Ecology Outside Restoration: RHATC Field Trip to Hunsur and Kodagu

From the 13th to the 18th of November, the RHATC Fellows visited Karnataka, primarily to understand conservation work being done by people outside of restoration projects. We stopped at The Liana Trust in Hunsur, followed by Rainforest Retreat at the Mojo Plantation in Kodagu. We also stopped briefly at a long-term ecological monitoring plot managed by the National Centre for Biological Sciences (NCBS), and finally attended a talk by Dr. Mewa Singh at the University of Mysore. Each place taught us about different aspects of conservation, from mitigating negative human-wildlife interactions to the scope for agricultural practices that support biodiversity.

The Liana Trust

On the first day of our trip, we travelled to the Liana Trust in Hunsur, Karnataka, accompanied by the Srinivasulu family (Bhargavi, Aditya and Chelmala) who work on bats and are based at Osmania University. The Liana Trust is an NGO committed to snake-related conservation and environmental education, especially in rural and agricultural regions, it was founded by Gerry Martin. The trust focuses on reducing human-snake conflict through scientific research, awareness campaigns, and community-based education initiatives.

Their efforts include snakebite research, rescue and rehabilitation of wildlife, community workshops, and the establishment of a serpentarium to supply venom for anti-venom development. The area was previously degraded farmland, which they altered by mulching for a year, planting trees, and providing boulders for microhabitat. Currently, the area supports much more biodiversity than it did, including birds, herpetofauna, and mammals, and is subjected to minimal management.

Serpentarium and venom production

We first went to see the serpentarium, guided by the curator, Ms. Lisa. Here, snake venom is extracted using processes that meet WHO standards and the entire venom supply is provided free of cost to Premium Serums and Vaccines for antivenom production. Lisa mentioned that the trust had permission to collect 346 snakes of seven species from conflict situations, but their long-term aim is to maintain 600 or more snakes through captive breeding to ensure a reliable venom supply. At present, the serpentarium houses 31 kraits, 11 adult and 24 young of Malabar pit vipers, 31 Russell's vipers, 12 adult and 6 young spectacled cobras, 32 saw-scaled vipers and 1 king cobra. The venom is extracted once a month only from F1 or F2 generation snakes.

All the snake enclosures were appropriately sized and designed to incorporate elements of the species' natural habitat, like wood stumps, hideouts, and vegetation. Every enclosure was equipped with a data logger to monitor carefully regulated temperature, humidity, and light intensity. They also had QR codes through which caretakers could access each snake's health and breeding records. The enclosures were sanitised daily and routine fecal examinations were conducted to monitor infections and ensure good health of the snakes. All snakes were primarily fed captive-bred rats and mice. Lisa shared a few interesting behaviours she'd observed in the captive snakes, like 'cryptic basking' seen in nocturnal snakes where they expose only a small part of their body at a time to the light to absorb heat.

When a new batch of snakes arrives, they undergo a two-month quarantine. During this time, they are sedated for easy collection of morphometric data and given three rounds of deworming at 14-day intervals. After a health check and PIT tagging, they are introduced to the main enclosures. Overall, the experience highlighted the trust's dedication to the welfare of their captive snakes and to supplying standard quality venom for antivenom production, shaping a safer future for both people and snakes.

The Liana Trust also houses several exotic reptiles rescued from inadequate housing care situations. Accompanied by Lisa, we visited the section where these animals are kept. She explained that they are no longer accepting additional rescued exotics due to limitations in space and manpower, to make sure those they already

Rescued from exotic pet trade: Cherry-headed or Red-footed Tortoise (from South America). © Pathak Hrishikesh.

Endangered African Spurred Tortoise. © Yadav Shreya.

have are well taken care of. Among the animals we saw were a green iguana, dwarf caiman, sail-fin dragons, a red-footed tortoise, an African spurred tortoise, and a green anaconda. Lisa mentioned that each of these animals is cared for according to detailed pet care sheets, ensuring their welfare.

We also learned about their native habitats and interesting aspects of their behaviour. For example,gGreen iguanas can become invasive, as a single female can lay around 60 eggs at a time; at the trust, these eggs are usually fed to other animals to not increase their numbers. The male sailfin dragon displays territorial head-bobbing behaviour, and the species shows almost no parental care—in one case, a female had even eaten her own clutch of eight eggs. Meeting Voldetort, the African Spur-thighed Tortoise, was a highlight; large, calm, and fully herbivorous, it calmly grazed on grass when placed on the ground.

Afterwards, we had a nice activity with Gerry where we tried out very high frequency (VHF) telemetry. After a brief introduction to telemetry and how VHF is used for snakes, we split up into two groups and competed to find the hidden transmitter. It really helped us understand the complexities of tracking an animal on the ground in the wild.

On Nature Education with Chandini Chhabra

Chandni is a nature educator with over a decade's experience. She and her team work with the government schools in the vicinity and Mysore district. Chandni says she is a believer of "actions lead to action", not just awareness but to bring positive change in behavior is her goal which reflects in her pedagogy. She primarily works with children between 2 to 12 years of age, so the sessions are curated accordingly emphasizing on intuitive activities, tactile experiences, and movement sessions. The sessions are well-researched and designed to instigate curiosity regarding different professions

Our evening session with Chandni on nature-based education. © Sanjay Molur.

related to the natural world such as paleontology and wildlife research by exploring the processes, methods and equipment used to learn about these fields. All the games and activities are highly contextualized according to the topic and whether to be done in the classroom or out in the environment, so significant efforts are invested in planning and preparation. Additionally, request boxes are deployed in the schools where children suggest what they want to learn about, which helps them direct their own educational journeys. She also conducts teacher training workshops to build capacity and develop engaging curricula, while raising awareness about snakebite and snake-human interactions in local schools. In this way, the education wing of the Liana Trust helps amplify their overall impact.

Gerry Martin on Snakes in India

Gerry Martin's presentation focused on the importance of understanding snakes, reducing human–snake conflict, and improving India's response to snakebite. He began by briefing us about snake biology, such as how snakes sense their surroundings using the Jacobson's organ, a special chemical detection system in the roof of the mouth which helps the snake identify prey, avoid predators, locate mates, and navigate. This explains why snakes rely more on chemical cues than eyesight or sound. We learned that India has around 360 snake species, out of which 60 are venomous, and approximately 17–20 are medically significant, meaning their bites can be dangerous or fatal. However, Gerry clarified an important point: snakes never bite humans intentionally. Snakebite is always a defence mechanism, triggered when a snake feels threatened, cornered, is stepped on or accidentally handled. Most snakebite incidents occur in rural areas, where people walk barefoot in fields, sleep on the floor, or move around without torches at night. These conditions increase accidental encounters with snakes.

He also discussed different categories of snakes. Non-venomous snakes like kukri snakes, wolf snakes, and rat snakes help in controlling pests. Mildly venomous species such as cat snakes and vine snakes cause only mild symptoms. Constrictors like sand boas and pythons kill prey by squeezing. Highly venomous snakes like cobras, kraits, Russell's vipers, and saw-scaled vipers play an important ecological role as predators, especially of rodents.

He also pointed out that snake rescue is not the same as conservation. Many people misunderstand rescue work, assuming rescuers work only for the welfare of snakes. In reality, rescuers help both people and snakes by removing snakes from human spaces and reducing panic, fear, and killing. For long-term conservation, rescuers must engage communities with clear, respectful communication that explains the ecological value of snakes and the importance of coexistence.

Looking at bee boxes with Avinash. © Sanjana VK.

A potential field for owl perch installation. © G. Pannagasri.

Discussing holistic conservation with Gerry. © Sanjay Molur.

A major challenge Gerry discussed was the issue of antivenom production and usage in India. Antivenom must be given only under proper medical guidance; otherwise, it can cause severe reactions or even be fatal. Also, venom composition not only varies between species, but also within a single species from region to region. India has only a few antivenom-production centres and the venom for these centres are collected from a restricted range. The current method of antivenin production followed by most Indian producers is also suboptimal and better protocols would result in higher efficacy of neutralizing venom. Lastly, antivenin is currently only produced for the 'Big Four' (common krait, spectacled cobra, Russel's viper, and saw-scaled viper), while bites from other snakes could also result in near-fatal symptoms. For example, plantation workers in Kerala were hospitalized with symptoms of what seemed to be saw-scaled viper bites, but were later found to be hump-nosed pit viper bites. Together, these aspects explain why antivenom effectiveness varies across regions and why collecting venom from a wider range of species is so important.

He concluded with these Do and Don't guidelines:
Do:

- Wear proper footwear when walking outdoors or in fields.
- Carry a torch at night to avoid stepping on snakes.
- Keep surroundings clean to reduce hiding spots.
- Stay calm and go to the nearest hospital immediately after a bite.
- Allow trained rescuers to handle snake removal.

Don't:

- Don't try to catch or kill snakes.
- Don't apply tourniquets, cut the wound, or suck venom.
- Don't rely on traditional healers or home remedies.
- Don't panic or run after a bite.
- Don't attempt to give antivenom without medical supervision.

On the next day, the 14th of November, Avinash and Karthik from Liana Trust took us to show the owl perches that they have installed in the farm for rodent population control as a potential accessory measure in the snake-bite mitigation plan. This is also an attempt to boost the biodiversity on the farm. The owl perches are poles with a small plank on top, that are fixed in fields to observe if this helps in the management of rodent population in the vicinity. This can potentially reduce human-snake negative interactions by giving snakes more competition for rodent prey. If this pilot succeeds, the Trust plans on deploying these in other farms in the vicinity.

The Trust also supports farmers who have been affected by snake bites. In some of these farms, they lease an acre of land from them to demonstrate the benefits of organic farming, including promoting coexistence between local communities and wildlife and supporting biodiversity. Additionally, they provide bee boxes to promote apiculture as an additional source of income through the sale of honey and wax. We visited an organic farming plot with 10 of these boxes containing *Apis cerana indica* bees with their queens. They also plan to eventually introduce another native species, *Apis dorsata*, in their apiculture initiative. If both pilots of owl perches and bee keeping succeed, they plan to replicate it at other locations in Hunsur. After a thorough discussion with Gerry about his plans with the organic farming and owl perches initiative over breakfast, we headed to the Rainforest Retreat at the Mojo Plantation in Coorg.

The Coorg Experience

On arrival, we were greeted by a beautiful property that was blanketed in greenery surrounding a running stream meandering its way around the cottages and the dining area. Mojo Plantations is a certified organic farm that Sujatha and Anurag started 31 years ago where they practice sustainable agriculture, now with their daughter Maya. Within the 25 acre plantation, they run an eco-lodge called Rainforest Retreat for long-term stays focusing on education, research and community.

After we'd settled in and had a refreshing meal, we visited a stream ecosystem where we observed many unique freshwater species living in the fast flowing water. This habitat supports *Tor malabaricus*, one of the smallest mahseer species, along with other stream fishes such as *Glyptothorax sp.*(hill-stream catfish), *Schistura sp., Nemacheilus sp., Mesonoemacheilus sp.* (hill-stream loaches), *Davario sp.* and *Garra sp.* These fishes depend

Glimpses of Rainforest Retreat and Mojo Plantation © Srijita Pal.

Glimpses of Rainforest Retreat and Mojo Plantation. © G. Pannagasri.

on clean, cool, highly oxygenated water and have special adaptations like flat bellies and sucker mouths that help them cling to rocks and move against the strong current. The hill streams of Coorg provide the perfect conditions for these fishes with rocky beds, plenty of dissolved oxygen, shade from riparian forests and natural seasonal changes. An exciting find were a few Stream Glory damselflies (*Neurobasis chinensis*) that shimmered green in the evening light. We also noticed a stagnant pool at the edge of the river where tussock grasses held the soil firmly, while other nearby areas without grass were heavily eroded. This clearly showed the importance of grasses and grasslands in preventing soil erosion and maintaining a healthy ecosystem.

Sanjay explained that building check dams in these streams would reduce the flow, change the depth, lower the oxygen levels and severely affect these sensitive species adapted to specific conditions. In the late evening we saw Davario fishes jumping out of the water to catch midge flies while bats were also feeding above the stream, as recorded by the Srinivasulu family. Walking back from the trail we observed rich biodiversity such as damsel flies, spiders, crabs,

Exploring a hill stream at twilight © Sanjay Molur.

earthworms, centipedes, millipedes, snails, slugs and frogs, highlighting the ecological richness of the Coorg hill stream environment.

The Ridge Walk

On the morning of the 15th of November, we headed out after breakfast for a short trek called the Ridge walk, which took us in a loop around the crown of the hill. On the way, we noted several interesting natural history features of the landscape, such as wild cardamom, Mysore trumpetvine (*Thunbergia mysorensis*), kokum (*Garcenia indica*), a lantern flower species (*Ceropegia* sp.), fishtail/toddy palm (*Caryota urens*), six species of fern, Jerdon's leafbird, a giant golden orb weaver (*Nephila pillipes*) and her impressive web, a white-bellied treepie, a bank where bee-eaters had burrowed into a mud cliff to make their nests, and different structures of moss and lichen. We also saw multiple sites where landslides had been caused by heavy rain a few years ago, and discussed how we would go about restoring them. Sanjay explained that since landslides expose hard rock, restoration cannot be done unless lichens and other habitat-forming organisms have enough time to weather the rock and make it suitable for plants to take root. On our way up, we mostly walked through commercial plantations, with occasional patches of native forest trees.

At the top, we emerged from a large forest patch into a grassland dotted with shrubs and bushes. We sat there to observe the landscape and discuss how restoration should ideally be carried out there, particularly in the

Discussing ecosystem resilience on the ridgeline © G. Pannagasri .

A landslide area with some natural regeneration. © Sanjana VK.

A cliffbank with bee-eater burrows. © Sanjana VK.

Setting off on the trail with Ravi anna. © Trisa Bhattacharjee.

Learning about nature-based agroforestry with Sujata. © K. Gokul.

Malabar Trogon female (*Harpactus fasciatus*). © Pathak Hrishikesh.

Tarantula (*Thigmopoeus* sp.). © Pathak Hrishikesh.

Coorg Yellow Bush Frog (*Raorchestes luteolus*). © G. Pannagasri.

Clear-winged Forest Glory (*Vestalis gracilis*). © Sanjana VK.

context of climate change, since Shola-grasslands are especially threatened by rising global temperatures. We concluded that although high altitude grasslands might be easily lost, it would not be wise to try and engineer a climate resilient ecosystem. This is because 'climate resilient' is only a name for a collection of traits such as drought resistance or high carbon sequestration capacity, and have nothing to do with the ecology of the plant and how it interacts with other biotic and abiotic factors. Therefore, it's best to try to restore the native ecosystem, since all the species it contains have evolved to work with each other over millions of years, making it more likely to be resilient to external stresses. Ultimately, however, we need to focus on stopping climate change if we want to save the world's biodiversity.

With this in mind, it was difficult to watch the clearing of vegetation we encountered on our way down, when passing through commercial plantations again. Other natural history observations included civet scat with coffee beans and a sparrowhawk being harassed by two drongos.

Nursery Build

In the evening, we pitched in to help plant Arabica seedlings and build a bamboo nursery to store them. With the help of Ravi anna and Lakshmana anna, who work at the plantation, we learned how to tie bamboo shafts together to form a frame open on one side and cover the frame with green netting on the top and three sides for shade. We also planted saplings in small grow bags filled with forest soil and arranged them in rows on raised mud beds in the nursery to prevent waterlogging. Some of us also learnt how to make the raised beds by clearing the area of weeds in which we planted the saplings directly. Afterwards, in the evening, we had an evening discussion about bat detectors and bat conservation with Chelmala, Aditya and Bhargavi.

The Valleys of Mojo

On the 16th, we started the day with a morning walk led by Sanjay through one of Mojo Plantation's valleys. We learned about the importance of the catchment areas in the Western Ghats, and the formation of the lateritic plateaus over millions of years due to long-term geological events and climatic interactions, which play an important role in the flow of water from its origin in the headwater area (primary system) to the quaternary system. We then climbed up to a hillock administered by the Forest Department, and discussed how the grassland ecosystems were being compromised by tree saplings (including non-natives) which are steadily taking over the grass patches. We identified some of the pioneer species used to start restoration, and learned how climate change is causing the Western Ghats to receive six months' worth of rain (2500-3500mm) in one or two months.

After breakfast, Sujatha took us on a small tour of the plantation, explaining how they try to prioritise ecological complexity over conventional agricultural practices like pest eradication. For example, she told us about how a "clean" plantation is biologically dead and instead, they try to maintain natural undergrowth to protect the soil structure. From a scientific perspective, this allows termites and their gut bacteria to thrive as essential nitrogen fixers, making nutrients available to plants without the need for synthetic fertilizers. In another example, she described how plants communicate, releasing volatile organic compounds when mechanically stressed which activate defense enzymes in neighbouring plants. In order to maintain these ecological relationships, the estate avoids lethal pesticides to control pests like the cardamom stem borer. Instead, they use natural repellents to reduce the number of pests and allow a viable population of predators to remain, ensuring that the predator-prey cycle remains active rather than wiping out the food web. Additionally, they allow all native trees and shrubs to remain as they are, only trimming branches to manage shade when necessary. This is how the plantation manages to support so much native biodiversity. Even invasive weeds, though they should ideally be removed, are managed carefully to stabilize the soil against landslides.

What Feeds the Plantation

Later in the day, we were shown the other practices the plantation employs. One of these was the use of biochar, which is organic material (usually wood) burnt in the partial absence of oxygen. This is soaked in effective

A top view of all the seedlings. © G. Pannagasri.

Watering stacked seedlings. © G. Pannagasri.

Putting seedlings in bags .© G. Pannagasri.

A diagram of the biogas plant. © G. Pannagasri.

microorganisms (EM) before being added to the compost, which speeds up the process of composting as it has a large surface area for adsorption. We were shown the process of making biochar, which was to burn the wood from the top, as a result of which a controlled burning atmosphere is created providing partial oxygen and this results in the upper layer of the wood to be burnt and traps the carbon inside. While we were told that this helps in carbon sequestration, we were unsure how it does so better than leaving it on the ground, as fallen logs will naturally break down and the carbon will return to the soil. Also, such logs provide habitat for a lot of detritivores and microorganisms, while burning wood in this manner contributes to carbon emissions in the atmosphere.

Another major part of the plantation was the domestic animals kept for manure and animal products. They keep domesticated cows, goats and hens. The weeds cleared from the plantation are used as feed and bedding for the livestock, and the cow dung from the sheds are used to produce biogas. The biogas plant consists of three tanks - cow dung and water are put into the first tank to form the slurry, which then flows to the second tank where it undergoes anaerobic breakdown by microbes for about six weeks (known as the lag phase) producing gases such as methane, carbon dioxide, etc. A pipeline from the second tank takes these gases to the kitchen to be used

Group photo with the Rainforest Retreat team. © Sanjay Molur.

for cooking. The remaining sludge is then transferred to the third tank from where it is extracted to be used in compost, transported through the plantation through pipelines.

We also helped apply compost beneath coffee plants to get practical experience of the daily labour required to run the plantation. We paired up to carry manure in trays and spread it under each coffee plant. Working on the slope was definitely labour intensive, but rewarding as we encountered a Malabar pit viper at close range! In the evening, we watched a film from the early 2000s about Rainforest Retreat and a private sanctuary in Coorg, SAI Sanctuary, which also talked about the impact of agrochemicals on local biodiversity in Kodagu.

Long term monitoring plot (NCBS) - Thithimati:

We left the next morning for Thithimati, where we visited an 85 acre estate bordering Brahmagiri Wildlife Sanctuary that has been recently leased to NCBS by a family for ecological research. Guided by Mr. Chengappa and Mr. Aiyappa, we learned that the plot held primary forest that has been degraded by lopping and grazing. Nine months ago, NCBS started long-term monitoring of tree dynamics like carbon sequestration, methane production, and litter fall in a one hectare plot. They have also done some camera trapping to document mammal diversity, and are planning to expand to other taxa soon. Mr. Chengappa explained to us how they measure girth at breast height (GBH) using dendrobands and how they tag all tree individuals with unique ID numbers. The monitoring site has 148 species of plants, of which all trees are native but some non-native species of weeds are present.


Learning about long-term monitoring with Mr. Chengappa. © Sanjay Molur.

Interaction with Dr. Mewa Singh:

After travelling to Mysore to spend the night, we visited the University of Mysore, where we attended a talk by Dr. Mewa Singh. Granted a lifetime professorship for his work, he has been a pioneer of ecology and animal behavior research, particularly focusing on primates. He spoke about 'Perception for wildlife conservation in India', where he used the examples of bonnet macaques, lion-tailed macaques, and slender lorises to show the different conservation needs each species can have.

Bonnet macaques, while generalists, have lost many large roadside trees because of development pressure and highway expansion. They are also actively poisoned and translocated without any attention to their ecology, resulting in more human-macaque negative interaction. As a result, they have been upgraded from least concern to vulnerable category in recent IUCN assessment. Temple groves remain a last stronghold for them, and protecting such groves as well as educating people about their decline is necessary for their conservation.

Lion-tailed macaques, on the other hand, are forest specialists found in the evergreen forests of the Western ghats. While their natural food consists mostly of fruits and insects and they live in populations of low density, human expansion has reduced their habitat. Now, lion-tailed macaques in Valparai have started behaving like bonnet macaques, entering kitchens and scavenging from garbage. Electrocution and highways which lead to canopy fragmentation are some of the biggest threats for the lion-tailed macaque. Their conservation requires linking forest fragments or deploying canopy bridges to help them move, enhancing the quality of habitats, and sensitising local communities to coexist with them.

Lastly, we learned about Dr. Singh's team's discovery of slender lorises in Dindigul district after spotting a local using a captive loris for fortune telling. With the help of the committed officials in charge at that location and dedicated fieldwork to assess the population, they were eventually able to get the area declared as the Kadavur Slender Loris Sanctuary. Overall, we learned that different species need different conservation management plans with multilevel interactions and inputs from researchers, NGOs, government, local leadership and the Forest Department to be successful.

Attending Dr. Mewa Singh's talk. © Sanjay Molur.

Conclusion

From this trip, we learned that while restoration is the most ideal way to combat biodiversity loss and habitat degradation, it is not possible in areas that humans actively use, as land is still required for agricultural and other uses. Still, we saw how even farms can support an incredible amount of biodiversity with the appropriate nature-friendly practices, such as minimising tree-felling, planting native plants, working with ecological cycles (e.g. prey-predator dynamics), not using harmful agrochemicals, and restoring waterbodies to their natural state. Donating land for ecological research was also a wonderful gesture which could help advance the field as a whole. Thus, even if they are not plant ecologists or active restoration practitioners, anyone can contribute to supporting and safeguarding local wildlife with the right attitude and dedication.

Acknowledgements

We would like to thank Zoo Outreach Organisation for organising this wonderful trip as part of the RHATC course, particularly Dr. Sanjay Molur, Director, and Trisa Bhattacharjee, Course Coordinator. We are very grateful to Gerry Martin for hosting us at The Liana Trust, and to Sujata, Maya, and Anurag Goel for our stay at the Rainforest Retreat, with comfortable accommodation and amazing food. We thank Mr. Chengappa and Mr. Aiyappa for guiding us at Thithimathi, and Dr. Mewa Singh at the University of Mysore for his talk on primate conservation. Lastly, we deeply appreciate that the Srinivasulu family accompanied us on this trip, came birding with us every morning, answered all of our questions with patience and kindness, and helped us learn about bat conservation.

G. Pannagasri, Sanjana Vadakke Kuruppath, Srijita Pal, K. Gokul, Pathak Hrishikesh, S. Naufal Nazium, M. Nishigandha, Ishika Shah & Yadav Shreya
RHATC Fellows 2025–26, Zoo Outreach Organisation, Coimbatore, Tamil Nadu, India.

Citation: Pannagasri, G., S.V. Kuruppath, S. Pal, K. Gokul, P. Hrishikesh, S.N. Nazium, M. Nishigandha, I. Shah & Y. Shreya (2026). Ecology Outside Restoration: RHATC Field Trip to Hunsur and Kodagu. RHATC 2025–26 Special Issue, In: *Zoo's Print* XLI(1): 20–31.