Breathing life back in

There is a pressing need to restore habitats in the Palani Hills before the ecology of the

The hills now face threats from **tourism, a tidal wave of waste,** expanding development projects, and ecological changes linked to invasive species.

NOT far from the bustling streets and temples of Madurai, a city with some of the oldest links to southern India's cultural history, is a mountain landscape that has experienced relatively little ecological change since the advent of Homo sapiens in India. The Palani Hills are composed of a lofty 1,000-2,000-metre plateau protruding eastwards from the spinal-cord-like Western Ghats into the semi-arid plains within eyesight of the temple town. Composed of weathered charkonite schist, the hills host a range of different ecosystems and forest types. Morphologically they are similar to the Nilgiris and contiguous with the High Range and Anaimalai Hills. Sri Lanka also has a similar elevated range in the Central Highlands, and all of these mountains have similar Pre-Cambrian geological origins. Today the fragile ecosystems in the Palani Hills are under threat – from both anthropogenic and ecological actors – and there is a pressing need to restore habitats before there is an irreversible change to the area's ecology. This article explores the idea of ecological restoration, what it means and why it is an idea whose time has come in the upper Palani Hills landscape.

Although they are named for the temple town dedicated to Murugan, the Palani Hills are most often associated with their hill station of Kodaikanal. Once a sleepy, little-known summer village, it has now metamorphosed into a major tourist hub attracting visitors from across the State, country and world throughout the year. People are drawn to the town's salubrious climate, viewpoints, man-made lake, confectionaries and other attractions. Most tourists come for short visits from the nearby urban centres in southern India, and the traditional "sea-

A PANORAMIC VIEW of the Palani Hills.

to the sholas

area changes irreversibly. TEXT & PHOTOGRAPHS BY IAN LOCKWOOD

son" that happens in the months of April and May has now been extended for most of the year. Some visitors stay on. The town hosts an eclectic mix of people fleeing India's urban centres: cheese-makers, organic farmers, retired civil servants, missionaries, artists and many others. While most of these people are drawn to the beauty and appeal of the hills, few of them are aware of the unique ecology of the area and the dramatic changes that have taken place in recent years.

Nine years ago an article in this journal (*Frontline*, August 15, 2003) addressed the lingering issue of protected area and community-based conservation initiatives in the Palani Hills. To this date, the issue remains in limbo, while proposals and counterclaims work their way through various government offices and elected bodies. Issues of competing claims on land in the lower hills towards the east of the range and the cash-laced issue of tourism are factors that have contributed to the stalemate. In the meantime, the myriad set of pressures on the landscape has steadily increased. The Palani Hills now face threats from tourism numbers, a tidal wave of waste, expanding development projects, and ecological changes linked to invasive species. It is a crucial moment, and though the challenge is significant, this is the time to act.

ON THE NATURE OF SHOLA/GRASSLANDS

One reason why the Palani Hills are special is that they still host remnant examples of the once dominant shola/grasslands vegetation mosaic. There was a time not so long ago when the upper Palani's plateau supported a vast shola/grasslands mosaic, stretching from the present lake basin to the western boundary with the High Range. This particular vegetation type is typical of the upper areas (roughly above 1,500 m) of the Western Ghats. The notable areas that support (or supported) it are in the Nilgiri Hills, the High Range and the Anaimalai Hills as well as in a few other highland patches. Undisturbed shola/grassland systems are characterised by large expanses of montane savanna grasslands interrupted by pockets of dense evergreen tropical and subtropical broadleaf forests called sholas.

Ecologists recognise undisturbed shola/grasslands as important hydrological systems, especially compared with plantations of introduced tree species. They help to intercept damp

GRASSLANDS AT IBEX Peak. These are threatened by encroaching exotic vegetation.

monsoon air currents and absorb much of the dramatic rainfall of the two wet seasons. Shola/grasslands are thus vital elements in the watersheds that millions of people living in the drier shadow of the mountains depend on for sustenance. Biodiversity is unique in shola/grasslands, with leading scientists calling them "sky islands" isolated from each other by changed conditions in the lowlands. There are relic populations (such as rhododendron species) whose nearest relatives are in the Himalayas and still older species (such as tree ferns, *Cyathea* sp.) that date back to the age of Gondwanaland. The high altitude of the southern highlands means that cold temperatures and frost play a key role in the winters. The system periodically experiences fires, and there has been much debate in the past about the role of fire in shola/grassland systems. The shola/grasslands mosaic is now broadly recognised as the climax vegetation of these hills rather than as an accident of anthropogenic influences (grazing, fire, and so on).

For much of the 20th century, montane grasslands were categorised as "wasteland". As a result, most of the montane grasslands were converted into commercial plantations of non-native, fast-growing tree species (notably eucalyptus, pinus and acacia) in all the major upper plateaus in the Western Ghats. In the Palani Hills, this most often left the pockets of shola undisturbed, but today these are hard to spot amidst the massive plantations. Afforestation of the montane grasslands started in the colonial period but continues into the present in some areas. Very few areas in the higher Western Ghats were spared from plantations. Today the largest expanses of undisturbed shola/grasslands survive only in Kerala's Eravikulam National Park and Tamil Nadu's Mukkurthy National Park and the Anaimalai Tiger Reserve (all areas that had been set aside for controlled hunting at one point in time). However, crucial places like the upper Palani Hills (under reserve forests) have pockets of habitat that still retain surviving rem-

MIST RISING UP to cliffs at 2,500 metres in a relatively undisturbed part of the Palani Hills escarpment.

AT PRAYER POINT near Marion. Small populations of Nilgiri tahr are still holding out on the southern escarpment but are threatened by invasive tree species.

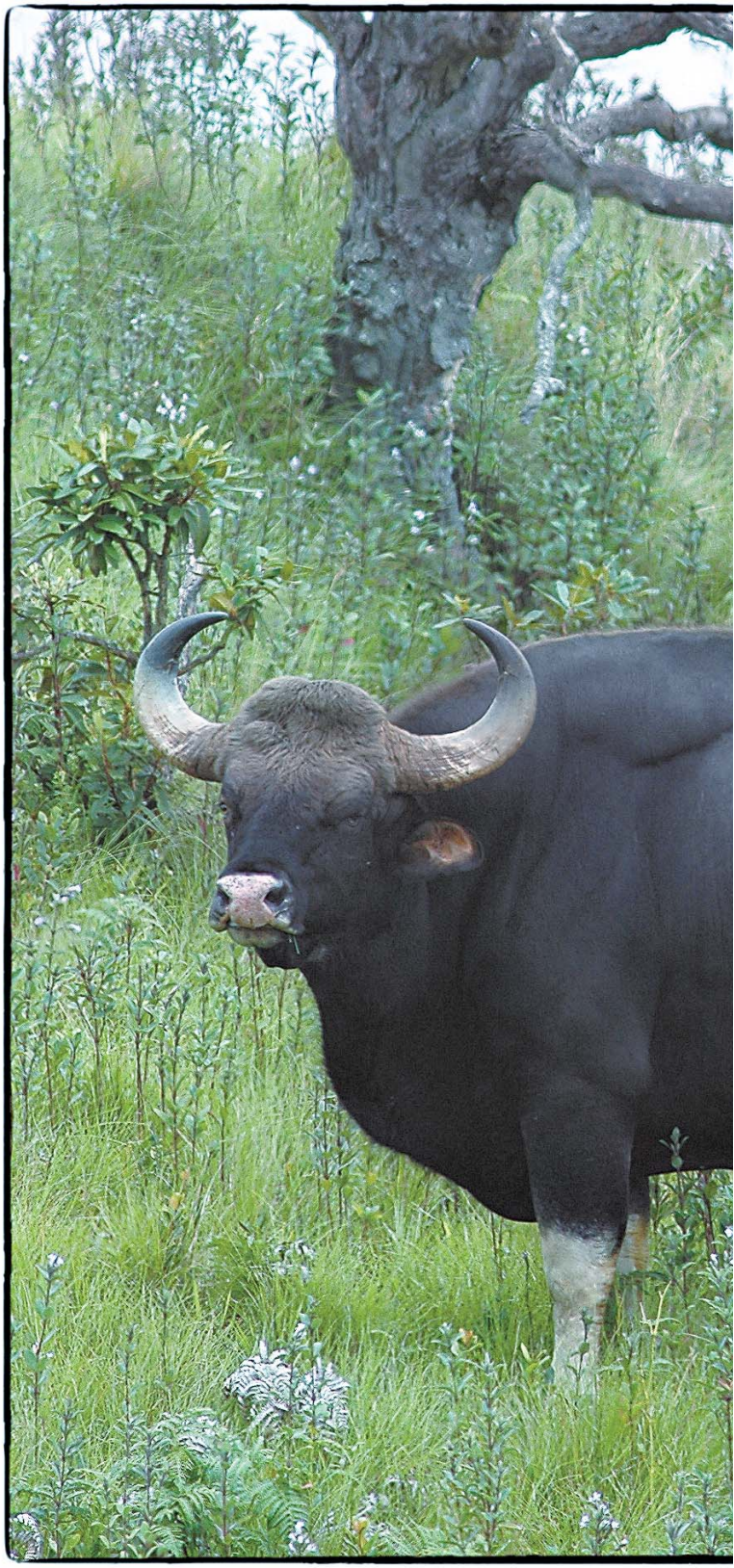
The biodiversity of Palani Hills

WHITE-BELLIED SHORTWING.

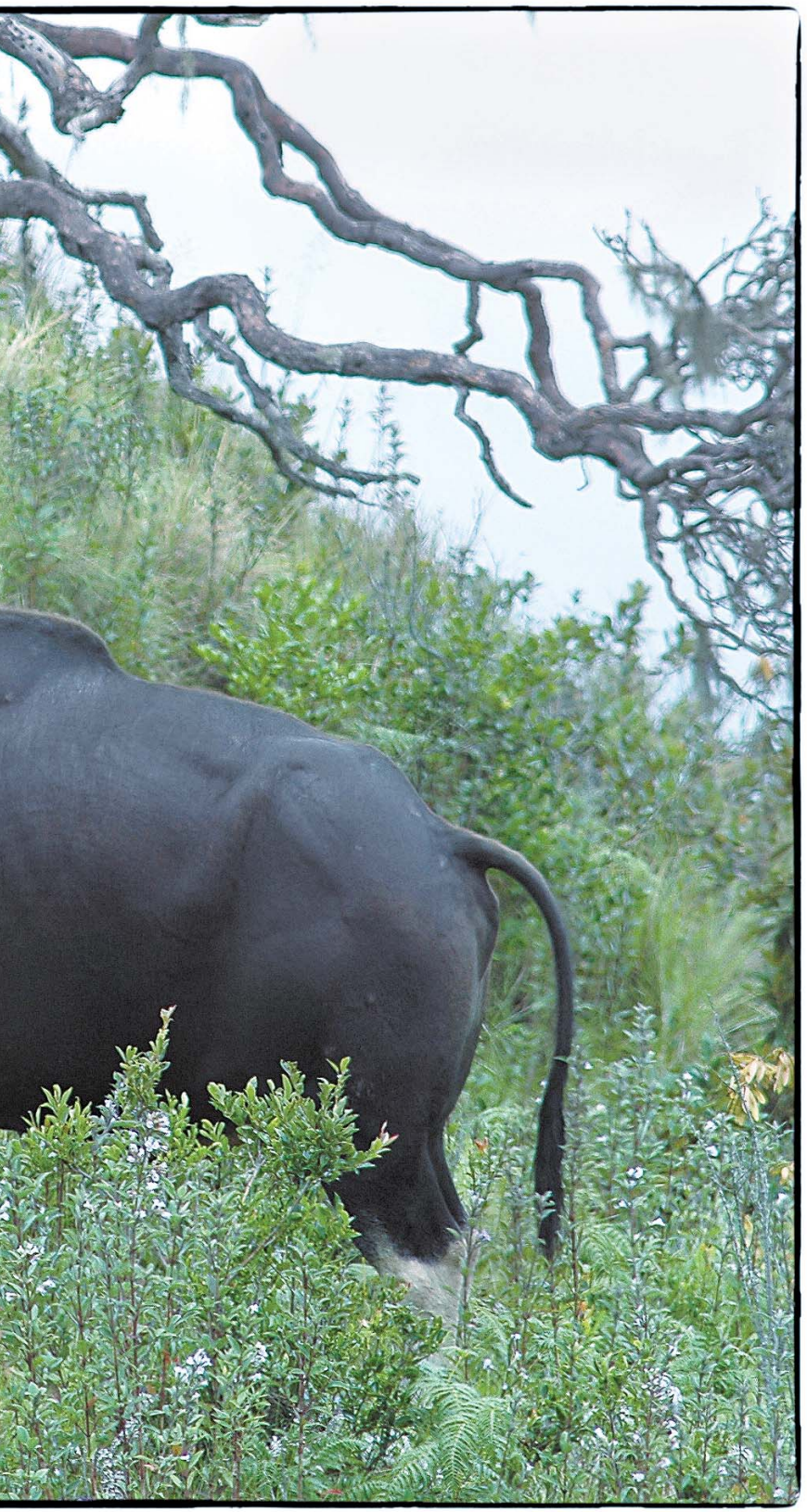
A LARGE-SCALED PIT viper.

GREEN FROG.

SHRUB FROG.



A GAUR AT Kukaal.



PRUNELLA VULGARIS.

VALERIAN.

EXACUM WIGHTIANUM.

LYSIMACHIA LESCHENAULTII.

nants of the mosaic. It is these areas that offer a significant opportunity for ecological restoration efforts.

HERE, SYMPLOCOS COCHINCHINENSIS in a wattle forest near Gundar Valley. Shola species are starting to colonise plantations of exotic trees on their edges.

VCT VOLUNTEERS AND workers cut back wattle at the Vatapari marsh. This degraded marsh and grassland is a key experimental site to gauge the effectiveness of the restoration measures.

INTO THE REMOTE PALANIS

Last summer, I had the good fortune to spend an extended period in the Palanis where I participated in two surveys of the upper Palani plateau that helped give a real sense of both the incredible ecological wealth of the area and the fragility of the ecosystems. Both surveys were organised through the Vattakanal Conservation Trust (VCT) with the support of the Tamil Nadu Forest Department. The aim was to get a qualitative assessment of the ecosystems along the southern escarpment

that stretches from Kodaikanal to Top Station. Several of us had surveyed the same area in 1996 during the kurinji (*Strobilanthes* sp.) blooming *(Frontline*, August 8, 2006). On this trip we were specifically interested in the state of grasslands in these remote parts of the Palanis.

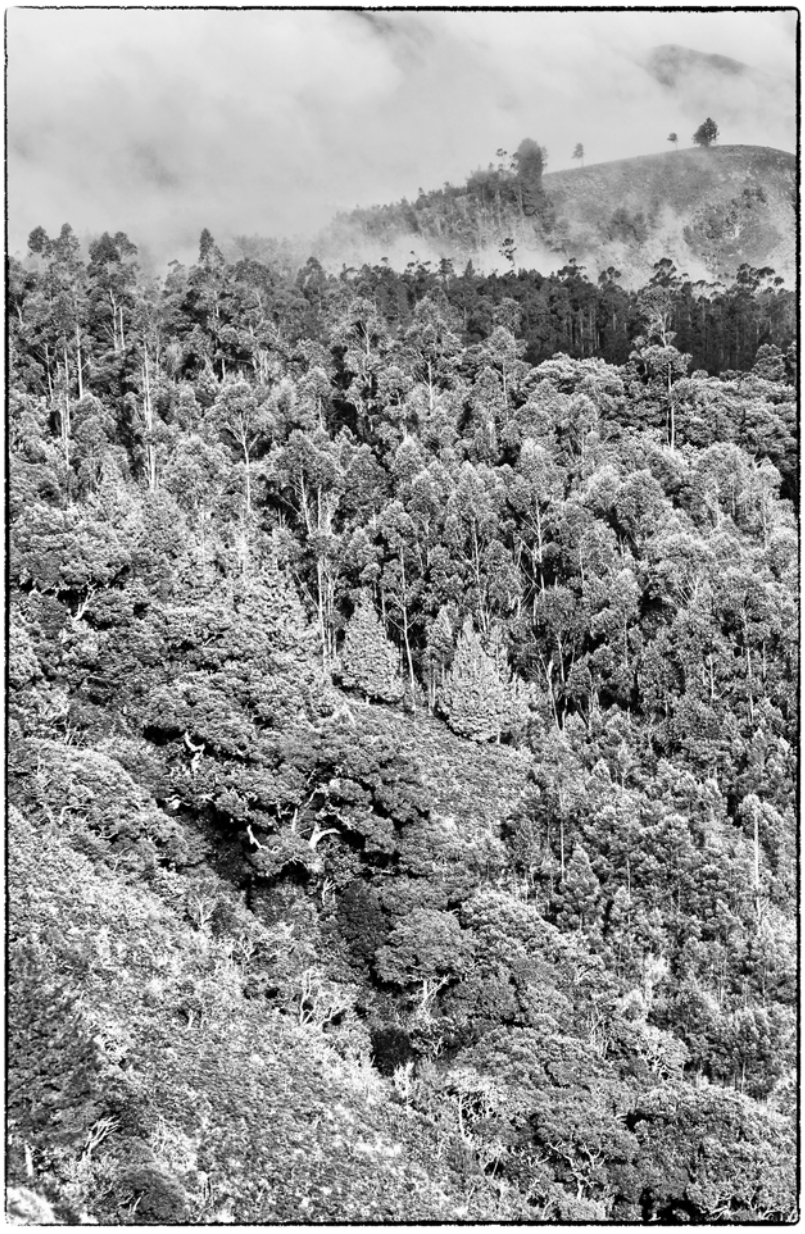
The southern escarpment of the Palani Hills hosts what are arguably some of the grandest, yet least known, landscapes in the entire Western Ghats. The cliffs of the escarpment rise abruptly from the plains of the Vaigai basin and ascend to a tableland whose edge undulates from 1,800 to 2,500 metres. The escarpment runs in a roughly east-to-west direction and is interrupted by steep ridges and cliffs diving precipitously downwards to the dry plains. Deciduous forest mixed with evergreen riparian woods carpet the lower slopes. In the upper reaches, patches of grasses and evergreen forests provide a last habitat for small populations of Nilgiri tahr (*Nilgiritragus hylocrius*), the endangered signature ungulate of the Western Ghats. The union of the Palanis with the rest of the Western Ghats near Top Station is a riot of rugged landscapes, grand peaks and lush forests.

The access to the escarpment is difficult, and assuming permissions have been granted, a good day's walk from the road head is needed before you reach the cliff habitats. Historically, a road connected Kodaikanal to the tea-planting town of Munnar in Kerala's High Range. It was built as an escape route in anticipation of a Japanese invasion in the early 1940s, an event that never materialised. For the first decades of Independence, the road gave people with automobiles an opportunity to motor through stunning, undisturbed shola/grasslands habitat. That changed in the 1960s and 1970s when the upper Palanis was intensively planted with non-native fuel wood species. Montane grasslands, under the jurisdiction of the Forest Department, were considered "wastelands" and had to be put to productive use, in this case to provide fuel wood, tannin and pinewood. There were also failed experiments in potato cultivation, but in the end it was the large monoculture tree plantations that came to dominate the landscape.

The road to Munnar was closed in the 1990s because it seemed to encourage uncontrolled tourist traffic and illegal activities (poaching and ganja cultivation). It has now been taken over by a mix of introduced and native vegetation. Fallen trees lie across large sections, a deep layer of humus has built up over tarmac, and there are only remnants of the former road. Strands of *Rubus ellipticus*, the exotic raspberry of the hills, and other shrubs have engulfed large areas. The old granite milestones, citing mileage to Cochin (Kochi) and Madurai, bear silent testimony to a time gone by.

On the first trek, our initial task was to find the old 80-mile round path that once led along the most spectacular cliffs, connecting Kodaikanal via Marion Shola to Vandaravu (the high point in the Palani Hills that was once known as the highest motorable road in India south of the Himalayas). The 80-mile round was once a four-or-five-day trek that many visitors to Kodaikanal in the early to mid-20th century traditionally took during their summer sojourns. I have always had a special affinity with the area: my grandfather and father had both hiked and photographed their adventures on the 80 and I followed in their footsteps in the 1980s as a student at Kodaikanal International School. In the 1920s and 1930s, the area was a relatively undisturbed wilderness, and later, during my father's time in the 1950s, there were few plantations in the outer hills. However, by the time I came of age, the grasslands had been largely consumed by vast plantations of exotic trees.

We ended up thrashing through dense groves of wattle (*Acacia melanoxylon*) that had been blown into a maze of fallen branches, upturned roots and thick trunks with layers of brittle, peeling bark. Invasive *Eupatorium* had taken advantage of the breaks in the canopy. There seemed to be no decomposers interested in breaking down the fallen Australian



SHOLA, IN CONTRAST to plantations and grasslands in the background, on the southern escarpment.

wood and navigating through it was a nightmare. Halfway through the thicket I ended up upside down after slipping off a wattle tree with my 25 kg backpack, cursing the people that introduced the species to the hills. At last we found the trail of the 80, familiar to me from numerous trips during my school and subsequent years. It passed through pockets of shola mixed in with plantations, and we witnessed signs of elephants, gaur and what looked like wild dog droppings.

The path ascended to the 2,513-m high point at Ibex Peak, the site of our first survey. When we reached the cliffs, we were impressed to discover a large meadow with a bewildering array of wild flowers, and grasses. The other team members started inventorying the myriad species, while I photographed and noted down the records.

I could not help being floored by the variety of colours and details of the flowers. However, on both sides of the meadow, plantations of pinus, acacia and eucalyptus were expanding out of their original planted areas into the marsh. On the adjacent cliffs, pinus trees of varying youthful ages had self-seeded and encroached into remnant grasslands. Piles of Nilgiri tahr pellets lay collected on delicate mosses in the shadow of these invasions. It was a bizarre scene. Mexican pine trees, so similar to Christmas trees with their drooping acidic needles, taking over some of the last grasslands of the tahr, a species that clung to survival in small, inconsequential numbers in the Palanis. We recognised that a small effort could quickly arrest the spread

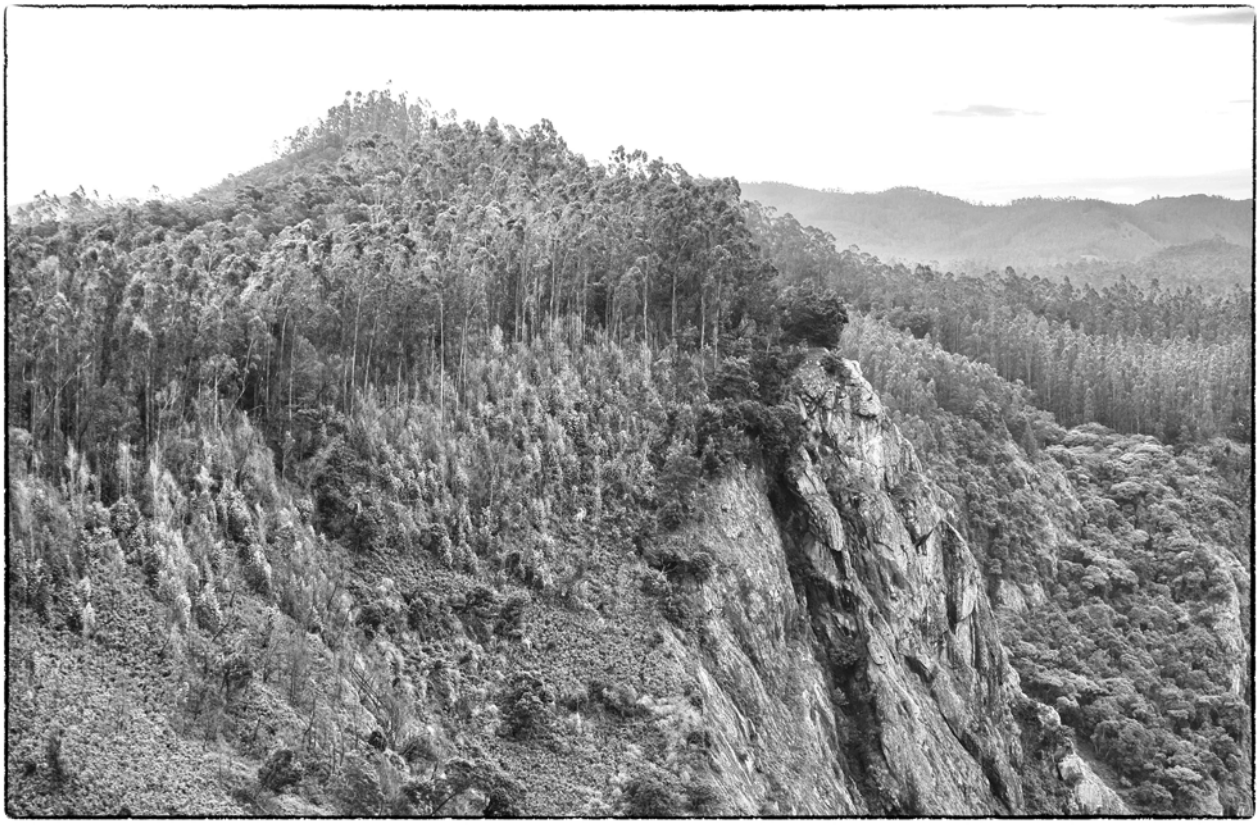
PLASTIC WASTE LEFT by tourists in the Guna Caves shola has been dumped between the roots of an ancient tree.

of the pine. During the next few days, we explored westwards along the escarpment. The scenery was, as I had remembered, stunning but the progress of the unplanned tree invasions was alarming.

During the original planting in the 1970s, the cliff-side grasses had been left alone, but now they were slowly but surely being swallowed up by the non-native tree species which were self-seeding and spreading into the last domain of the grasslands.

Over the course of several days and then on the second trip to Marion Shola, we had a chance to observe the Nilgiri tahr on the escarpment cliffs. Most of them were at a distance but a few herds were 30-40 m away. The plantations flowing over the cliffs were encroaching on the habitat that the tahr prefer. There is evidently some pressure from poachers living in remote, hard-to-reach plantations on the lower cliffs, and the tahr seemed to stay high on the escarpment.

To long-term observers of the Palanis, there has been a clear revival of large mammal populations in the upper hills. Residents of the township of Kodaikanal are well aware that herds of gaur are found daily around the lake and frequently in the middle of the town and in their front gardens! Indian giant squirrels (*Ratufa indica*) have returned to Bombay Shola (*Frontline*, November 6, 2009, and Nilgiri langurs (*Trachypithecus johnii*) are making a slow return at Pambar and Berijam Sholas. Farther out towards Berijam, there has been an increase in the sambar (*Cervus unicolor*) popula-



EUCALYPTUS TREES INVADING grasslands on the Palani Hills.

tion, and herds of elephants now seem to be permanently roaming the upper plateau (something that was extremely rare 20 years ago). Reports of big cats are more frequent, with tigers being found in Berijam and signs of leopard on the rise nearer to human settlements. Two years ago, a pack of wild dogs (*Cuon alpinus*) made a dramatic kill of a guar at the Vatapari marsh within full view of a VCT team doing restoration work.

THE PARADOX OF PLANTATIONS

Non-native tree plantations in the upper Palani Hills pose a curious, paradoxical challenge to ecologists, conservationists and foresters: a ban on logging for altruistic reasons has allowed non-native species to ravage native populations with few checks. Once plantations were established extensively in the 1970s, the upper Palani Hills were commercially logged for several decades. The wood provided an important energy source for hill communities and raw materials for industries in the plains. However, commercial logging in this area was stopped in 2001 when the South India Viscos plant in Coimbatore was shut down on account of serious water pollution concerns (wattle contains tannic acid, a key ingredient for tanning hides, and so on).

With the evolving notion of the Western Ghats being a "biodiversity hotspot", there was also increasing interest in protecting the area for its biodiversity. Environmentalists at the Palani Hills Conservation Council had also highlighted the hydrological argument for protection: "The health of the hill is the wealth of the plains." However, other than the blocking of traffic and the halting of logging, little was done to address the serious ecological damage that had happened in the decades of rampant silviculture. What we now know is that leaving alone the mixed landscapes of plantation on former grasslands, with patches of sholas, has contributed to a dramatic shift in the ecology of the upper hills. The ramifications are significant for both biodiversity and the hydrology of the hills.

It is important to remember that the sholas of the upper Palanis plateau were largely left intact during the conversion of grasslands to tree plantations. Even today significant sholas survive among the plantations though the water flow and hydrology have been adversely affected. When logging happened, native species were mostly left alone. What is less known is that shola species have spread into plantations of the non-native species. In numerous locations across the Palanis, there has been shola invasion of the exotic plantations! This is a significant and unexpected change. In some cases, what were once montane grasslands and were then converted into plantations under the guidance of foresters is now evolving into a hybrid shola forest. From a biodiversity point of view, this is intriguing though it is not what was in place before the plantation drives.

THE NEXT BIG THING

The idea of ecological restoration in degraded montane grasslands in the Palanis is a vital solution to the woes of the Palanis, from an ecological, aesthetic and economic point of view. It is highly doubtful that the original shola/

grasslands mosaic can be restored to its full extent. However, crucial areas such as the cliff grasslands of the southern escarpment (Kodaikanal-Berijam-Marion Shola-Vandaravu) area are in urgent need of restorative intervention. It is only relatively recently that the grasslands have been invaded by the non-native species and thus the restorative work should focus on weeding out non-native plants and giving indigenous ones a chance to thrive and survive. Many of the grasses still exist here, hanging on perilously among the invasive exotic tree and shrub species. A sustained campaign could conceivably address this problem. The cliff area is significant because it is the habitat for Nilgiri tahr and indeed they are good indicators of the health of the native shola/grasslands vegetation. A further idea that is worth exploring at a different time would be the reintroduction of captive-bred tahr in the cliff ranges closer to Kodaikanal.

There are economic reasons to promote ecological restoration. The very significant quantity of biomass that has built up in the upper plateau plantations of the Palanis does little for the natural ecosystems, but is a potentially profitable source of biomass energy and/or timber. Technically, any restoration work could pay for itself with the sales of wood, though this is an idea that is rarely talked about. It would also provide employment opportunities and thus give populations in the hills a stake in restoration and conservation initiatives.

THE FOREST DEPARTMENT and NGOs run nurseries that specialise in propagating native shola species.

Restoration work on montane grasslands is currently being carried out by the VCT at the Vatapari marsh near the Kodaikanal golf links. It is the first time that anyone in the Western Ghats has tried to restore these systems, and experience has proved that the process is slow-moving The VCT has received support from the Tamil Nadu Forest Department and established a partnership to move the idea of restoration forward. Essentially, it is conducting the critical experimental work that must be implemented on a larger scale once there has been greater acceptance of the idea of restoring montane grasslands. A key aspect of their study is the study of steam flow and changes in hydrological patterns as the extent of the restoration expands. At its nurseries, the VCT team has successfully propagated the variety of native montane grassland species that would be needed in any restoration initiative.

The Palani Hills face an uncertain future as tourism and development expand into the periphery in the outlying hills further away from the core area of Kodaikanal. The ecological changes of the past 50 years are significant and yet we are understanding only now what kind of a dramatic ecological impact has been caused by the conversion of montane grasslands into non-native tree plantations. There is a great need to map vegetation types and land use in the hills and create a dynamic GIS database of the area.

There is a need for further education about the ecology of the hills. Attitudes about natural ecology and the role of it in biodiversity and hydrology are absent in the dash of tourists to see all the sites, dance in pine forests, eat as much as possible, and breathe in the

New idea in India

THE Society for Ecological Restoration defines ecological restoration as "an intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity and sustainability". Frequently, the ecosystem is degraded, damaged, transformed or entirely destroyed by human activities. Ecological restoration is now a key management strategy in protected areas across the world.

In India, it is a relatively new idea, but clearly there will need to be further interest in ecological restoration. The Nature Conservation Foundation based in Mysore has been conducting pioneering work in degraded rainforests converted into tea estates near Valparai. Their work in the Anaimalais has set the standard for others trying to restore similar rainforest habitats. At the same time the Vattakanal Conservation Trust has also been building up years of successful shola regeneration in the Palani Hills, an idea first hatched by the Palani Hills Conservation Council through its shola nurseries.

The VCT's work with restoring the Vatapari marsh near the Kodaikanal golf links is the first effort in the Western Ghats to restore montane grasslands and will establish clear methodologies for further restoration activities in the upper plateau areas of the Western Ghats. It is now setting up nurseries of native grasses and shrubs that complement their success with raising different shola species.

See http://www.vattakanal-conservationtrust.org/ for further information.

Ian Lockwood

RHODODENDRONS, SUCH AS this one on the Ibex Peak escarpment, are among the few trees that coexist with montane grasslands.

famous Kodai air. At night the lake basin reverberates with the deep techno thump of various hotel discos. Out of sight of most of visitors is a hillside and shola edge polluted by veritable mountains of waste that the tourists and the township produce. The idea of sustainable tourism that is less reliant on vehicles, uses less fossil fuel, creates less waste and stresses the natural aspects of the hills is still a dream in the working.

Meanwhile, out in the remote Palanis there is an urgent need for quick restorative action to arrest the spread of non-native species into the remaining native montane grasslands along the escarpment. □

Ian Lockwood is an environmental educator, geographer, writer and photographer based in Sri Lanka. More of his work can be sampled at www.highrangephotography.com

REFERENCES

Bawa, Kamaljit S., Primack, Richard and Oommen, Meera Anna; *Conservation Biology: A Primer for South Asia*; ATREE/University Press, Hyderabad, 2011.

Chandran, M.D; "On the ecological history of Western Ghats"; *Current Science*; 73: pages 146-155; 1997.

Myers, N., Mittermeier, R., Mittermeier, C., da Fonseca, G., and Kent, J. "Biodiversity hotspots for conservation priorities"; *Nature*; 403: pages 853–858; 2000.

Robin, V.V., Sinha, Anindya and Ramakrishnan, Uma; "A view from the past: shortwings and sky islands of the Western Ghats"; *Indian Birds*, October 2011.

Samra, J.S. *et al*; "Hydrological implications of planting bluegum in natural shola and grasslands watersheds of southern India"; 10th International Soil Conservation Organisation Conference; May 1999.

Society for Ecological Restoration (www.ser.org).

Thomas, S.M. and Palmer, M.W.; "The montane grasslands of the Western Ghats, India: Community ecology and conservation"; *Community Ecology*; 891: pages 67-73, 2007.