence, i.e., a community that has reached a steady state under a particular set of environmental conditions.



blue; giri- hill). It is particularly common along the edges of the sholas, as is *Rubus* (wild cherry). A fire resistant tree found along the shola edges is *Rhododendron nilagiricum*; it is also scattered through the grasslands, and is conspicuous with its bright red blooms. The most common understory shrubs in the sholas are *Psychotria spp.* and *Nilgiranthes spp.* (previously *Strobilanthes spp.*). There are several ground orchids in the sholas, *Calanthe* being the most plentiful. Many of the grasses here are endemic and several have the most exquisite though miniature flowers.

A critical reason for the preservation of grasslands is the nilgiri tahr. The tahr is a wild goat which lives on steep slopes and near cliffs in the montane habitats of the Western Ghats. In the Nilgiris, the numbers have declined dramatically over the past few years. Census data indicate that there may be less than hundred and fifty animals today. Most of these are in the Mukurthi National Park which is one of the few areas with undisturbed shola grassland habitat. The tahr live in small groups of 10 to 15 animals but may form large congregations of 100 or 200 animals. Such groups are still to be found in places like Eravikulam, in Kerala, but are almost unheard of in the Nilgiris. The major causes for the decline of the tahr are believed to be loss of habitat and poaching.

A number of other species would have suffered due to the loss of habitat. The Western Ghats support, as mentioned earlier, a high diversity of flora and fauna, and the montane systems are no exception. There are several species of amphibians, including

Figure 5 Towns have sprung up all over the Upper Nilgiris and have directly and indirectly contributed to the degradation of the habitat. The tree in flower is *Meliosma pinnata*, a common tree in the Upper Nilgiris. (top left)

Figure 6 Many plants and animals are endemic to the Western Ghats, some to the Nilgiris. The Nilgiri Salea (*Salea horsfieldi*) is an anagamid lizard, found only in the Nilgiris. It is a common lizard, and changes colour depending on its environment. (top right)



Figure 7 Pit vipers are found only at higher altitudes. All pit vipers have a heat sensitive pit near their nostrils with which they sense the body heat of warm blooded prey like birds and mammals. This horse shoe pit viper (*Trimeresurus strigatus*) is common in the grasslands. It is a small snake, about one and a half feet long and is mildly poisonous. (top left)

Figure 8 A variety of beautiful flowers are found in the sholas and grasslands. The Nilgiris (Blue Hills) are named after 'kurinchi' (*Strobilanthes kunthianus*) which bloom en masse once in twelve years. This flower (*Aeridis ringens*) is an orchid and is found growing on trees in sholas. (top right)

the tree frogs which are found primarily in these habitats. These frogs survive here despite the extreme cold which is not usually conducive to cold blooded animals.

A unique group which is found only in the Western Ghats and Sri Lanka is a group of burrowing snakes known as shieldtails (See *Resonance*, August, 1996). This group, with 44 species, belongs to the family Uropeltidae. These snakes burrow in the soft soil under logs and stones, and are active during the rains. During winter, they hibernate or move around in the network of burrows one to two metres below the soil. They are bright, colorful snakes and are often killed because they are believed to be poisonous, though they are not. The loss of this habitat would probably spell doom for most of the species.

There is an interesting myth in the Nilgiris about snake bites that bears mention here. Many of the hill inhabitants believe that the bite of snakes will not harm a person as long as he stays in the hills. However, once he goes to the plain, *the poison rises in the body* and the person dies.

While shieldtails and other snakes are killed out of fear, other animals are killed for a variety of reasons. Nilgiri langurs are killed for their skin and blood. People believe that the meat and the blood of the langurs has medicinal properties. The skin of langurs is used to make drum heads.

Slender lorises are also exploited in the Upper Nilgiris. In this case, the animal's urine is believed to have some magical



medicinal property. The animal is made to urinate on a string and these are sold to the public. (In one case, I offered to buy the slender loris, and was quoted a price of Rs. 1500.)

Various other animals are exploited for their skins. These include giant squirrels, jackals, jungle cats, leopards, bears, and langurs. Jungle fowl are regularly poached for consumption, as are sambar and till recently, tahr. Where there is no active poaching, humans still scavenge fresh kills of predators, especially wild dogs.

Fragmented Forests

The sholas offer an opportunity to study an aspect of ecology that has gained much importance in the world today. With forests getting fragmented the world over, there has been a lot of focus on policy for the preservation of the remaining forests. Very often, this is a trade off between development forces, and conservation movements. There then arises the need to have an optimal strategy ie. how should the reserves be designed.

The question is framed, in conservation circles, as the 'SLOSS' dilemma or 'Single Large Or Several Small' ie. with a given area to be preserved, should one have a single reserve or should it be divided into several smaller ones. There are, of course, several factors which influence these decisions, but some are critical.

Some of these results are based on ecological theory developed originally for explaining and predicting island species diversity. Other isolated habitats can also be treated as islands. These would include populations in lakes and habitats on top of mountain ranges. Conservationists have tried to apply the theory of island biogeography to these forest fragments. This way, one can estimate the number of species that a given patch of forest might be able to support. We can also try and predict the minimum forest area that a particular rare species might require.

The theory predicts that the large reserves will support some rare species that none of the small ones may. Hence, a single

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The shola grassland is found only in a few areas in the Western Ghats. Most of it has already been lost, but the few remaining areas can be protected, if measures are taken immediately. The loss of this habitat would be a great loss to science and to mankind for it has much to offer, both in terms of diversity and aesthetic value.

large reserve may have more species than several small ones combined. Further, the chances of extinction are greater on the smaller reserves. However, in the case of an epidemic, or any other natural disaster, the entire population of a given species may be wiped out in the case of a single large reserve.

The sholas are naturally fragmented forests or terrestrial islands where aspects of island biogeography can be researched. This could have great relevance to the development of conservation strategies, an area of ecology still in its infancy.

Endnote

Having painted a very bleak picture, one must add that there are several groups- Non-Governmental Organizations (NGOs), individuals and the Government- that are working very hard to save the Nilgiris, and the montane ecosystems in particular. Attitudes have also changed very much; the hunter of yesterday is the conservationist today, the poacher of yesterday is the tracker today, and the future of some of these animals maybe a little brighter.

However, as we speak, animals may be going extinct faster than we can save them. The lesser animals, such as invertebrates, have not been studied in detail in this ecosystem, and several species that have not even been documented, may be going extinct. It is a known fact that some of the amphibian species in the Western Ghats are extremely rare.

The shola grassland is indeed a very unusual and special ecosystem in that it is found only in a few areas in the Western Ghats. Most of it has already been lost, but the few remaining areas can be protected, if measures are taken immediately. The loss of this habitat would be a great loss to science and to mankind for it has much to offer, both in terms of diversity and aesthetic value.

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