ZOO'S PRINT

Communicating Science for Conservation

Magazine of Zoo Outreach Organization
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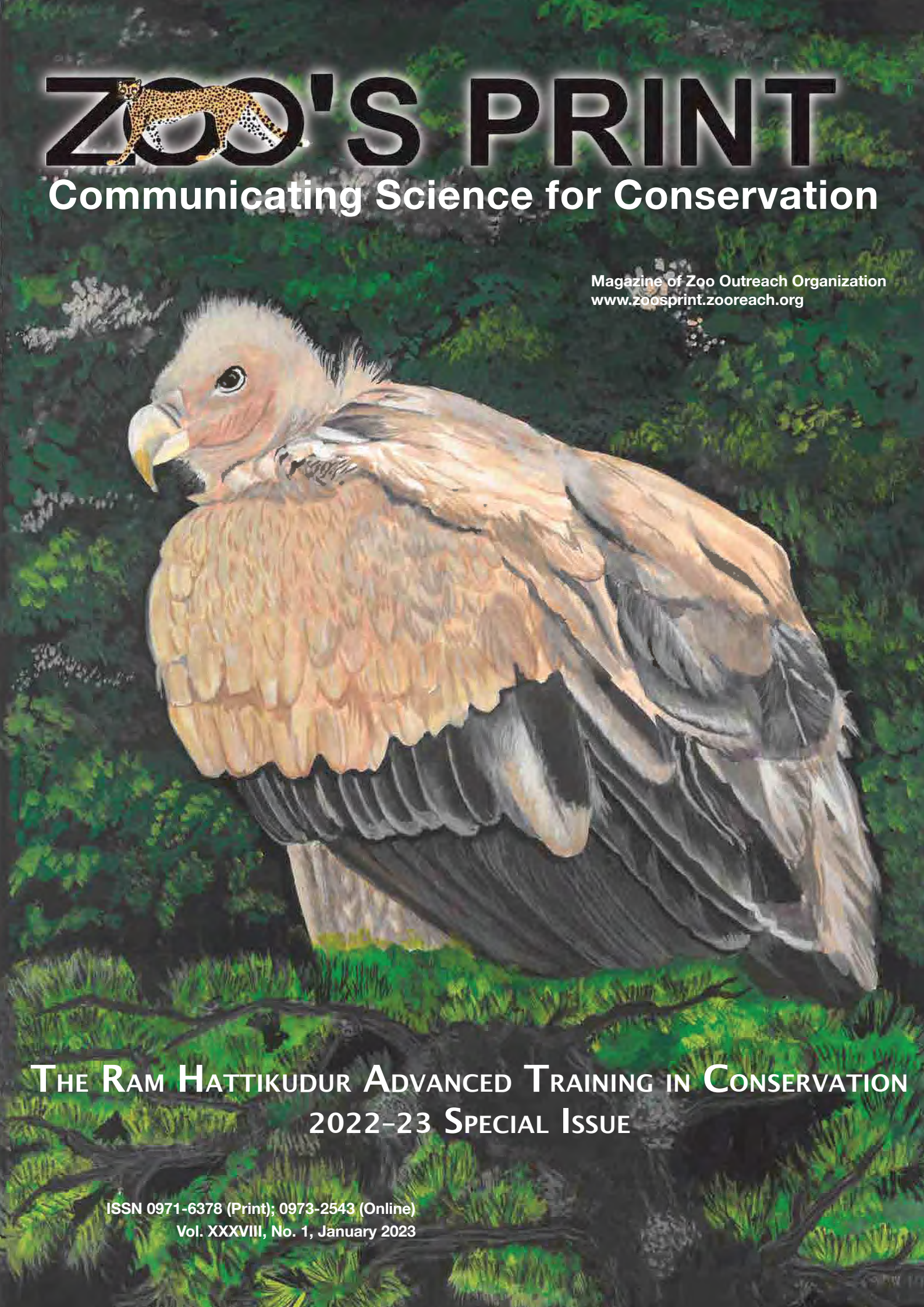

The Ram Hattikudur Advanced Training in Conservation 2022-23 Special Issue

ISSN 0971-6378 (Print); 0973-2543 (Online)
Vol. XXXVIII, No. 1, January 2023

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Contents

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Photographs by the Zoo Outreach Organization team, unless otherwise stated.

Cover photo: Himalayan Griffon (*Gyps himalayensis*) in poster colors, adapted from H. Byju. ©Pooja Ramdas Patil.

CAPTIVATED BY CONSERVATION

The Ram Hattikudur Advanced Training in Conservation 2022–23 batch embarked on their first field trip with excitement and joy. Planned for a period of nine days from 27th October to 4th November, on the morning of 27, the 10 fellows boarded a traveller with luggage and sleeping bags. That morning, our laughter was to mask the nervousness and fear because the previous night we heard stories about horrific blood-sucking leeches from our mischievous mentors. Anyway, equipped with salt sprays and knee-length socks we started our journey.

Mysore

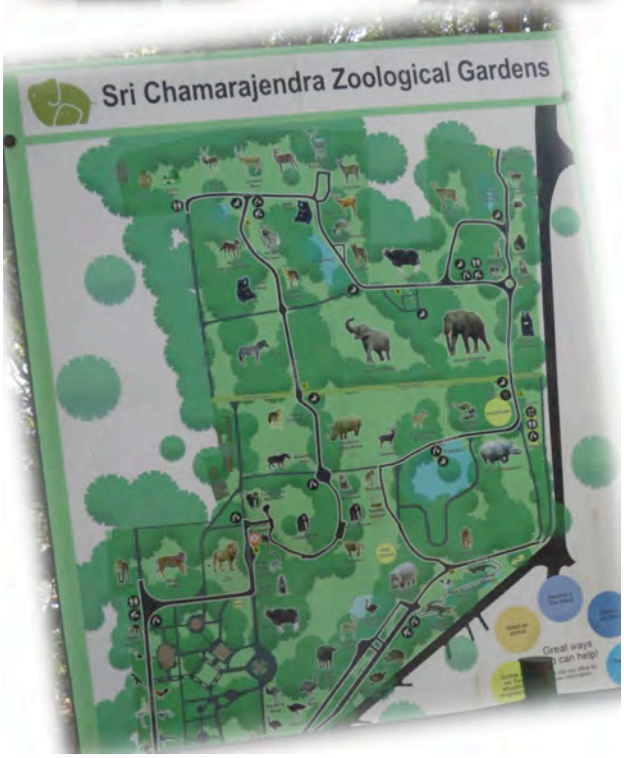
Our first stop was Mysore city. Here we got the opportunity to visit different locations and meet prominent personalities.

Mysore Zoo Walk:

Our first location visit in the city was to the Chamarajendra Zoological Park, Mysore. Our guide Tanuja Dasharath welcomed us heartily and directed us through the zoological park. We were impressed by the precautionary measures being taken to prevent plastic waste in the Zoo. First, we went near the birdhouse; the section was filled with many exotic bird species. Tanuja explained to us the tragic situation of the pet trade in India, how people import pets and later abandon them when they are unable to take care of them. At the primate enclosure, we observed the capuchin monkeys use their prehensile tail to clutch food and climb trees. However, not everything was rosy. We stood witness to the unfortunate crowd's behaviour towards these caged creatures, calling out to seek the creature's attention. We soon moved to the park's central area where Tanuja and Sanjay briefed us on Sally Walker's legacy, and we felt the zoos in India need people like Sally to make them a better place for conservation and welfare. As we neared the cages of the big cats, we saw the usual disappointing phenomenon of zoo visitors going head over heels, just to catch a glimpse of the charismatic species Leopard and Tiger. We sighed and moved on near the gorilla enclosure. There stood the Guest tree (*Kleinhovia hospita*) and had its precious guest- an ornamental tarantula or the Regal Parachute Spider (*Poecilotheria regalis*). Seeing all of us gaze at the arachnid, even those going gaga over the gorilla now gathered around this tree to catch a glimpse of this smaller, but nevertheless elegant creature. It was interesting to see how flexible a crowd's behaviour could be. While walking,

Payal asked us to imagine if we were to play stripes and spots here and we realised how important role the zoo can play in educating people.

To recapitulate, it was fascinating to understand that visiting a zoo does not always mean that we have to look only at animals inside a cage but also we must look around for animals in their natural habitats. Also, all day at the zoo we saw people of all ages, families, and backgrounds taking moments to talk to each other about something interesting and share their thoughts. We also got to learn the importance of zoos in striving to educate visitors about zoo animals and their wild counterpart's conservation needs while fostering an appreciation for wildlife in general.



Interaction with Professor Mewa Singh

The RHATC team got the opportunity to meet the distinguished professor, Dr. Mewa Singh, who is internationally recognized for his work in the area of animal behaviour, ecology, and wildlife conservation, on their visit to the University of Mysore on two occasions. The first meeting was an opportunity for the fellows to introduce themselves and share their background. The second congregation gave us insights into the work done by the great primatologist through his presentation, "Approaches to wildlife conservation in the Indian context focusing mainly on two species Lion-tailed Macaque (LTM) and Bonnet Macaque (BM)".

Our RHATC batch has fellows from diverse educational backgrounds, some of us were nescient about Dr. Mewa Singh, despite the fact we all had hearty conversations with him. Although, even after experiencing numerous lung-related discomforts he continued with his presentation till the end and his friendliness and sense of humour immediately struck a chord with all of us. We also had the opportunity to listen to and have discussions with his students who have been working on important conservation projects.

A few insights from Dr. Mewa Singh's presentation:

- 'Approaches to wildlife conservation in Indian context', two species Lion-tailed Macaque (LTM) and Bonnet Macaque (BM) were compared to explain the principles of conservation.
- Anthropomorphism, which is reflected in interpretation and not in scientific methodology.

- How religion and politics affect conservation actions were explained with examples of Nilgai (*Boselaphus tragocamelus*) and Rhesus Macaque (*Macaca mulatta*).

To summarize, it was a great privilege for all the RHATC fellows to have shared space with such an experienced and renowned conservationist. His humility is something to learn from. The opportunity to hear stories about struggles and challenges in his field of work motivated and inspired all fellows to keep working in the field of conservation. It also helped us understand how important it is for researchers to publish their work in peer-reviewed journals so that they can be later converted into policies. In order to work together for a greater cause we need to sometimes lose some of the heroic and ego-driven tendencies that too often pervade our profession and embrace a new role as patient custodians.

Stay at Arjun's Farm

The RHATC team's accommodation during their visit to the city of Mysore was Arjun's farm. The team reached Arjun's farm on Bogadi Road late evening and the fellows started pitching their respective tents, which was a new experience for most of us and the excitement was palpable. The feeling of accomplishment outweighed all the struggles of pitching our first tents. In addition, the birthday celebration of our fellows, Swathi and Akanksha, added celebration to the exuberance. The misty morning walks around the field felt like absolute bliss as we were lucky enough to have sighted a diversity of butterflies, spiders, bugs, and birds.

The stay at Arjun's farm was a wonderful experience. The entire farmhouse was well maintained and both Arjun and his family served us mouth-watering sweet dishes and food. In brief, the RHATC team had a gala time during their stay at his farmhouse.

Mysore Regional Natural History Museum

The fellows Mysore itinerary also included a visit to the Mysore Regional Natural History Museum. A humongous banyan tree welcomed us at the entry. Mr. Sreenivasa, the museum's education officer greeted us. Upon entering the museum building, elephant statues made out of iron wires, and a cheetah statue made from taxidermy adorned the hall. The statues and specimens mesmerized us. The Van Ingen brothers were the hands behind the near-perfect cheetah taxidermy. Mr. Sreenivasa gave us a brief about the creators and process of taxidermy. What next greeted us was unheard of before. We could touch the specimens! Like amused kids, we ran our hands through these. Unfortunately, not all people experience things the same way. Sreenivasa showed us how apathetic people had shoved waste plastic wrappers into the specimens which was disheartening to see.

An array of specimens including hooves of different rhino species and a huge Balinese whale skeleton was engrossing. The next was a very creative seashell collection and an exhibit on freshwater ecosystems. We saw an exhibit section dedicated to the Humpback Mahseer. The specimens included the fish's scales and pharyngeal teeth which left us wondering how huge this fish can grow. There were also other displays showing the importance of freshwater ecosystems and the threats they are facing. The museum intriguingly informed us about evolutionary stages. The museum also had a good collection of butterflies, birds, seeds, fruits, and woodland; a section was dedicated to information on different tribal people of India, their lifestyles, and their costumes. The museum hosted dioramas that were enrapturing, including expressions of animals modelled exemplarily.

The museum is really helping in engaging people in science and nature and it is an ideal place for students to explore different kinds of things which would help them have a sound knowledge of the rich Indian history and diversity in the context of flora and fauna. The visit to the museum was a learning experience for all of us as it dealt with various aspects of natural history depicting the flora, fauna, and ecosystems thereby promoting conservation and environmental awareness through its exhibit galleries and educational activities.

Chamundeshwari Temple

While visiting a place it is always important to understand the different deities of that region as it helps us understand where they came from and their significance. We all got the opportunity to visit the Chamundeshwari temple for which we took a short scenic drive from Mysore to the Chamundi Hills. At the temple entrance the sculpture of Mahishasura, the deity of the local tribes was present from which the city Mysore got its name. With a group photo in front of a massive idol, we continued our journey to the next phase of comprehending different approaches to conservation. The RHATC team's next travel destination after Mysore was Liana Forest Farm located in Hunsur owned by the famous herpetologist and conservationist Gerry Martin.

The Liana Trust Experience with Romulus Whitaker, Gerry Martin and Chandini Chhabra

The Liana Trust is a farm located on the outskirts of Hunsur. The moment we reached the place, we were welcomed by Gerry Martin. We went to the dining area and introduced ourselves to Gerry Martin. The dining area was a very pleasant space made of wood and situated just across a mesmerizing lake. The place had a lot of interesting things to see, like bananas in a glass box and their peels kept in a jar, and instead of dish soap, there was ash to clean the utensils, a trampoline in sight, etc.

Interaction with Romulus Whitaker

While interacting with Gerry, he told us that he has a very 'ancient living specimen' called Rom, it took us a while to realize that we were going to meet the legendary 'Romulus Whitaker'. We turned around to see an old white man, with long white hair whom we had seen all our childhood on television educating us about snakes, coming towards us. It was an unbelievable and emotional moment. He started interacting with the fellows by telling his childhood story of how he got interested in snakes and ultimately arrived at the land of snakes – India with his family. He told us about his not-so-easy herpetology journey and how he has pioneered and achieved so much in terms of creating the most efficient and successful herpetology projects in India by his mantra to just push oneself and never give up no matter how many times you fail.

Here are some of the stories Rom shared with us:

- Rom mentioned how he used 'Miami Snake Park' as a basis for the Madras Crocodile Bank. He spoke about his journey with the Irula tribe and how he was mesmerized by their ways of catching snakes.
- The stories of his journey continued and one such story was when Rom once asked Irula tribesmen to teach him to catch snakes, but they denied it by saying that he was too old to learn now and that they would have taught him if he was 4-years-old.
- His work with the Irula tribe in venom extraction for the production of anti-venom in India as Rom knew how severe the problem of snake bites was in India.
- His stories also included the two-month pilot project that was worked on with the Irulas in Florida for the eradication of the Burmese Python as this invasive species became a very big problem and infested the ecosystem. They worked in association with Dr. Frank Mazadi from the University of Florida and had to work using scientific methods. According to him, the Irulas were not very satisfied after the completion of the project, even though it was considered a success; because they believed it could have been performed better if they used their traditional snake-catching methods (like tracking through slithering marks, smell, shed skin, poop, etc.) instead of the scientific methods.

After this heart-warming session with Rom, we had Biryani for lunch, and Rajib and Akansha heartedly thanked Sanjay and Payal for giving the fellows the opportunity to meet Romulus Whitaker.

Interaction with Gerry Martin

After Rom, Gerry Martin had an insightful talk and discussion with the fellows. The first discussion with Gerry was about the general situation of human–snake interaction in India. The discussion topic was Russell's Viper Telemetry Project, and how most of the snake bites happen in monsoon as it is the breeding season of the snakes and people working barefoot on farms get bitten.

This was followed by a visit to Gerry's exotic animal collection, where animals seized from the exotic pet trade were kept in captivity. The following exotic species were observed:

Veiled chameleons from Yemen, Blue Tree Monitor lizards from Papua New Guinea, Green Tree Pythons, Milk snakes, Humped Nose Pit Viper, Russell's Viper, Corn Snake, Mata Mata Turtle, King Cobra, Saw-Scaled Viper, Common Krait, Albino Spectacled Cobra, and Russell's Viper along with other species.

In the second gathering, Gerry gave us a presentation on snake bites in India.


BUG!!

Some of the key takeaways from his presentation were:

- There are about 343 known snake species in India out of which only 50 can do significant damage whereas around 17 of them are medically significant. In India, the big four Russell's Viper, Saw-scaled Viper, Common Krait, and Spectacled Cobra are considered major threats by the local people.
- Some people usually confuse a Saw-scaled Viper with a Humped-nose Pit Viper. Hence, educating people about snakes around them is very important to understand what kind of damage they can cause to humans if any.
- Results of anti-venom and how the median effective dose reacts to the median lethal dose are different.
- The session also included things like Dos and Don'ts after a snakebite mitigation effort and other basic knowledge about snakes.

This was followed by a question and answer round, discussions and then dinner.

Interaction with Chandni Chhabra

We also got the opportunity to interact with Chandni Chhabra, an educator who tries to bring the wonder of science and nature to life for children. She informed us about her wildlife education initiative NerdBird and told us about how she got interested in educating children about wildlife. Chandni's journey and contribution to conservation education felt enlivening. The important takeaway from her session is that educating educators such as school teachers and equipping them with the right tools to teach will help create a bigger impact in the long term. It is important to empower educators as it helps in creating an infinite chain reaction.

Herping Experience and Orientation to Radio Telemetry Method:

During our time on the farm we also got the opportunity to go herping and an orientation was conducted on the radio telemetry method. During the herping experience the first thing we spotted was a huge Checkered Keelback, followed by an Indian Bullfrog, moth caterpillar, a painted frog, a bandicoot, mouse, etc.

We had a session with Gerry on radio telemetry methods which are used for monitoring and tracking snakes. We played an exciting game where we had to find the hidden transmitter using the receiver and antenna.

Following this session fellows bought books like 'Snakes of India', 'Every Creature has a Story', and 'My Husband and Other Animals' from Rom and Janaki and took their autographs to personalize our books. The last activity was the revelation of Gerry Martin's treasure box. The box had a cow's skull, shaded snake skin, fangs, eggs of caiman, emu, and rat snake, burned chameleon in a forest fire, etc.

Overall, the visit to the Liana farms and interactions with Gerry taught us about the importance of approaching people's sentiments delicately to achieve wider conservation goals. After these amazing sessions and 1.5 days of priceless learning and experiences, we had to say goodbye to Liana, Gerry, and Rom with a group photo.

The next layover where we spent the maximum number of days was Coorg.

Coorg

Experiences at Rainforest Retreat, Madikeri

Our first destination was the Rainforest Retreat in Coorg owned by the couple Drs. Sujata and Anurag Goel. Rainforest Retreat is an eco-lodge within the Mojo Plantation. Sujata welcomed us with a delicious lunch. The greenery and moist weather were pleasant and lively. In the evening along with coffee, we interacted with Sujata and

had a brief introduction where everyone shared and listened to thoughts about conservation. During the introduction, we heard the pleasant call of the Malabar Whistling Thrush for the first time. As the night proceeded the air was filled with the sounds of various different animals living in the forest. We saw many invertebrates—cicadas, katydids, beetles, moths, crabs, fireflies, hexapoda spiders, stick insects, praying mantis, different species of frogs, Western Ghats Large Snail, and the Malabar Pit Viper.

Ridge Walk Experience

The next day we went for a 7 km ridge walk with Ravi who works at RR. He was well versed with the native flora and the following was observed:

• Wild tobacco, wild brinjal, citrus species, and some edible berries. A natural recipe for organic insecticide can be made by adding hot water, cow urine and wild tobacco. Some of us used leaves of wild tobacco to keep leeches at the bay.
• Different kinds of fungi such as the golden fungus, rust fungus, and black fungus, and many symbiotic associations of the fungus.
• Almost the whole place was covered by beautiful ferns of different types and bryophytes. We also spotted some orchids, the Bulbophyllum were flowering, and a rare species of plant – Ceropegia.
• Along the ridge were plantations of coffee, pepper, and cardamom, all of which were growing in the canopy of trees in the forest.

Ravi pointed out the massive landslides which occurred in that area back in 2018. We observed that the place was hit by a landslide and it was all covered with moss which gave the appearance of a rocky hill. Dr. Sanjay Molur explained to us how with a landslide, the place loses its precious topsoil which is very important for any vegetation to grow and

how it takes years to bring back that nutrient-rich topsoil. We also talked about aquifers i.e., sediment that holds groundwater. As the rainforest area records 200–300 cm rainfall, It is highest in that area. The groundwater level rises and sometimes the top layer becomes wobbly which is a sign of landslides. It affects the layers of soil which took many years to form. We got to know how grasslands play an important role in preventing landslides and how long it takes to rejuvenate again. Now only the moss layer can be seen. We were shocked after hearing that after the landslides, it will take 30 to 40 years to regain the original. We also got to know about the difference between fox-tailed and fish-tailed palm growing in that area and how fish-tailed is a native species and fox-tailed is invasive. Many insects and spiders were also spotted, different species of dragonflies and damselflies, funnel web spiders, giant wood spiders (female) with many males on their web, skink, and many species of beetles. Shola grasslands were visible from the ridge walk and the highest peak in Coorg- Tadiandamol was also visible.

The following species were seen along the way- the blue bottle butterfly, slug moth caterpillar, chocolate pansy butterfly, dead shieldtail snake, road-killed green vine snake, heterometrous scorpion, *Indrella ampulla*, lycosa spider, termites (and learned that they don't actually cause harm to the trees), puffball fungus, grapefruit tree, and many more.

The ridge walk was followed by a somewhat tiring but unique task of disseminating gobar-filled compost across coffee plantations.

Composting Experience

The organic coffee plantations on Sujata's farm were a sight to sore eyes. Sujata explained how on her farm she doesn't use any chemicals, pesticides, or fertilizers. The manure used on her farm is purely made of composting leaf litter, wet waste, etc. she explained to us how to put it around the coffee plants in a circle away from the roots and cover it with leaf litter (mulching) so that when it rains the nutrients can spread equally to all parts of the roots, and how roots spread below the ground as much as the branches spread above the ground. During the whole process, Ravi and Muthu helped and guided us in the process.

It was a very good experience, running around, carrying the compost, putting it in the right way, filling the baskets, and working as a group. All of it was very tiring but at the same time very enjoyable. One important lesson that we took forward from this experience was that it takes a lot of hard work to nurture a plant from its seed and hopefully now, we are less likely to waste any food, tea, or coffee.

Interaction with Maya about her M.Phil Dissertation

Maya is Sujata's and Anurag's daughter who plays an integral part in running the Mojo Plantation. She took us to show around Valley 2 which was one of the places affected by the landslide, and how they tried to plant different species and are still testing which native species can be planted and can withstand harsh weather. But still, after planting they faced wild boars raiding that area to feed on the sweet potatoes. Maya shared how the clay and mud after the landslide happened were utilized by some art students during workshops to make mud cottages and glass bottles which were used to make windows, and also naturally made colours for painting it. For the time they have left the land to be regrown as a forest so fewer coffee plants were present there. There were lots and lots of Wedelia which is a new invasive species that often occurs in disturbed habitats and spreads. There were other plant species such as the charcoal wood tree, Gongura plant, *Sauropus androgynous*, heliconia, rose apple, rue plant,

and a species of Strobilanthes, Elaeocarpus, and Garcinia which is a native species. She told how garcinia is used to reduce fat and is added to non-vegetarian food and only recently the fitness industry has taken interest in kokum to make expensive weight loss products. Then we went briefly to the Valley 3 and saw many invertebrates along our way. At the end of the walk, we spotted a Beddome's Keelback. After lunch, we had a discussion with Maya where she explained her thesis which she did in her M. Phil in the Geology Department of Cambridge. It was on anthropomorphism and preserving wilderness in cultivation. The highlight of Maya's interaction with us was her knowledge about the plantations, biodiversity and the landscape around them. She intricately explained how conservation issues are interlinked with humans living around those wild spaces. After her talk, we all started our trek towards Kalur River.

The Kalur River Experience

The walk to the Kalur River helped us witness different species like the beautiful hawkmoth caterpillars, attractive yellow-purple in colour, and bushes of wild roses blooming on both sides of the path. We played skipping stones but after finding the life on a single stone that was a dragonfly nymph, we stopped playing it. We also got to know how these water bodies have great biodiversity. There are many different ecosystems existing in the same river such as the riffle, cascades, and pond-type, each of which has different species adapted depending on the flow of the water. The thought experiment which included a question of what will happen if there is a dam constructed in the riffle part of the river helped us understand the negative impacts of the construction of dams in such ecosystems. The negative impacts included a riffle can go extinct due to the slower pace of the water and the slow-flowing part of the river will also be affected due to the dam that blocks the flow of water and nutrients along with it. Another situation was given as to what will happen if we open the damn after a while, which also had the same answer that it will affect the life living on both sides of the damn, the organisms may flow into the pond like part of the river with a great force and hence won't survive and the organisms there will also get washed away. The conclusion was that changing the course of the river or constructing a dam will always be harmful to the organisms living in it.

The conclusion of the exercise was that environmental impact assessment is necessary while building any infrastructure in nature. Otherwise, people will face flooding when the river increases its area after rain and people have built their houses near it.

Time at Rainforest Retreat was enriching as Maya and Sujata helped us to understand the balance between wildlife and anthropocentric activities. In addition, the food at the rainforest retreat also requires a separate mention as it was delicious, healthy and nourishing. Also, we would like to give a big shout-out to Ravi, Muthu and all the co-workers for preparing such delicious meals and sharing their knowledge of the biodiversity and of the land with us.

Experience in The Magnolia Mist with Abhishek and Anna

Abhishek and Anna run the Magnolia Mist, a certified organic farm, and homestay at Galibeedu, Kodagu district, Karnataka. Abhishek started the tour by taking us to a spot where we could see the transition area between the rainforest and the shola grassland. Abhishek explained to us the characteristics of the shola grasslands and their importance as unique habitats. We got to know why the big trees were not seen in such an ecosystem, because of the rocky soil, only grass species could grow in such soil and they perform an excellent function in holding the soil tight due to their roots. The abundant growth of Acacia whose propagation was made easier by the civets in the area. Abhishek told us that an acacia species grows prominently here, as they have adapted themselves to thrive in difficult conditions. We also got to know that leopards and elephants were prevalent here. We saw a Leopard scat on the road that had a huge amount of fur in it, most probably that of Sambar deer.

The density of orchid species found in this area was very high. We also saw the native Phoenix palm with charcoal deposits at the bottom of the trunk which stands witness to its resistance against the fire. Since the dates from this palm have a big seed and very less pulp, it is not considered ideal for commercialization, some people use it to make brooms.

We then trekked down the steepest slopes of our lives barely balancing not to fall down the valley, Abhishek humorously added to our anxieties by informing us about the density of Malabar Pit Vipers and King Cobras.

The magnificent Champaka tree welcomed us to the Magnolia Mist. After a scrumptious meal made from a native species of red rice grown on their plantation, Abhishek took us around the estate. He explained how he does organic farming and the fact that he has left about 40% of the total area of the estate undisturbed. He also explained how this has a positive impact on the yields. He took us through a huge stretch of open land which had no cultivation.

There was a small stream running at one side of this, that floods the entire open space during heavy rains. He explained that along with the flood waters, a few species of fish arrive at this valley which they use as breeding sites, and return with the receding waters. We walked past a small pond of water next to the paddy field, which had a huge population of tadpoles. He told us how the population of rats helps with insect control in the paddy fields. Sanjay added to this that even though rats and mice collect paddy seeds from the crops, they don't actually feed on it, rather, they use it to line the walls of their burrows. Since they keep changing burrows, we can collect the paddy from the burrows. More than 10 kg of paddy can be found in one single burrow. So, the farmers don't face any loss, they even stand to gain from the labour-intensive work that the rats have already done for them. We then walked through the tea plantation, the horrific leech-infested area where all leeches were crawling toward us. Interestingly, tea wasn't the only crop we saw here. Along with tea, several other crops like pepper were also grown.

The next stop was at the area where Abhishek showed us how he dries the Costus and tea leaves. He also told us that the demand for Costus has seen a tremendous rise due to its effects on insulin production in our bodies. He informed us that people who drink this tea along with the maintenance of proper dietary restrictions have been able to withdraw from Type 2 diabetic medications.

Abhishek then took us to the coffee storehouse, the subtle savour of coffee filled our noses, and the aroma lifted our moods. Here Abhishek stores, roasts, and grinds dried coffee seeds. He explained that he only starts processing the coffee once the order has been placed by the customer. This helps retain the freshness of the coffee and also, the ratio of arabica and robusta in accordance with the customer's needs can be modified. He also took us through the packaging process which involves the use of a one-way valve in the paper pouch, which lets in the air but keeps away the moisture, keeping the coffee fresher for a longer time than when he uses airtight packets. He also showed us how to identify natural and genuine cardamom from adulterated cardamom. He explained how the cardamom seeds are harvested prematurely to maintain the green colour, when in reality, the flavour and potency of the cardamom attain their peak only when it becomes ripe turning yellow in colour. But, in the markets, yellow cardamoms are sold at a much lower price than green ones. Abhishek has an opportunity to develop the roadway which will act as an economic enhancement but he chooses not to develop considering the devastating impact it could have on wildlife around the area.

The teeming wildlife found there attests to the good health of this ecosystem. It is inspiring how Abhishek and Anna have managed to find that balance to maintain the native forest cover along with practising sustainable cultivation practices.

Learnings and Experiences with Neethi Mahesh

Neethi Mahesh, a river ecologist and conservationist from Bengaluru, spent a day with us to talk about scientific forest restoration along riparian zones in the Dubare reservoir area. We reached Dubare Elephant Camp and met with her and some members from the local

Jenukuruba tribe at 10 AM. After acquainting ourselves with the terrain, we commenced our walk to the riparian corridor which was used by elephants to cross forest fragments. Gundajja and Siddajja, tribal members, and some forest officials led a 45-minute walk to the riparian zone. We traversed from dry deciduous forest to moist deciduous forest before we got to a scenic riverbank. Neethi let us absorb our environment for a bit before giving us the task at hand.

We learned biodiversity mapping is crucial to ecology and conservation. Acquiring the taxonomy and spatial distribution of species that thrive and survive in defined ecosystems helps form an understanding of the possible interactions when it comes to conservation. Working with indigenous communities (in this case, the Jenukuruba tribe) unlocks otherwise privileged information and helps with gaining momentum on conservation projects. By the riverbank, Neethi instructed us on how to identify the names of mid-to-large trees as well as the saplings that grew in the area. These trees had withstood the forces of nature and supported the surrounding ecology. The task was to replicate the vegetation at the Dubare riparian zone along other riverbank locations of the river Kaveri. Some of the species that we found were native to the zone were *Hopea parviflora* (Malabar Ironwood), *Pongamia pinnata* (Indian Beech), *Mangifera indica* (Wild Mango), *Vitex altissima* (Peacock Chaste Tree), *Vitex leucoxylon* (Whitewood Chaste Tree), *Diospyros malabarica* (Indian Persimmon), and *Syzygium heyneanum* (River Jamun).

All tree species performed crucial functions to keep the ecosystem in a pristine condition. Species like the *Mangifera indica* are canopy species that stabilise river banks and provide shade for mid-storey riparian species of trees. The Malabar Ironwood tree saplings can

withstand flooding and submersion during the monsoon as they have a deep tap root system. It is also food for many mammals, birds, and fish. Jamun provides food for many species of birds and fish. The bark is also medicinal for elephants suffering from stomach ailments. Just like the Malabar Ironwood, these trees can also withstand floods and wet conditions.

Once the mapping was done at Dubare, we travelled to a landowner's plot to plant the saplings of the tree species identified. Two of his farmhands helped us plough the soil and plant the saplings. The soil in which they were planted was nutrient-rich with earthworms, bugs and beetles. Neethi informed us that the saplings had to be monitored every month to check for survival threats, diseases and other factors that could prevent them from growing. If successful, this restoration project would:

- Remove air pollutants by absorbing them into their leaves and bark.
- Prevent soil erosion by growing roots that hold the soil together.
- Be a habitat for endangered and other species.
- Prevent floods and landslides by absorbing water and slowly releasing it via transpiration.

The land owner, Jimmy, was very welcoming of the initiatives run by Neethi and was a steward of conservation activities in Coorg, Jimmy spoke about the importance of understanding native and non-native species and the science behind reforestation. As a witness to gradual climate change, like most of us, he continues to support petitions to protect forest habitats from deforestation and 'developmental' projects. Neethi mentioned that even though there was land available for planting saplings and replicating riparian ecosystems, the availability of native saplings was low in the Forest nursery. Projects like these are labour-intensive which is why support from locals is paramount to ensure that follow-ups are done and critical action is taken at the right time. Converting them to caretakers of their surroundings by helping them conserve scientifically is a function of time as well. Neethi says conservation is not easy but we have got to keep doing what we do and work in groups.

Once we were done with the planting, Neethi also gave us a background of her work as an ecologist, working with water systems and plants. She had worked extensively on studying the Mahseer species. The Mahseer fish is extremely sensitive to its environment and cannot survive in disrupted water habitats. Their migratory behaviour puts them under direct threat from destructive fishing practices and anthropogenic activity. She spoke about how radio tagging them helped to understand their behaviour and the challenges she faced with people not familiar with conservation. She has documented riparian flora and has authored the book 'Riparian Profile of the Dubare Reserve Forest' which the RHATC team used as a field guide to identify plant species for the restoration project.

Interaction with Neethi helped us understand the ecological aspects of riverine biodiversity and the role of native trees in elephant conservation. Fellows witnessed that with evidence-based-conservation planning and getting support from locals very crucial in dictating the success of conservation programmes.

PetroCount Experience

After all the exhilarating experiences we headed back to Coimbatore but took one last pause at the *Pteropus medius* or the Indian Flying Fox bat roost site near Attagulipura, Chamraj nagar district, which made us excited again. The large flying foxes were shrieking and cackling hanging inverted, we had the task of counting bats and

enrolling in PetroCount, a citizen science project to monitor the southern Asian bat populations. Dr. Sanjay Molur, systematically explained to us the methodology to enter data, two methods to count individuals direct and indirect were used in the estimation survey. The citizen science form also inquired about the data collector's information, GPS location of the site, trees, the nearest village, nearest forest, threat information, sacred groves, and many other related factual and anecdotal information.

Overall, the tour gave us scientific insights and the freedom to choose our interest areas. It felt relaxing and rejuvenating, we felt a sense of belongingness, being together we laughed, danced, studied, debated, questioned and learned different conservation approaches. With all the interactions and experiences, we were 'Captivated by Conservation'.

Soham Parnaik, Tandrali Baruah, Melito Pinto, Rajib Saha, Akansha Mishra, Swaathi Na, Lakshmi Ravinder Nair, Pooja Ramdas Patil, Aishwarya S Kumar & P. Kritika, RHATC Fellows 2022–23, Zoo Outreach Organisation, Coimbatore, Tamil Nadu, India.

Centres for studying conservation - Masinagudi and Holematthi

Masinagudi was a trip that we looked forward to after a great time of learning in Coorg.

We left at 4.30 AM on Saturday to beat the holiday traffic to Ooty. 1.5 hours later, we mounted the ghat section and witnessed the sunrise from our cars. We made a pitstop at Hotel Adyar Anand Bhavan and another stop at a popular tea shop called Iyer Bakery. The drive after that was a bit challenging due to the mist and rain, with visibility at around one metre. There was so much to absorb on our way to Mudumalai Tiger Reserve and to Masinagudi Village thereafter. We spotted the Malabar Giant Squirrel, Bonnet Macaques, and some native plant species. With all the beauty around, it was also disheartening to see the invasive Lantana camara and Eupatorium take over most of the landscapes along with monocultures of Eucalyptus trees.

After we checked into our accommodation at Masinagudi, we had a quick lunch and proceeded to Priya Davidar's residence in Sigur Plateau Priya Davidar is a retired professor and a field ornithologist who completed her Ph.D. under the guidance of Dr. Salim Ali. Ms Davidar spoke about her work in brief and sought our introduction and plans for the future. Priya's husband, Jean-Philippe Puyravaud, a landscape ecologist was also present and gave us an overview of their experiences with wildlife, and their interactions with elephants like Rivaldo.

"Watch out for leopards and tigers. Even if you don't spot them, it is very likely that they have spotted you." These were cautionary words thrown at us before and during our trip. Quite thrilling to hear it off-field but once on the field, you actually start to think if it might be true.

The Davidar residence had seen a lot of elephant movements, and Jean-Philippe informed us that a man had a near-death experience with a tiger. With tales like these, we were on high alert while jaywalking around the main building structure. A sharp alarm call of what we assumed was a Chital's made us stop in our tracks and listen keenly on where the action was happening. It was presumed that a tiger or a leopard had found its dinner that evening. We left the Davidar residence before sunset and returned for our next session, a day later.

H. Byju, an avid vulture conservationist, was with the RHATC team during the entirety of the trip. Like Sanjay, traveling in Byju's car was like listening to a fun, educational podcast. With slick driving and a familiarity with the town owing to his extensive work on vultures, we took an unplanned diversion and spotted a nightjar, Grey Mongoose, Wild Boars, and Spotted Deer. We drove past the Bokkapuram Village, up till the point where cars were allowed and then retreated to our accommodation for the night.

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Day two at Mudumalai was quite a treat. We visited the Moyar Gorge and got a lesson on the geography of the valley, the wildlife that visited the gorge and the evolutionary history of the Western and Eastern Ghats. The fact that we were overlooking a gorge that was 2.5 billion years old was overwhelming!

We decided to head back to the Davidar residence after a quick cup of tea and a talk on vulture conservation by S. Manigandan, a Ph.D. student and one of Byju's mentees. A few sips later, Byju spotted a vulture flying towards the gorge followed by many others.

They seemed to be landing about 700 m from where we were sitting and a quick check on the binoculars confirmed that they were indeed circling around a reservoir lake near the gorge. We finished our teas and darted towards the spot and got an astounding view of about 50 White-rumped and Long-billed Vultures basking in the sun. Vultures need thermal heat to fly and can sense when the sun comes out. All of us were ecstatic about the spotting, and we left with big smiles on our faces.

Back at Priya Davidar's, we were given a task to understand the foraging ecology of birds. Thanks to near-pristine habitats around them, there were numerous bird species found around the main residence. Our group was divided into a team of two members each, and we had about six teams in total. We were told to identify a species – birds or ungulates – and study their behaviour for 30 minutes in total. The results had to be compiled in four categories – movement, foraging, resting, and vocalisation. We found that different species invested different times for their activities. After completing this activity, we headed back to our accommodation.

Conservation action

Day three was something of an experience reserved for the lucky conservationist. We had the morning to ourselves so Byju decided to take us to the Bokkapuram Village and the temple on one of its hillocks. The temple hosts a yearly festival for the deity where people from other towns nearby congregate to celebrate. We parked our cars at the base of the hillock and trekked for about 30 minutes to reach the temple.

Once we reached the summit, we overheard a local forest officer radio his colleague about a wounded vulture resting below a shrub. Byju rushed to the scene and found that the vulture was alive but was restricting its movements.

The vulture that we found was a migratory one. It turned out that we were keeping an eye on the Himalayan Griffon Vulture Gyps himalayensis, an Old-World vulture native to the Himalaya and the Tibetan plateau. We left the bird alone for a bit and waited for the forest officials to arrive with first-aid and necessary gear. A rectal temperature check was done to check for hypothermia. The ideal body temperature for a vulture is around 104–111 °F whereas the wounded vulture's temperature was 91 °F. The diagnosis was that the individual was probably hypothermic and hadn't accumulated enough heat to take off. Vultures exhibit an interesting ecology in the way they fly and regulate their body temperature. They use thermals, which are rising columns of warm air, to facilitate low-

energy flight. Most vultures are equipped with enormous wingspans of up to 2.8 m which suit this style of flight. Using thermals prevents the necessity to flap large wings, helping the birds save on energy that would be required for flapping during flight[1]. Unfortunately, on further examination, the vet discovered that the bird had a broken wing and wouldn't be able to fly soon.

This rescue mission was completed in about three hours. Byju, at the forefront of the mission, assumed a protective position over the injured bird up till the moment where the cardboard box and a thermal source, a light bulb of about 100 Watts was brought in to take the vulture for treatment. Ticks from the bird made their way up to Byju and he coolly flicked them off. The sight, although amusing, was a lesson on maintaining composure when a larger mission is at hand. He never once let the bird go out of his sight and grasp until proper apparatus was brought and further care was ensured by the veterinarian.

Of the people that came atop the hill to rescue the vulture were the range officer, forest guards, and four to five anti-poaching watchers. The deputy director of Mudumalai Tiger Reserve (MTR) was on the call with Byju, calling to check on the status of the bird's health. The further course of action, we were told, was to let the bird recuperate on its own, after which it would be translocated to Vandalur Zoo. After this amazing experience, we set on our way to Hanur, as there were different sessions scheduled over there starting from 13th December.

[1] https://southafrica.co.za/why-do-vultures-use-thermals.html#:~:text=Vultures%20use%20thermals%20to%20facilitate,suit%20this%20style%20of%20flight.

At Holematthi

Conservation does not just mean at species or landscape level, but also often needs to be done at the community level through outreach. But how does one go about doing community-based initiatives for conservation? To learn this, we the RHATC fellows traveled to Hanur to visit the Holematthi Nature Information Centre and interact with the Holematthi Nature Foundation team (HNF) and learn about their outreach work. The HNF is an NGO that's been actively involved in conserving the wild landscapes of Karnataka. The team is led under the guidance of Dr. Sanjay Gubbi, a senior scientist at Nature Conservation Foundation (NCF), who's also the program head of HNF. The HNF carries out its conservation work mainly in the landscapes of Male Mahadeshwara Wildlife Sanctuary (MMH), Biligiri Ranganatha Temple Tiger Reserve (BRT), and Cauvery Wildlife Sanctuary (CWS). Their conservation work includes long-term population monitoring of large carnivores such as Tigers and Leopards through camera trapping and their prey base through the line transect method. Along with these, they do outreach and capacity building through nature information centres and community-based initiatives.

When we reached Hanur, we were accommodated by Ashritha Anoop, one of the RHATC Fellows from the 2021–22 batch, who works as the field coordinator, for community initiatives at HNF, Hanur. On 12th December, we visited the Nature Information Centre (NIC) at Ellemala. The NIC is built with the aim of nature education and outreach to children of local rural schools. Through NIC, they aim to make children aware of

Studying

CONSERVATION

Holematthi

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Hands on - Camera trapping.

Ashritha Briefiing about the NIC.

Identifying individual leopards from Camera trap images.

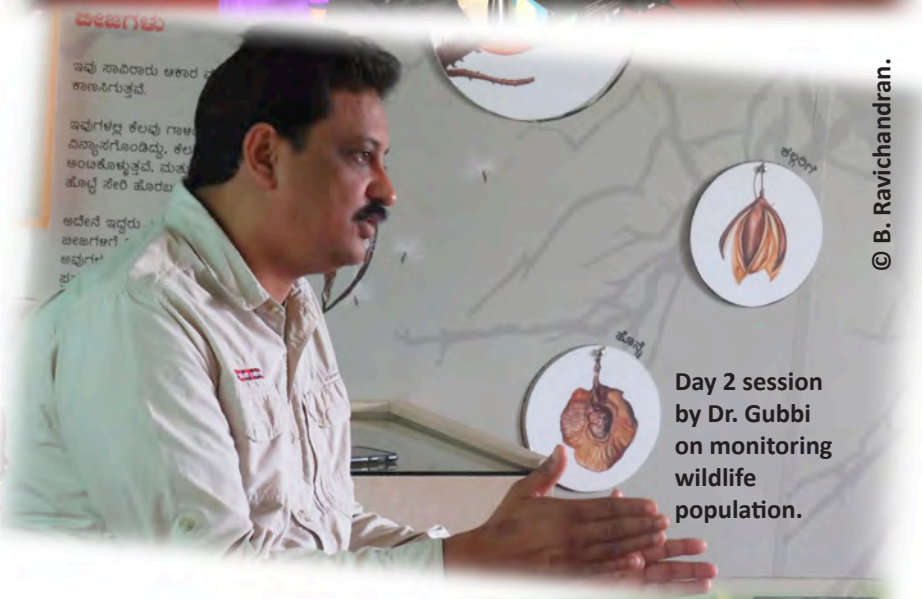
the wildlife around them so that negative perception about wildlife in them is reduced. The NIC also helps in the capacity building where the frontline staff of the Karnataka Forest Department (KFD) are trained in wildlife monitoring techniques such as camera trapping. The NIC is located in an area where it is surrounded by three protected areas—MMH, CWS, and BRT. Upon reaching NIC, we got introduced to Mr. Abhishek and Mr. Eshwara Prasad who work at the NIC. We spent time exploring the vicinity of the NIC and found foamy material on the leaf blades of some plants. Abhishek told us that those were by spittlebugs. We also saw caterpillars with tumor-like structures on their body and wondered what they were. We got to know that these were caterpillars of the moth Carea angulata. These were some of the things we were seeing for the first time in our lives.

After a while, Abhishek and Ashritha, alongside Mr. Eshwara Prasad, took us on a tour in around the NIC. The NIC is informative from both outside and inside. On the outside, there are paintings of local butterflies with names in both Kannada and English. We were told that the butterflies were painted there since they are visible easily, they make up the best materials for the children to take interest in nature. On the floor were prints of leaves of different plants, and one would be definitely left guessing the plant. There was also a cast footprint of an elephant, where one can compare their foot size with that of an Elephant's. Nine of us fellows' feet were equal to that of one Elephant's. Abhishek told us that the height of an elephant is nearly twice the circumference of its foot. There was also a sloth bear photobooth where one can put their head and hands in and pose like a sloth bear. The wall opposite contained silhouette paintings of microhabitats. Before entering the NIC, there's a signboard saying 'I'm a forest and this is my story'. The inside of NIC contains various art depictions of wildlife, such as the story of a tiger who survived to see her cubs reproduce successfully, and a narrative about elephants. There is also the story of Malai Mahadeshwara, a short mention of Veerappan. There were also paintings of different birds and mammals with respect to their activity day and night. The birds were painted at the levels of their occupied niche. On one of the walls was the painting of different wild fauna, which when viewed from a bit far appears as if the animals are looking at us. When most such wildlife paintings use tigers as the main attention catch animals, it was not the case here. Rather there were animals like Dholes who would catch someone's attention first. Hats off to the concept and the group of artists that made the concept come true.

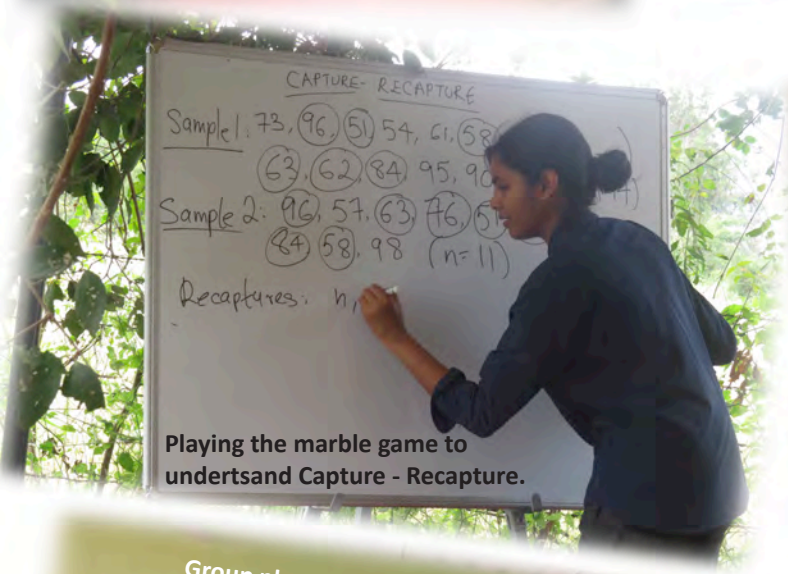
We were then joined by Dr. Sanjay Gubbi and his colleagues Malaika Chawla & Shravan Suthar. After a brief introduction, Dr. Gubbi started out the session by briefing us on Outreach for conservation, the need for rural outreach, the Holematthi NIC, and how it stands apart from other NICs. Here we got important insights into things that need to be considered while designing a NIC. One of the key points here was that if the NIC contains information in the local language, then it fulfils a great purpose of outreach to local rural children. Our perception of 'who is a stakeholder?' was debunked by Dr. Gubbi. We also got to know about the importance

Spittlebug in its foamy nest.

Day 1 morning session by Dr. Gubbi.



Day 2 session by Dr. Gubbi on monitoring wildlife population.



Playing the marble game to undertsand Capture - Recapture.

Carea angulata Caterpillar.

Group photo with HNF before departure.

RHATC fellows looking at Holematthi merchandise.

of evaluation after conducting any outreach task. After the session, we were divided into groups and were tasked with acting out how we would convince a government authority for a conservation cause. After each group presented its case, Dr. Gubbi gave important tips that need to be considered when presenting such cases. Here we learnt that politicians are actually not stupid. But it's we who need to be extra smart and planned when presenting our cause for conservation. After this wonderful morning session, we headed out for lunch.

At noon, we reached a dam-built area named 'Uduthore Halla'. The landscape was scenic. We saw a large number of swallows rapidly taking a dip in the water and flying away. Most probably they were building a nest nearby, which we couldn't locate. We also got to see the hovering flight of a Black - Shouldered kite, where it would stay fixed at a spot in the sky, flap its wings repeatedly, and swoosh down on its prey. It was a beautiful moment to watch. After spending some time here, we headed to the HNF office, Hanur for another session with Dr. Gubbi. In this session we got to know about how HNF works to protect the different landscapes of Karnataka, and about 'Fuelling Change', one of their community outreach programs whereby they provide LPG to poor people in the areas in the vicinity of the protected areas. They also provide them with fuel-efficient water boilers. This community initiative came into existence when it was found that these local communities would venture into forests to collect firewood. In the process, not only do they cut down the trees, but also come into face- off with wildlife like Elephants, which would put both lives at risk. With this community initiative, the dependency of these people on firewood has been reduced by a lot. Dr. Gubbi also mentioned that despite this, people sometimes still go to forests to collect firewood. A big takeaway here was that often shortcomings happen in conservation work. So we need to speak about that as well, and learn from them. We also got to hear from the outreach members which included Ganesh, Prabhu, and Narmada. It was really engaging to speak with them and listen to their experiences of people's initial hostility and their friendliness towards the outreach members now. Another important learning here was that people like Ganesh, Prabhu, and Narmada become key in community outreach programs. Since they are locals with incredible skill and ability to talk to these communities, they are able to convey the intention and gain people's trust. After this beautiful session, we departed back.

On the second - day, with a handful of minutes to spare before the session by Dr. Gubbi began, we got an opportunity to look at and purchase some of the merchandise by HNF. These included books authored by Dr. Gubbi such as the 'Leopard Diaries and 'Second Nature', notebooks with beautiful paintings, wildlife lapel pins, and greeting cards. After a while, Dr. Gubbi began his session on monitoring wildlife populations. We got a brief overview of why, how, and when to monitor the populations and different methods such as the capture-recapture technique for monitoring. During the afternoon session, we had some fun activities such as picking marbles to understand the capture-recapture, and matching the leopard images to identify

At Nagamma, a LPG beneficiary's house.

Muthu explaining how the boiler works.

RHATC fellows looking at a shola grassland on BRT Hills.

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RHATC fellows at a Tibetan monument.

RHATC fellows at Lokkanahalli Village with Muthu.

the number of leopards from camera trap images. During the activity of identifying leopards, Shravan gave us some tips on how we can identify certain patterns to identify individual leopards. Following this activity, we got hands-on experience in deploying camera traps thanks to Shravan. Here we learnt of the important things to be kept in mind such as clearing vegetation so as to avoid false triggers, the different heights at which the camera trap needs to be deployed for the target species, and recording the data in the camera trap deployment data sheet. After this activity, we bid farewell to Dr. Gubbi and his team. We then went to Ponnachi, another beautiful landscape in MM hills where we spent time looking at the beautiful valleys. As the sun set, the sky took different gradients of colours. It appeared as if an invisible painter is creating his evening art. After having spent some quality time here, we departed back.

On the third day, we along with Ashritha and Ganesh visited some of the beneficiaries of the community initiatives by HNF. We visited two villages, Lokkanahalli and Boredoddi. At Lokkanahalli, one of the beneficiaries named 'Muthu' joined us in visiting two houses of the beneficiaries. It was an exhilarating experience interacting with the villagers, discussing with them their livelihoods. Muthu told us that since there are agricultural fields at the base of the wildlife sanctuary, they often face Elephants raiding their crops. At the beneficiaries' house, we saw how the fuel-efficient water boilers work. Discussing with them made it evident that this initiative has made a major impact in their lives by reducing the usage of firewood and venturing into the forests to collect the same. We then bid our goodbyes to the people of Lokkanahalli and began our journey to Boredoddi. En route, we stopped by to see the shola grasslands on the BRT hills. Upon reaching Boredoddi, Ganesh briefed us on how the condition of the villages as before. There used to be stacks of firewood through lengths and breadths of the village for usage by the villagers and for selling to others. But after the community initiative by HNF, this has significantly reduced. We visited one of the beneficiaries of LPG named Nagamma, who prepared a really delightful tea for us. Sipping our tea, we engaged ourselves in conversation with Nagamma and her family. We got to know that getting LPG has reduced their burden by a lot. Now they are able to cook food faster which in turn helps them to get to fields for their agricultural labor quicker.

Even though we were traveling in cars, the distance between each village felt huge. This made me think of the dedication and the effort the HNF outreach team possesses to cover these distances, and often through difficult roads and terrains to outreach people living at the edges of these protected areas. Kudos to them. Upon departure from Boredoddi, we saw a 1.7 km corridor stretch. We learnt that an NGO has purchased the agricultural lands and has handed it over to the forest department so as to maintain it as a corridor. Byju explained to us that since some parts are in process of being converted to corridor, there are electric fences around the agricultural lands.

On our way to Basavanagudi, a Tibetan settlement, we stopped to see an anti-poaching camp (APC) from a distance. Byju explained

to us how the situations are at APCs and how the frontline staff operates even in tough conditions to prevent poaching. Continuing our journey, we reached Basavanagudi and stopped at a Tibetian memorial. Here we filled out our feedback forms about our experience with HNF. At this moment, a neighboring lady voluntarily offered each of us a bottle of water. She also explained to us what the religious structures in that place signified. It was really interesting to learn about the culture of Tibetans. After spending some time here, he continued our journey to a Tibetan hotel to have lunch. After enjoying Tibetan delicacies and bidding adieu to Ashritha and Ganesh, we headed back to Coimbatore.

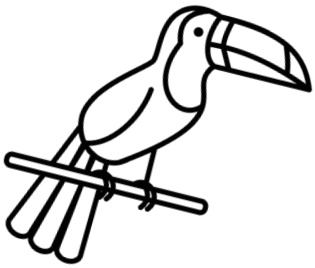
These three days with HNF taught us many things. The conservation vision of Dr. Gubbi, the work spirit and perseverance of Ashritha, Ganesh, Abhishek, and many others of the outreach team of HNF, have inspired us. One of the things that Dr. Gubbi said to work where our strength lies is one of the key approaches that one needs to follow in conservation. The experiences of interacting with different members of HNF and having an exchange of information are simply unforgettable. We feel lucky because would anyone else have an opportunity to get insights from two of the well-known Sanjays of Conservation at once? We think not.

Acknowledgements

The Masinagudi-Holematthi trip was a gratifying one for the RHATC Fellows. We would like to thank H. Byju, for his valuable insights on the Moyar Valley and vulture behaviour. Dr. Priya Davidar and Jean-Phillipe Puyravaud for their hospitality and lessons on bird ecology, and insights into elephant conservation, Dr. Sanjay Gubbi for sessions on population monitoring, community outreach and insights about the landscapes of the Western Ghats. Ashritha Anoop for guiding us through the landscapes and accompanying us throughout the different sessions we had at Hanur, Abhishek and Eshwara Prasad for showing us in and around the Nature Interpretation Centre, Shravan Suthar and Malaika Chawla for demonstration of capture - recapture, and camera trapping, Ganesh, Prabhu, and Narmada of Outreach team, HNF, for sharing their valuable experiences of community interaction during outreach.

Our wonderful experiences on field trips were made possible through the vision and planning of the RHATC Core team. We extend our deepest gratitude to Dr. Sanjay Molur for showing us the path to scientific conservation and sparking a sense of discovery within us, Payal Molur, for educating us on the nuances of conservation, B. Ravichandran, for his sense of humour and being the backbone of our team and providing the best photographs, Latha Ravikumar, for helping us tie loose ends together, Priyanka Iyer, for increasing our appreciation of the natural world, Trisa Bhattacharjee and Usha Ravindra, for being lovely peers in our journey of learning.

Melito Pinto, Lakshmi Ravinder Nair, Pooja Ramdas Patil, Soham Parnaik, Aishwarya S Kumar, Akansha Mishra, Tandrali Baruah, Rajib Saha, P. Kritika & Swathi Na, RHATC Fellows 2022–23, Zoo Outreach Organisation, Coimbatore, TN, India.



Creative works on the field trip

HunMyCoorg Trip

After a day of classes and packing
And after a night of soiree,
RHATC fellows 22-23
We're set to start the party.

Knowing Sally's roots in the children's fave
Was warm, encouraging and fun.
The Mysore zoo with Tanuja
Was nostalgic for some.

Mahseer in the museum,
And Mahseer in Kaveri;
Sreenivas and Neethi sailed
The educational ferry.

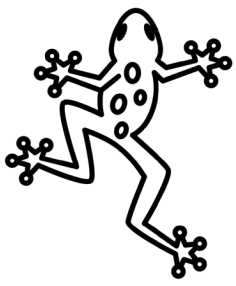
The Liana Trust and Gerry were raw
With night walks and tracking in the day.
And all I can say after meeting Rom is:
"Sri Rom... Janaki... baithe hain, mere seene Mai!"

After Mysore and Hunsur, came the highlight
"The Rainforest Retreat in Coorg".
And My Oh My, the beauty there
Took away all our sorg.

The streams, the walks, the cottages,
The composting and getting tired.
All of it was taken care of
By Sujatha, food and bonfire.

The best day was with Abhishek:
With cuts and blood and leach bites
But all of us recovered from these
With Arya, coffee and orchids at Sholai.
With conservational wisdom of LTM,
Mewa enlightened us all.
And camping at Arjun and Abhay's place
Is a great memory to recall.

With spottings and injuries and
lifers and bonfires,
With jagaratas and dancing like a mess,
The HunMyCoorg Trip out and out,
Was an absolute success.



Akansha Mishra, RHATC Fellow 2022–23, Zoo Outreach Organisation, Coimbatore, TN, India.


Kritika

Side-1

I have tried to draw the things and places that influenced me the most during the field trip. The highlight I clearly remember and what I feel is the best part about the trip is the trek led by Abhishek.

It was an entirely new experience for me as I have never trekked in my life. And also I like water bodies so crossing the stream to get to the trekking spot was also a very new and amazing experience as I have never crossed a stream.

At the beginning of the trek, it seemed very challenging and I thought I can't make it or I might end up falling but by following the people who went before me and receiving some help I was able to climb up to the shola grassland and I remember thinking that the climb was worth it. Returning back to the bottom seemed even more challenging to me as I couldn't see any track and there were no trees to hang on to, but to my surprise, the grass were strong enough for me to hold onto them and climb down. I had a feeling of accomplishment when I finally reached the ground.

P. Kritika, RHATC Fellow 2022–23, Zoo Outreach Organisation, Coimbatore, TN, India.

Side-2

I drew a bunch of different things which has had an impact on me or the things that are burned into my memory. One such thing is the leeches, I was surprised by how fast they can detect us and how fast they can climb onto and attach to the body. My initial fear vanished into thin air after handling a few of that leeches.

I held a snake in my hands for the first time, I had mixed emotions of fear and excitement before holding one, and after it was just amazement at how its epidermis actually is.

I have a slight fear of animals that make sudden movements or whose movements I can't predict and one such thing is a frog. I have seen some before but I never dared to touch or even go near one, this time I build up my courage and touched a frog and it wasn't so bad.

I really love walks and that too on calm and dark nights are the best – gives me real peace.

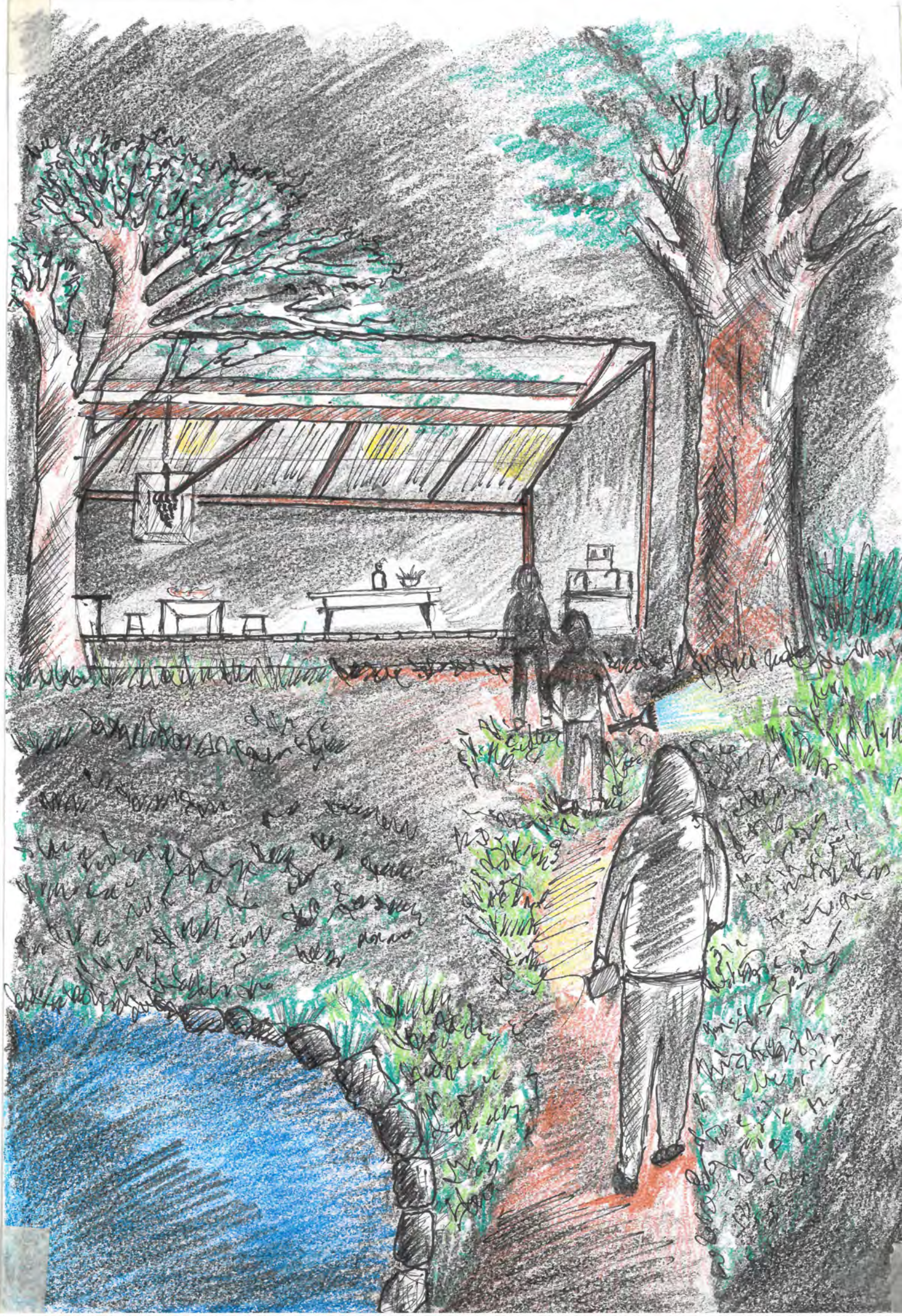
A bunch of other things which were the highlight of the trip were - the cicadas I saw for the first time, those large black tadpoles in a group at Abhishek's farm, and the heteropoda spiders roaming around in and out of the cottage.

My first ever nocturnal walk

Growing up as a girl in a conservative Indian family was difficult for me. I always wanted to explore nature at night, spend time in observing beautiful creatures. But never got the freedom. As part of our Coorg trip, we met Gerry Martin at the Liana trust situated at Hunsur, Karnataka. I took an instant liking to that place. The wilderness and ambience of the place felt like a scenery painted by a great artist. It can't be explained in words. The wooden floor, with basic but comfy seating arrangement, one can't feel even in 5-star hotel. After lunch, we got to know that we were going on a night walk. It felt surreal, because I had been waiting a long time to experience this. I was impatient for the night to arrive and could feel every minute ticking by.

After all these years, what I have dreamt about was finally going to happen the night walk in search of beautiful creatures of nature. As we were on our way for night walk, I could hear loud the frogs, crickets. I felt Like they are also celebrating my freedom. We spotted Sri Lankan painted frog was peeking out of the guava tree trunk, many snails, bull frog, crab spiders, crabs in the stream, rodents on trees, katydid, Hawk moth caterpillar, etc. It was awesome experience indeed, which I am unable to put in words more than this, just lived in that moment.

Pooja Ramdas Patil, RHATC Fellow 2022–23,
Zoo Outreach Organisation, Coimbatore, TN, India.



The 10-day field trip to Mysore, Hunsur and Coorg opened new vistas for me, literally and figuratively. Whether it was the leopard we saw at Mysore Zoo, the Chequered keelback at Hunsur, the damselflies at Kaloor river or the frogs and crickets at Rainforest Retreat, a muted feeling of gratitude was my travel companion. However, these feelings were quickly followed by a sense of despair and guilt. What moved me the most was listening to the ever-punctual Malabar Whistling Thrush, calling at 530 AM and 530 PM. Its carefree song felt ironic to the rapid destruction of forest habitats.

There's a lot of work to be done. What I hope to do with my observations and my experience is to take it back to people and communities oblivious to biodiversity loss – one of the critical planetary boundaries. I have created two tongue-in-cheek posters, in familiar frames, to subtly bring in awareness on the adverse environmental effects that casual consumerism causes.

- *The first poster is an advertisement that we see from users of forest raw material, in this case, a wholesale furniture manufacturer. The ad displays the hidden value of the tree used to make the furniture.*

Companies are usually not transparent with product lifecycle information and this poster asks the buyer to be more careful while making purchase decisions.

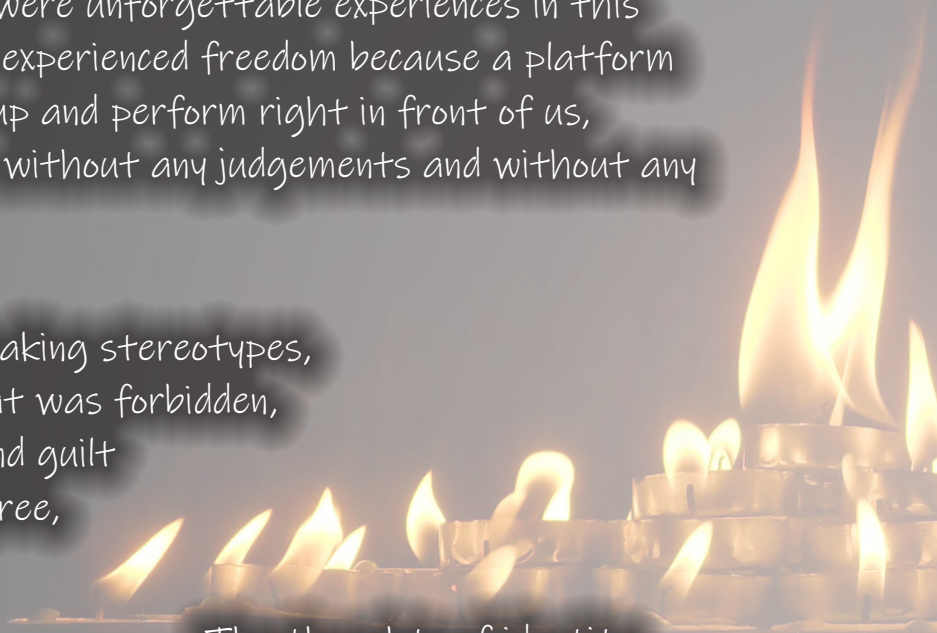
- *The second poster is a food menu that lists popular dishes consumed in certain parts of India. The usual descriptions of the method of preparation are replaced with information on the animal's ecosystem value, urging the end consumer to reflect on their choices as basic as food.*

This trip summary would be remiss if I didn't mention the solidarity of the RHATC team – both tutors and fellows. Even though our unified goal is towards conservation, our observations on the trip were very different. I look forward to seeing us grow together and spread the joy of seeing life around us intact.

Lakshmi Ravinder Nair, RHATC Fellow 2022–23,
Zoo Outreach Organisation, Coimbatore, TN, India.

A Magical Fireplace

A Magical Fireplace: Locusts were calling from far end, we were sitting together, trying to soak heat. That night was magical because that night I found a place of warmth and warmth came not from firewood but from people around me. People who were strangers just a month before, I felt were now were tied together by unseen and unbreakable thread. Interactions with others, myself and food were unforgettable experiences in this Coorg trip. That day I experienced freedom because a platform was for anyone to step up and perform right in front of us, without any obligations, without any judgements and without any critics.



Freedom
You were there breaking stereotypes,
Saying it aloud what was forbidden,
From the shame and guilt
You chose to stay free,

Free from sceptical glances
And tabooed stares
From those booing sounds
You chose to stay free,

The thoughts of identity
Defined by your perceived past
You broke that shrewdness and
You chose to stay free.

It was difficult to witness you liquify
Those rigid norms of patriarchy
From Admiration or criticism
You chose to stay free.

Seeing you free made me realise
Some force was holding me back
Thinking what was supposedly necessary
But you chose to stay free

Those flamboyant gestures
Shape of your pneuma
From your own body
You chose to stay free.

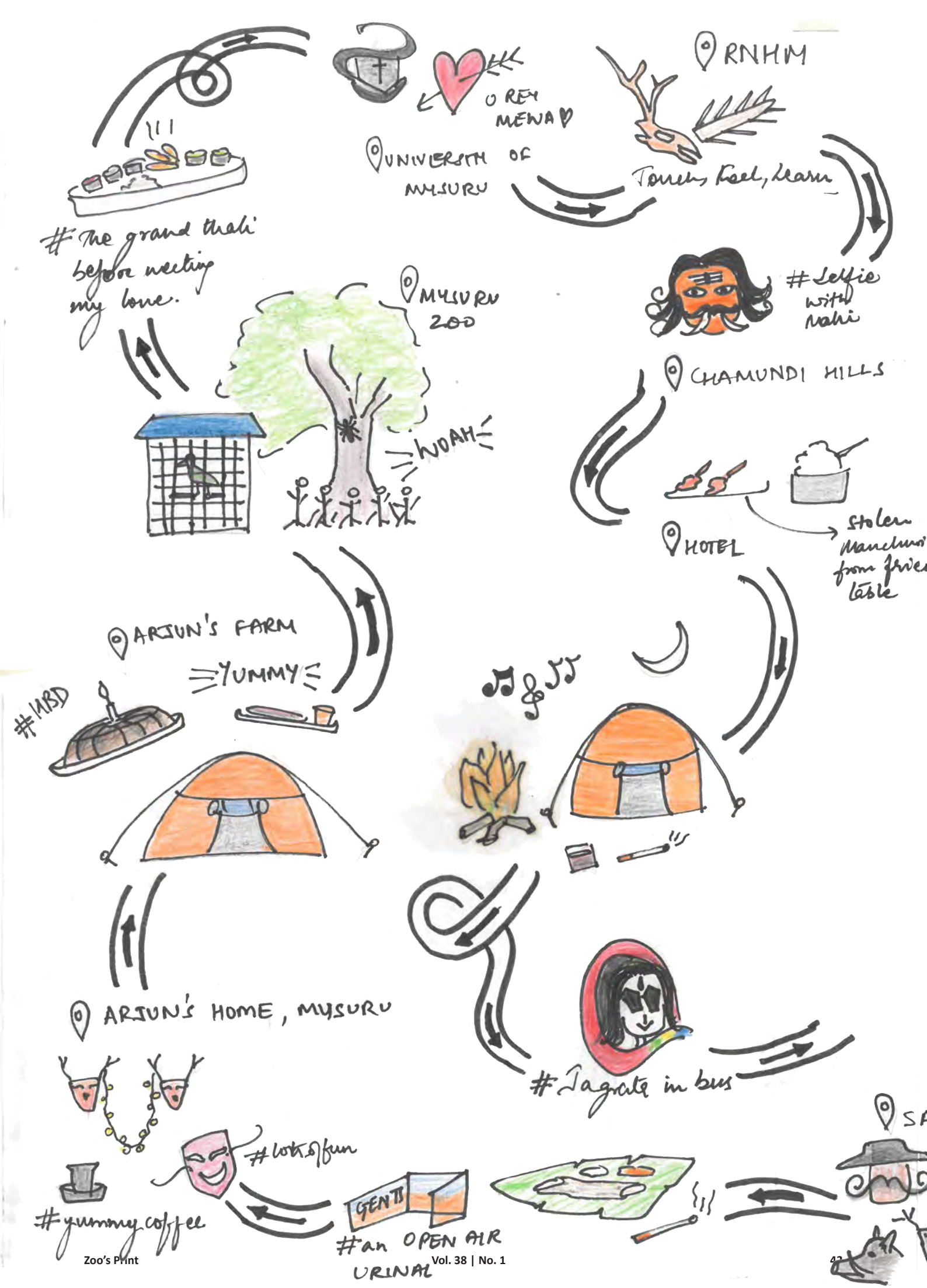
All the time I was calculating
Boundaries that kept me from exploring
Even when I Showed off my caged freedom
You chose to be absolutely free.

With every minute passing it felt like a loss because I never wanted that night to end, the connection felt like sensation that may never return like a granule of sand that slips faster, the harder we try to hold it. Love I gave was not mine, love I got was not mine. No matter how badly I wanted I could not possess Love nor could I store it in any vault, it seemed like a chemical that needed to be freshly prepared. Then I found joy in letting it pass because the experience had carved beautiful memory for me.

Aishwarya poured her heart in her songs, Trisa teasingly danced, we joined the chorus and cheers, we ran, we laughed for no reason at all. The fireplace blazed and so did my existential crisis, suddenly my thoughts, my struggles, became ordinary there was no need of any effort now. That place offered comfort, security and acceptance, all I needed was made available for me. Sense of inner peace made me aware of everything but nothing in particular, then I started to hear internal and external sounds vividly, and abstract images were visible in that fire. I became afraid, or maybe I labelled experience as fearful.

What's the hurry I ask,
Labelling and categorising all along,
Why the deliberation I ask,
The need to prove yourself
Why do you have to be perfect I ask,
These interactions and experiences
Can they be purchased I ask,
Love and compassion being the answers
Why do I ask?

Soham Parnaik, RHATC Fellow 2022–23, Zoo Outreach Organisation, Coimbatore, TN, India.


#The grand thali before meeting my love.
UNIVERSITY OF MYSURU
O REY MEWA
RNHM
Touch, feel, learn
#Selfie with Nahi
CHAMUNDI HILLS
Stolen Manchuri from fried table
HOTEL
MYSURU ZOO
WOAH
ARJUN'S FARM
YUMMY
#MBD
ARJUN'S HOME, MYSURU
#Jagruta in bus
#an OPEN AIR URINAL
GENTS
#yummy coffee
#lots of fun

Memories bring back, memories bring back you!

The night of 26th October 2022 was unlike others. Taking pride in my packing skills, I was relaxed that I would be able to get in my stuff in no time. And it did happen so; just that I had not realised that I had no time and we had to leave in an hour/two. Thankfully, I managed to get a quick good 'midnight' sleep. While I was still in the delusion of having enough time to catch up a little more bedtime, I was startled by a mad thud on our room's door. That was a nightmare. I thought I had overslept and was late and, Sanjay had banged the door in anger. Rajib, our friend, however, was to be blamed. Nothing agitates me more than someone breaking my sleep this way.

It was 3:30 A.M., we all stuffed our luggage onto the van and were now ready to start the journey. I tried to catch up a quick nap to overcome the frustration of having lost a peaceful sleep to Rajib's devilish door thuds. Soon, we stopped by a restaurant, primarily with the intention to empty our bladders. The sun had now risen.

By 8:00 A.M., we had reached the Sathyamangalam Range. The greenery thrilled me. What excited me even more was the fact that I was finally in the famed place that was once used by the 'mighty' Veerappan. I desperately wanted to visit the temple dedicated to him but could not. Well, that's saved for some other day. On our way, we caught glimpses of wild boars, chitals, hill mynas and a dozen other birds which took off in flight even before I could identify them. We stopped at a place for breakfast. After some of us were done, we decided to roam in the backyard of the eatery. This is when an Open air urinal for gents caught my attention. We wondered which architect had they hired to design it.

Mahishasur's own city

The farm

We reached Sanjay's friend Arjun's place in Mysuru. After a warm welcome and coffee, (thanks to Arjun's wife, Geetha for it) we headed to our halt for 2 days- Arjun's farm. I could not help but stare at the starry sky. It looked magical, like white paint sprinkled on a black canvas. Soon, we all pitched in to pitch our tents. It felt really good! That satisfaction of having our tents ready under the starry sky felt so good! What added to our excitement was that Geetha had baked a yummy chocolate cake to celebrate the birthdays of two of our friends.

The famous zoo

Next morning, we headed to the famous Mysuru Zoo. Ms. Tanuja, a naturalist, took us around the zoo and shared some amazing information. Listening to her and Sanjay talk about the legacy Sally had left behind made me wish I had known her before. Experience here was quite different from my previous zoo tours. None of the previous had been so insightful and fun at the same time. We had also managed to pull a crowd and educate a few there when all went into a frenzy on seeing a tarantula spotted by my friend, Melito. Explaining it to the crowd gave a sense of confidence and also a sense of responsibility.

The men- Mewa and Mahishasur

The University of Mysore was our next destination. The next visit was the best. I had my dream-come-true moment. As we walked in the corridor, I read the board- Prof. Mewa Singh. I had expected to see a tall man but there he was, a cute little man in front of me. Finally, I was standing in front of one of my favourites!

In the seminar hall, I could not stop myself from staring at him in awe. I was lost and words slipped my tongue. All I could do was to shout out loud, "Mewa, I love you". What followed next would always be close to my heart. Payal slowly pushed me closer to Mewa and asked me to pose for a photo. I asked Mewa if I could hug him and as soon as he agreed, I held him tight. My joy knew no bounds.

After the 'Mewa Madness', we next left for a history tour. Ever since I had heard from Sanjay of the fact that Mysuru city been named after Mahishasur, I had wanted to visit this place which adorns the statue of this 'people's dear demon'. But when I saw it, none

RAINFOREST RETREAT, COORG
#Fun in the stream
KAJU KATLI
FIELD MARSHAL CARIPPA'S HOME
+ 08 Liver coffee
Malabar pit viper
Biodiversity assessment
HERPING @ night
HELD SNAKE & HERPETOLOGY
ROM
TELEMETRY
#Composting
Menon Meet
SHOLAI
#firstwild trek
STREAM
#Magnificient Magnolia
Tusker on Road
THE LIANA TRUST, HUNSUR
OUR PLACE, COIMBATORE

of it matched my expectations. I had imagined of a statue which was well maintained and was revered much. However, all I could see was an isolated statue built in the middle of a road, just for the sake of some selfies. Nonetheless, definitely the talks we had shared regarding Mahishasur and his worship continue to inspire me.

After a super tiring day, we had a gala night at Arjun's farm. Drinks, music and dance made the environment magical. The next morning, we started our journey to Hunsur, Gerry Martin's place. This was the day we saw the legendary Romulus Whitaker in flesh! I very vividly remember Rom entering the scene soon after Gerry had introduced him. A tall man in a white shirt and shorts, with his hair let loose, walked towards us. He had an aura of his own. The next thing I remember is my friend crying. This day also marked some of my firsts- like holding a snake and herping.

The Coorg calling

Field Marshal Cariappa

"Coorg has many contributions to the Indian military", said Sanjay. The place undoubtedly takes pride in it by having named roads named after and displaying statues of many noted military personnel. I had heard of one of these Coorg military men, the famous Cariappa, whose name adorns a place in Delhi- called the Cariappa Marg. Never had I imagined that I would one day get a chance to visit his home. Interestingly, Sanjay and Payal know the Cariappas and we as fellows had a chance to visit his family, see their beautiful home, play with their dogs, and eat some really yummy Kaju Katli that Ms. Beena Cariappa got for us. This marked the beginning of our Coorg journey.

Rainforest Retreat (RR) and Magnolia Mist

After passing by a number of green places, we finally reached our next stop which hosted us for the next 5 days. Splendid, mind-boggling.. the list would go on if one would started describing this resort which stood within an agroforestry land. After filling our tummies with a wholesome meal, we headed to the stream nearby. I played my heart out here. Leeches crawling onto my body, the ice-cold water, none bothered me. All I enjoyed was, that moment.

Here we befriended a few people. Post the dinner, the place around the bonfire immersed itself in the sound of some tribal instruments. Mahika like every time mesmerized

us with her violin. Over the next few days, we had a ridge walk (which opened our eyes to many flora, fauna, and fun) and walk through restoration sites at RR. The place also saw some adventures like me tasting poop after being fooled by Sanjay who told me they're civet coffee beans; my knee bleeding out after I fell on the road during our usual night walk after dinner and the adventure of joining in to add compost to coffee plantations.

The adventure which followed the next day will remain closest to my heart. We had the most adventurous and amazing trek to the Sholai grasslands! The climb and descent were equally exciting! While we all enjoyed every moment, a lot of learning kept happening too. We also went walking upto the Kalur river and got our feet dirty in mud. It was here that I saw the first time I had seen a Magnolia tree. This one at Magnolia Mist, however, was special in a way that it was over 1500 years old. Also, enchanting was the aroma of coffee in the processing house.

The way back

Neethi Mahesh and freshwater

We started our journey back. Just few days in the wet and green Coorg and our eyes had got already too used to them. This only troubled us when we reached the Dubare Reserve Forest, a deciduous forest with patches and umpty cleared space (in the vicinity). Small humble huts of the Jenu Kuruba tribes, who stared at us strangers in their place, found place inside the forest.

Neethi's biodiversity assessment was real fun with us non-natives struggling to ask the locals the common names of plants. We also sat and drew the landscape. I can't possibly put those emotions into writing. This was also the day Sanjay decided to go adventurous and tripped and injured himself on the banks of Cauvery.

Mewa, tents and tuskers

As we made our way back, we met Mewa and had an amazing talk with him. Too tired, that night we slept without pitching any tents. Rolled in our sleeping bags, us all sleeping on the floor reminded of Egyptian mummies laid down next to each other. We bid adieu to Mahishasur's city and so did we to the tuskers of Sathyamangalam, who paid us a visit before we parted ways.

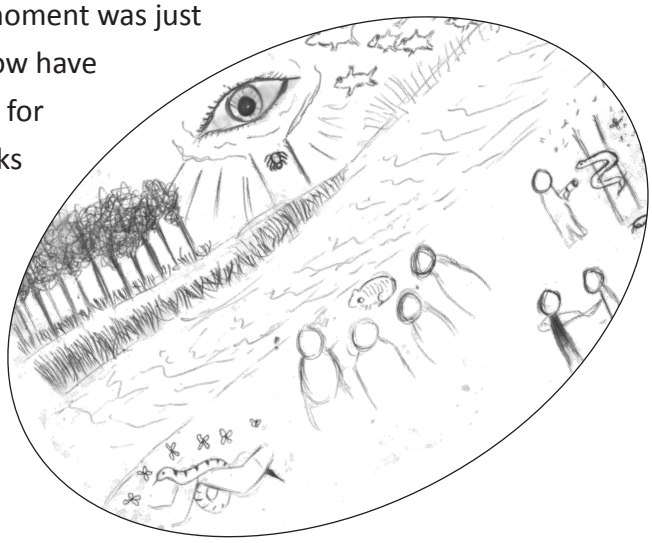
Aishwarya S Kumar, RHATC Fellow 2022–23,
Zoo Outreach Organisation, Coimbatore, TN, India.

The rainforest retreat experience

In this weather, I'm feeling so cold,
Hey, are your hands free so that I can hold?
Come on let's go, for this place is to explore,
There is diversity in life at every step more and more,
Hey, did you see that frog jump?
Isn't this a forrest without gump?
We are not Dora the explorer with the Swiper,
But, we were lucky enough to see the Malabar pit viper!
Sujatha is the organic farming lady,
Her words of wisdom are true and not shady.
Hey Cyan! What new Katydid today did you find?
Can you tell me a bit about it if you don't mind?
Hey Vansi, can we hear another tribal song?
It's all tribal knowledge, what could possibly go wrong?
Composting was an activity that taught us hard work,
When your efforts are appreciated, isn't that the perk?
Magnolia is a tree that's standing strong and tall,
I sincerely pray that an evil person wouldn't make it fall.
Abhishek's orchid collections are simply awesome,
Dear mother nature, please make conservation values in everyone's heart blossom.
The four days of our stay went so quick and dime,
I can't wait to go back to this place again,
Because it was an experience of a lifetime.

Interpretation

The eye represents my naturalist's eye being opened from being only focused on birds, and below lies the tarantula that made it all happen. The 4 heads surrounding a frog represent the moment me and 3 others closely watching a nyctibatrachus species. In a situation where I was hoping to see at least one night frog, I found tons of them, the moment was just indescribable. The flying frogs depict how the frogs now have caught my attention, and they have become new birds for me. The river represents the Cauvery river, on the banks of where we spent memorable moments. The grasses depict the shola grasslands that we visited. Two people holding hands depicts me holding hands with my fellows for support during trekking.



Melito Pinto, RHATC Fellow 2022–23,
Zoo Outreach Organisation, Coimbatore, TN, India.

COMPOST JENGA LAYERS

We are often taught that composts should have "delicate balance of organic materials". With this comes two questions firstly, what exactly, does this mean and secondly, how do students remember what to use while making compost. The problem can be addressed by giving students a tangible model of compost and have them experience what could happen if a component of that organic matter were removed and which microorganisms help in formation of the compost. Through a modification of the popular game Jenga a hand on-knowledge based activity that visually demonstrates the concept of delicately balanced compost that will ultimately produce a healthy plant could be prepared. The name of the new game would be Compost Jenga Layers.

Preparation

Jenga is a popular block-balancing game. Small wooden pieces are stacked together to form a tower. Players remove pieces until the tower falls. This activity works best with small groups (four to eight students), and therefore multiple sets are necessary. For compost jenga layers, Jenga sets were modified to represent the different layers of compost with each layer having information on the microorganisms that assist in the composting process. To make the game more colourful we could paint the ends of equal numbers of blocks red, blue, green, yellow etc. to represent different layers of the compost. Following are the different names of the layers of the compost jenga layer game:

- The first level -sticks, twigs
- The second level - grass, leaves
- The third level- Animal house waste
- The fourth level-Oil cake (neem, pongam)
- The fifth level- Vegetable waste
- The sixth level- leaves and grass
- The seventh level- cow dung and wood ash
- The eighth level- a healthy plant

Objective of the game:

This activity will allow students to learn about composts in a tactile way. Although a field trip to an actual organic farm is ideal however, not all students have this opportunity. This activity gives students a concrete and tangible model with which they could work.

The objective of the game is to

- Make students observe how each layer is different and that it took the removal of more, less or different blocks to not form a healthy plant.
- Knowledge on how microorganisms work together in different layers of the organic materials to produce compost and ultimately a healthy plant.

Rules of compost layers jenga game:

1. The tumble tower set comprises of 36 wooden blocks that is built into a tower.
2. The aim of the game is to rebuild the compost layer without losing any of the blocks or causing the tumble tower to topple over in the process. Any number of players can join in a game of tumble tower and it can also be played alone.
3. The blocks should be stacked in threes and each alternate story is laid in cross ways direction so, for example, if the blocks in the first level lie lengthwise in a north-south direction, the second level blocks should be positioned so that they lie east-west and so on.
4. The loser is the player who causes the tower to fall – it may not be their fault but if the tumble tower falls during their turn, this player is counted as the loser.

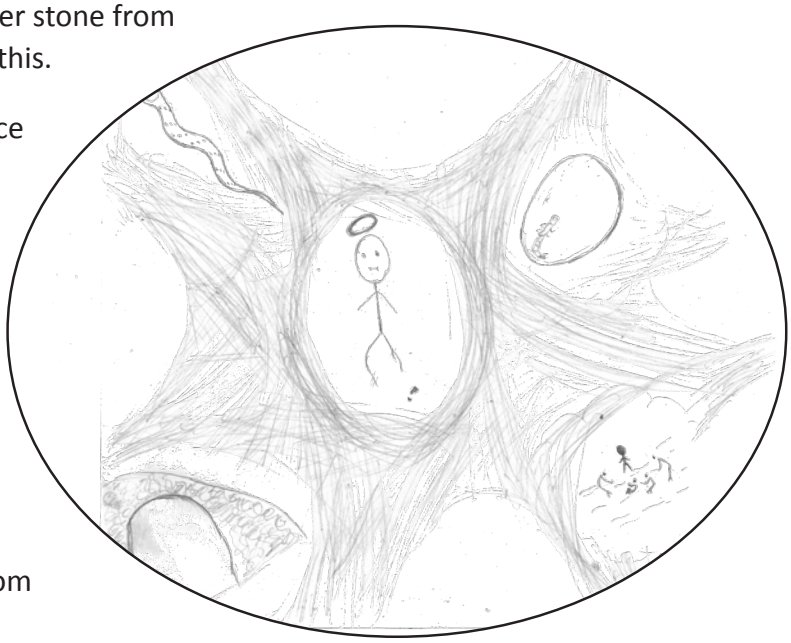
Tandrali Baruah, RHATC Fellow 2022–23,
Zoo Outreach Organisation, Coimbatore, TN, India.

This trip gave me a lot of lifers, from seeing golden mushrooms to seeing Malabar Pit Vipers both in captivity and in the wild. This drawing is an attempt to capture a few of my favourite travel memories as well as a few occurrences that left a profound impact on me.

The first thing that we did as soon as we reached the rainforest retreat was to have a splash battle in the stream in front of our cottage. The freezing stream water hardened and strengthened the bond between us.

I have seen videos of landslides before on news channels and social media. All the videos just showed the loss of homes and in a few cases the loss of the lives of people who had the misfortune of getting struck under the landslide. I never thought beyond this until I saw the site of a landslide that happened in 2018. The fact that trees and plants thrive only on the top soil of the land which is only about 1 or 2 feet was very shocking to me. Even though it has been almost 3-4 years since the event took place the site was still not able to recover its topsoil to date which means that there is no vegetation growing there too despite many attempts to change this.

Next comes the time we spent at a river about 3kms from the place we were staying. It was a really beautiful river which hasn't yet been polluted by humans. We jumped in and started playing in the river. The innate monkey gene instigated us to hold a stone-skipping competition. A small insect-like organism, later identified as a damselfly nymph, crept out of one of the river stones I had taken for this purpose. Discussions with Sanjay and Priyanka about this made me aware of the repercussions of the stone skipping and how I might be disrupting this ecosystem even if it is on a relatively small scale when compared to fishing using dynamites. I never lifted another stone from the river or the riverbank after this.



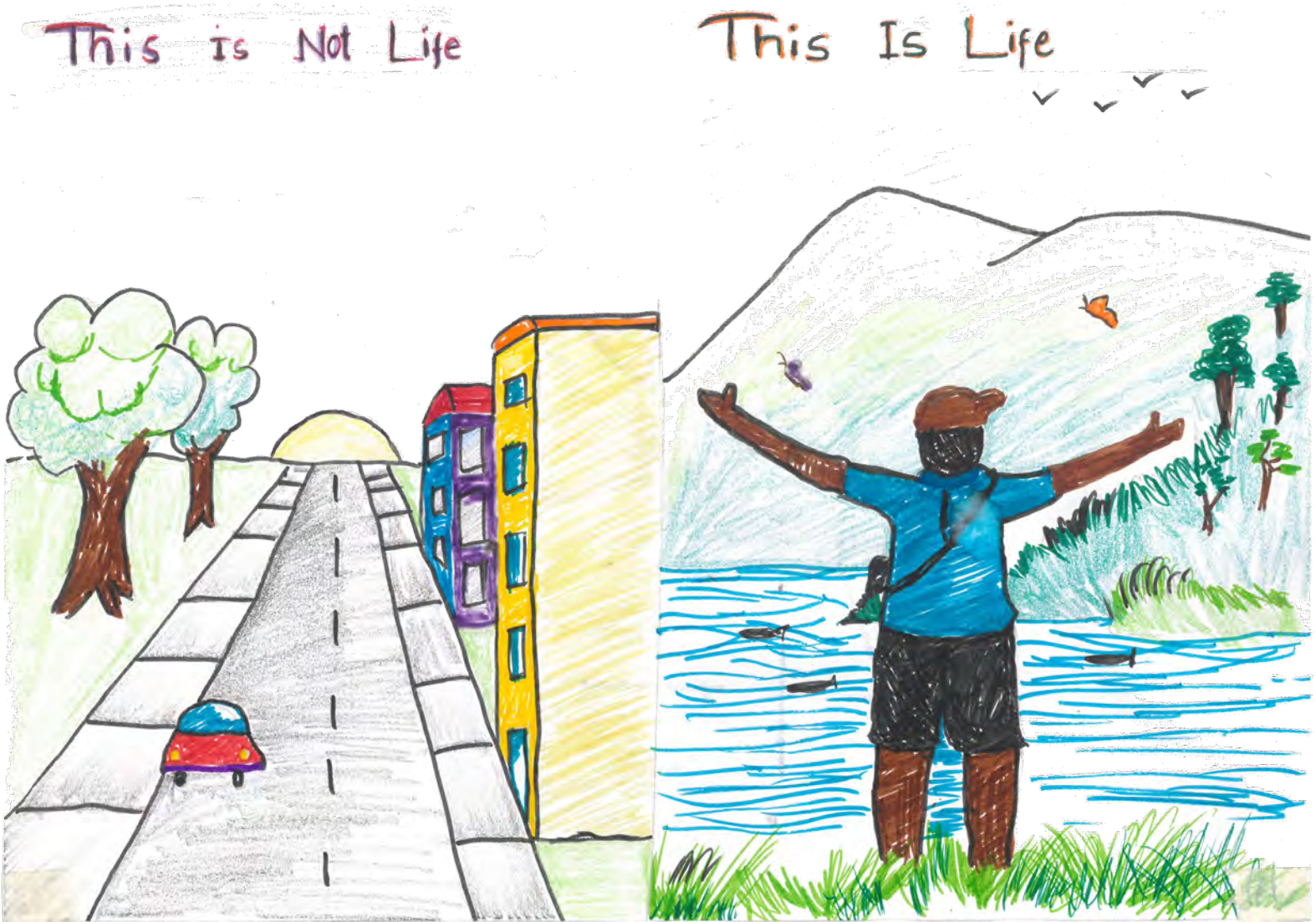
This trip also gave me the chance to see a Beddome's keelback with prey in its mouth for the first time.

I know that these incidents will now remain ingrained in my memory like an insect caught in a spider's web. I have tried illustrating these events inside of a funnel spider web, seeing which was also a lifer for me from this trip.

Swaathi, Na, RHATC Fellow 2022–23,
Zoo Outreach Organisation, Coimbatore, TN, India.

The city life is filled with daily chaos, hustle-bustle, pollution and city life is very busy, which I never liked. In this fieldtrip we RHATC fellows are spending some of our days in western ghat, where we got to know about the beauty of mother nature and learned many new things about nature which made me fall in love with nature again. Nature helps us to rid of stress and anxiety. It is hard to explain the power of nature in relieving my physical and mental stress. Nature is an open classroom where you can learn and know something new at every step. I tried to express my feelings in this illustration which I felt there.

Rajib Saha, RHATC Fellow 2022–23,
Zoo Outreach Organisation, Coimbatore, TN, India.



A field trip to remember

The Ram Hattikudur Advanced Training in Conservation 2022–23 fellows visited the island of Rameswaram and some other important locations to get some on-ground experience of the marine field under the watchful eyes of our mentors and with the assistance of H. Byju, an independent conservationist and Raveendran Natarajan, an electric engineer-turned-naturalist. There was a palpable feeling of excitement as we, clothed in lightweight fabric outfits, started our journey from Coimbatore to Rameswaram with a transition from dusty feet to sandy feet.

Home to the winged visitors

Our first stop was the Vettangudi Bird Sanctuary known for its winged visitors where the feathered flocks roost and nest on the trees. It is an ideal nesting place for larger-sized birds. When we reached the bird sanctuary the weather was pleasant and it was an awesome sight to watch the birds rise up and touch down the waters. We were fortunate to witness Asian Open Bill Stork, White Ibis, Oriental Darter, Intermediate Egret, Pond Heron, and Little Grebe.

The fellows were then divided into two teams to determine the abundance of birds at a particular site in the bird sanctuary. We were introduced to the point count method to survey the birds. A point count consists of standing in a specific location and counting birds. One counts the number of individual birds (of each

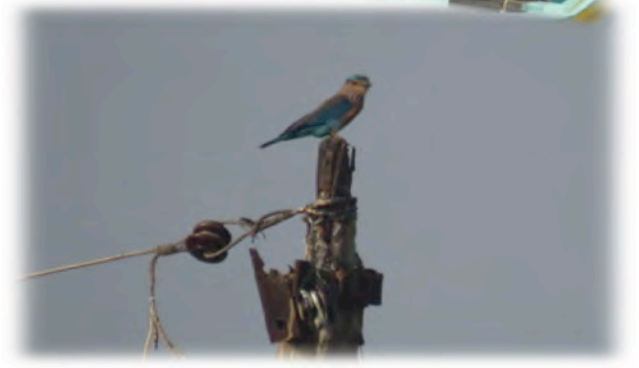
species) within a circle of a certain radius. We used the radius of the binocular for the point count method. The method was used to calculate the abundance of Black-headed Ibis, Oriental Darter, Asian Open Bill Storks, Little Cormorants, and Intermediate Egret.

To conclude, although we could observe eutrophication in the stagnant water body it was rejuvenating to just watch amid the natural greenery how the birds went about their busy business of feeding while we prepared to leave for our next destination an eco-tourism site.

Boating around eco-tourism site

Ready to explore the landscape we excitedly got down in Karangadu, a community-based eco-tourism site covering the mangrove forests of Ramanathapuram district. The Tamil Nadu Forest Department has formed an organization called the 'Environmental Development Committee in collaboration with the villagers of Karangadu. Through this organization 'Community Eco-Tourism' is organized and they provide facilities such as boating, kayaking, paddle boating, and snorkelling to see the creatures under the water. When we reached the place there were very few visitors and after some persuasion, we were allowed to go boating. On the pleasant boat trip, species such as Crested Tern, Brahminy Kite, Avicennia, Flying Fish, Hermit Crab, Sea Squirt, and some waders that wandered were a feast for the eyes.

Once the site visit was complete we drove to our accommodation at Uchipuli near Mandapam camp. Upon arrival, we started pitching our tents. The accommodation was owned by nature enthusiast and philatelist of Madurai, Raveendran Natarajan who has been working in the landscape of the Gulf of Mannar mostly on shore birds.



A companion of the winged birds

Raveendran runs the Iragukal Amritha Nature Trust which is based in Madurai and is currently working as a nature educator for the Uzhavan Foundation. Once we completed pitching our tents and had our dinner we all got together for his presentation. A few takeaways from our interaction with him are:

- *Most women are not encouraged to join the field of conservation. However, it is very important to teach them as they carry their knowledge for around three generations.*
- *Zoology should not be made a textbook subject and more fieldwork should be included in the course.*
- *Along with students, it is equally important is to reach out to the teachers, who in turn can spread the message to a large number of youngsters.*
- *In 1978, there were more than 170 birds in Madurai. Recently, they have recorded around 272 birds based on regular monitoring and constant efforts.*
- *Different techniques like Shadow puppetry can be used to teach students the identification of birds.*
- *He along with Byju was instrumental in establishing a plastic checkpoint before the proposed bird sanctuary in Dhanuskodi to combat plastic pollution.*

The presentation ended with Byju explaining through a map, our present location and where we will be traveling to in the next four days after which we mentally wined down ourselves from the day and prepared for a restful night's sleep.

A cyclone hit town

The first location for the next day that is day two was Dhanuskodi. It was a picturesque place to be, there's an eeriness to the fact that what once used to be a town so significant, is nothing more than a ruin now. It is no more than history now, thanks to a cyclone that took place in the year 1964. It destroyed everything, and what remains now is a sandy shoreline with ruins dating back to those days. The only residents of this island are now fishermen folk that are spread across the place. It is also a paradise for birders for its population of migratory birds that fly from different countries. Therefore, it has been proposed as a bird sanctuary. The birds along with other species seen on our way to that place were Slender-Billed Gull, Brown-headed Gull, Crested Tern, Little Cormorant, Little & Intermediate Egrets, and lizards.

On the way to the ghost town, we stopped at a fishing site where we for the first time saw bycatch- the incidental capture of non-target species during fishing. A staggering amount of marine life- including jellyfishes and crabs were hauled up with the catch and then discarded.

Although that sight was disheartening nonetheless, it was also interesting to watch and understand the dynamics of people working and how the pricing for a pomfret caught in the catch skyrocketed in such a short period of time. We with a heavy heart left for our final destination Arichal Munai- the endpoint of the Indian mainland. The road leading to the endpoint was artificially constructed by levelling up the sand bar which are moving spaces just like the sand dunes found in a desert. Once we reached we all stood there and gazed at the ocean on all sides while the wind tried to toss us away. We also got to see the Pamban Railway Bridge that connects the town of Mandapam to Rameswaram; Palk Strait, the inlet of the Bay of

Bengal between southeastern India and northern Sri Lanka, and the Kodhandaramar Temple from afar.

We bid adieu to the cyclone-hit coastal charm Dhanuskodi and in the evening we proceeded to our next adventure which was a visit to meet the eight-legged creature - the tarantulas.

Visit to the humble abode of the Tarantula burrows

The world of tarantulas was exposed to us during our visit to the Mysore Zoo when we spotted the Regal Parachute Spider, a Poecilotheria regalis tarantula. Also, more insights and in-depth knowledge about different species of tarantulas were learnt by us during our sessions on IUCN Red List Assessments. One such species was Poecilotheria hanumavilasumica*, a Critically Endangered tarantula species, endemic to Rameswaram Island, which was extensively studied by The Wildlife Information and Liaison Development (WILD) Society and Zoo Outreach Organisation (ZOO). They have been instrumental in understanding the distribution, habitat association, ecology, behavior, abundance, and threats of* Poecilotheria hanumavilasumica *on Rameswaram Island, Tamil Nadu.* Poecilotheria hanumavilasumica *also commonly known as Rameshwaram Parachute Spider is now restricted to a few tamarind, casuarina, and mixed dry deciduous trees and palm plantations on the island of Rameshwaram and on the mainland close to the island.*

We got the opportunity to visit one of the study sites in which Drs. Manju Siliwal, Sanjay Molur, B.A. Daniel, and Mr. B. Ravichandran conducted their study. The site was the Hanumavilasum Temple Grove; a sacred grove undisturbed and

well-protected by the Rameshwaram Temple trust, a type locality for P. hanumavilasumica *species. The grove consists mostly of tamarind trees that are more than 50 years old. There are certain instructions that we needed to follow while visiting a tarantula site.*

Mentioned below are the instructions we followed before visiting the grove:

- *We should not stomp our legs and walk as tarantulas are very sensitive to vibrations.*
- *To prevent us from getting lost in the wilderness and the darkness the fellows were divided into a group of two.*
- *We were told to be silent and behave as the villagers are superstitious about the tarantulas and by our behaviour we should not aggravate the antagonism against the tarantulas.*

We started our trail and all ten fellows were lucky to sight for their first time Poecilotheria hanumavilasumica a light and dark brown striped tarantula with yellow colouration on the underside of the front legs. Few findings during our trail in the Hanumavilasum Temple Grove were:

- *Approximately, 35 individuals were spotted by the team during the whole trail, some spotted inside or on the tamarind trees while others were sighted in the fallen trees.*
- *Mostly females and juveniles were spotted during the trail. The females were 7–8 inches in length. No male was observed during our visit in that area.*
- *No males were encountered mainly because they were wanderers and do not have permanent burrows or maybe the females might have devoured the males after mating. Females on the other hand were sighted more during our trail near the burrows as they*

mostly remain in the burrows throughout their life.

- *The increase in juvenile spotting was due to the completion of the breeding seasons along with the hatching of the eggs which mostly takes place around the months of July to October.*

Besides, Rameshwaram Parachute Spider we spotted a black widow spider, geckos, wolf snake, bullfrogs and many more. The black widow was easily identified by its characteristic shiny black body and strikingly red hourglass-shaped marking on the abdomen. Also, a very funny sighting which we suspect was of palm civet. As we started moving back to the entrance we spotted the last beauty of the day a giant tarantula. The abdomen was huge and the yellow coloration was such a sight to behold. We then finally moved out of the spider heaven, which also marked the end of our adventures for the second day in Rameswaram.

Visit to the place with 'No' Birds

Day three started early as we were to travel even south to Rameshwaram towards Tuticorin, about 80 km to a place called Valinokkam, a salt pan site in Ramanathapuram district. Earlier the place was used to break ships however, now they have transformed into salt pans. Before looking through the binoculars we saw some 3-4 Brahminy Kite and thought there were only those few birds in the landscape but once the binoculars were on we saw hundreds of waders perfectly camouflaging with their surroundings, almost not visible from the naked eye. We spotted the greater and lesser Sand Plover, Kentish Plover, Redshank, and Greenshank during our visit. As we headed towards a nearby wetland in Valinokkam, known as Brahmankullam which holds the water for salt pan for salt production. The land was full of gastropod shells that too very tiny ones, which was odd to be in a wetland, later we got know that water from the sea gets pumped there to

extract salt, and with it comes all these shells. We stopped at an area where Raveendran stealthily moved to capture the shore birds. We all sat on the ground and tried to imitate him while Byju crawled closer to him. Raveendran then narrated his Maya flamingo story- the story of the flamingo, whose picture he wanted to capture but ended up getting stuck in the quicksand.

The salt pan walk with us was also joined by Somu prasad a forest guard in charge of that area. He narrated stories about the challenges of being in that job, the illegal trade of wildlife species like sea cucumbers, and the consequences of taking the right action.

Our main motive to visit the salt pan was to spot a flamingo. Nevertheless not being able to see that bird was compensated by the spotting of a majestic Peregrine Falcon and several waders, the Barn Swallow and the Palm Swift beautifully flying above our heads. With smiling faces, we moved towards our next location a turtle hatchery.

Visit to our flippered friends hatchery

Somu Prasad was more than happy to take us to a forest department turtle hatchery. It gave us an opportunity to understand and observe the nesting and hatching process of the turtl and how things work on- the ground. Murugavel and M. Selvam, anti-poaching watchers (APWs), who have released around 50,000 hatchings till now briefly spoke to us about their duties and the hatchery process.

- *The turtle comes to the shore and digs around a foot-deep hole and lays 80 to 150 eggs and closes the hole. Turtles are also responsible for making some false mounts to confuse any potential predators.*
- *The anti-poaching watchers identify the nest sites based on turtle tracks. They cover a 7 km stretch along the coastline early in the morning to check if any turtle has laid any eggs and there were a total of 23 APWs in that region.*
- *The eggs of the turtle are jelly-like when they are fresh so in that state they have to make the transfer from the nesting site to the hatchery.*
- *They take measurements of the nest- the depth, width, length temperate and try to replicate it as precisely as possible. They collect the sand in the nest to fill it up in the hatchery and cover the nest with some sheets.*
- *Dogs and humans are the main threat to turtle eggs and hatchlings nowadays, humans because of hunting and disorientation of light to the hatchling*
- *The highest number of turtle nesting happens in March and hatchings are usually released in the early mornings between 4 to 6 A.M. but they also told us that they are observing a change in the laying season in turtles - it getting a bit early.*

They discussed the change in perceptions of the fishermen's community about turtles and their eggs over time. It was fascinating to understand that they now encourage their relatives and villagers, who have also become informers, to protect the turtle eggs. It was then time to have fun at the beach but little did we know what awaited us.

SO-CALLED 'DISCARDS'

We got to a place near the landing centre where the sight was disheartening – heaps and heaps of what local fishermen called 'discards' was present just in front of us. In those discards were different species of gastropods, bivalves, crabs, corals, sea horses, and sea dollars. There were rotting corpses of puffer fishes, sea cucumbers, and sea urchins. Priyanka Iyer informed us the discards collected were from a bottom net. This serious issue needs to be addressed but it has different complications. To ease our minds we all went to the beach.

Fun at the beach

As we started walking towards the beach near the landing site, we saw boats and gillnets in the sea. The sea out there had a very different structure as the shelf was not too deep maybe around few meters and even an elevation (sand bank) could be found in the middle. The floor was very different as it had seagrass. The whole experience was refreshing and was the ideal gateway for the end of our day three.

Community interaction

On day four we went to the village of Chinnapallam situated close to the Gulf of Mannar Marine National Park where we met Mrs. Lakshmi Murthy, the local counsellor and Seacology prize winner. She shared stories and discussed with us the change in the sea-scape

over three generations. For instance, earlier the fishing boats used were row boats however, now they have shifted to motor boats. A few insights from our interaction with her are.

1. *There has been a shift from exploitive fishing to sustainable forms and how she was instrumental in setting up the process. To safeguard the resource and sustain their livelihood the local communities gave break from fishing a few days a month – 6 days they go for fishing 9 they take a break, and that cycle is repeated.*
2. *During her childhood days, the community was able to visit the Kurusadai island and used to live there for about fifteen days and then come back to the main Rameshwaram island, back then the islands were in control of the fishery department, but since the control change to Forest department they are not allowed to go to the islands and also because of the marine protected area that came in 1986.*
3. *In 2020–2022 the death of fish due to algal blooms reduced the seaweed quality.*
4. *The species of seaweeds they harvest in their local names and their utilization are as follows: Kanji – used in food; Marikolunthu – used in food; Kalathankora – for dye; Karakam – for dye and Verr pasi – for food but the exact cause is not known to the community.*
5. *The dried seaweed is processed in the factories to be used for different industries. Around 200 kg of seaweed has to be processed to get 7–8 kg of agar. The communities does the initial processing in their village and then send it for further processing industries in Madurai which is then exported internationally.*
6. *The community doesn't go in the places of the corals because they have a basic*

understanding of their importance and the effects they have on their fishing nets, also sea weed collectors have been attacked by marine fauna near those areas. She was also active in agreeing to recognise the Gulf of Mannar seaweed collectors as a unique group of women fishers and the utilization the prize money in establishing schools for the children in that community.

Lakshmi and her community's story is a perfect example to show that no one is too small to bring an impactful change in their community. After the interaction, it was time for us to walk towards the sea and explore the marine inhabitants present in that area.

Sea walk - exploring the marine world

The group went into the sea at low tide; for a long walk where the sea floor was covered with sea grass. It felt like we were going on a stroll alongside stunning aquatic creatures. The walk was slow and careful as the sea bottom was muddy and knee-deep at times. Nonetheless, the rich marine biodiversity that was spotted includes two different species of sea cucumbers, sea hare, sea lotus, crabs, hermit crabs, gastropods, big bivalves, seaweeds, algae, egg cases, starfish, mantis shrimps made our day. The species seen were lifers for many of us and the practical knowledge of different species like the tube feet of starfish and sea cucumber helped us deepen our knowledge about the marine world and its inhabitants. We also got to understand from Dr. Sanjay Molur the importance of sea cucumber role in the nutrient cycling of the sea bed. Overall, walking on our own feet under the sea and touching and capturing the aquatic life was indeed a charming and exciting activity.

Visit to a marine interpretation centre

In the evening the group visited the interpretation centre beside the Vivekananda memorial located in Kunthukal village in Pamban, Rameswaram. The interpretation centre showcased various marine species found in the Gulf of Mannar along with appropriate information and catchy illustrations. However, the information when double-checked was copied from Wikipedia. But the good part about the centre was, on the entrance a structural representation of Olive Ridley Turtles, the smallest and most abundant of sea turtles along with their threats was engaging to catch every tourist's attention. The group then moved out to a not-so-crowded beach nearby and saw the bivalves with their muscular foot in action, along with shore grasses. The captivating depictions in the illustration centre along with the beach experience made this place worth going to.

All good things come to an end

On the last day, we started our journey back to Coimbatore and on our way, we stopped at Therthangal Bird Sanctuary. We used a watch tower with two stories to spot Pelican, Storks, Glossy Ibises, Lapwings, Purple Heron, Barn Swallows, and others in the vegetation. As the temperature got hotter we scrambled back into our cars and got on our way. In transit, we also got to taste one of the signature desserts of Madurai—Jigarthanda! As all good things come to an end the field trip might have ended but the memories, knowledge, and lessons learnt will always remain etched in our hearts.

Conclusion

The focus for the RHATC batch 2022–23 has been marine ecosystem, wildlife, and its different aspects. Although, we were privileged to see a lot of diversity which we had not seen

before but, we also saw because of people using the landscape there has been an increase in the number of invasive and we were also exposed to the sad reality of bycatch. Therefore, it is a vastly changing landscape and will continue to do so if we do not start taking action. Also, the field trip enabled us to gain invaluable experience working in the marine system whilst exploring different marine species. We were also treated to some bonus wildlife encounters. To recapitulate, the field trip was indeed a trip to remember and in the long run, the experience of the trip will help to inspire us, the budding conservationists to continue working in this field.

Acknowledgments

Our wonderful experiences on field trips were made possible through the vision and planning of the RHATC core team. We extend our deepest gratitude to Dr. Sanjay Molur for showing us the path to scientific conservation and sparking a sense of discovery within us. We would also like to thank Raveendran for giving us the opportunity to interact with local communities, forest officials and H. Byju for being there with us, for providing information and assistance on various aspects of marine conservation. Also, Payal B. Molur, for educating us on the nuances of conservation, Sarojamma, for ensuring we don't miss home, and B. Ravichandran for giving us the opportunity to use his photos for this report and for being the backbone of our team. We would also like to thank Priyanka Iyer and Usha Ravindran, for increasing our appreciation of the natural world and Trisa Bhattacharjee for being our support system. And finally we would like to thank Latha, Geetha and Radhika for helping us tie loose ends together.

Tandrali Baruah, P. Kritika, Rajib Saha, Lakshmi Ravinder Nair, Melito Pinto, Aishwarya S Kumar, Swaathi Na, Pooja Ramdas Patil, Akansha Mishra & Soham Parnaik, RHATC Fellows 2022–23, Zoo Outreach Organisation, Coimbatore, TN, India.

The SACON Report

Day 1 at SACON

On the 5th of December 2022, the RHATC team visited the Salim Ali Centre for Ornithology and Natural History (SACON), Anaikatty, Coimbatore. As we entered the campus, shrubs and trees, chirping birds, and freely roaming chitals welcomed us. After making our official entry into the institute building, we gathered at a meeting hall with Dr. H.N. Kumara moderating the lectures. The first one to address was Dr. Aditi Mukherjee. As scientist who had recently joined SACON as a faculty, Dr. Aditi introduced to us SACON. From talking about the campus' unique location, architecture, and the biodiversity that it holds, she gave us a brief introduction of the institute and its people. She then mentioned some of the species that the institute is/has been working on, for example, Edible nest swiftlet, lesser florican, Hornbills in southern India, conservation plans for Important Bird and Biodiversity Area along with their collaborators and MoU partners.

Soon, she introduced us to her study where she took us through the secret lives of elusive burrowing animals - pythons and porcupines, a study which was based in Keoladeo National Park in Rajasthan. Before delving into the topic, she briefly explained us the history and the current status of the site. Her study was aimed to locate these burrows, know the factors allowing them to use these places, and to understand the animals' activity pattern around these burrows. It showed how the two burrowers, along with others, coexist in and around the burrow.

Apart from this, she also threw light on the burrowing categories an animal is categorized into, based on its extent of burrow usage, for e.g., porcupines use it the most and are found inside, thus making them the primary users. Similarly, the jackals and hyenas are secondary and tertiary users, since

they use the burrow's periphery and further. All of them, are known to form a winter month congregation. To observe these otherwise 'blind to our eye' behaviour of burrowing animals, she had made use of a specially customized burrow video camera unit. This opened our eyes on how technology can be tweaked to suit our study style/ objectives. There were many failed attempts of their video cameras being destroyed by animals, stolen by people, and being stuck in burrows. However, none of these deterred them from experimenting further. True, they did have enough funds which gave them the opportunity to experiment, but their perseverance and adaptability to situations deserve applause. Apart from the video camera studies, she mentioned about the changing basking patterns of the Indian rock python due to the anthropogenic changes. She also spoke about her independent research on the invasive *Prosopis juliflora* in Keoladeo National Park.

Next scientist who addressed us was Dr. Rajah Jayapal, a senior principal scientist at the institute. He delivered a talk on one of his recent projects on the survey of house sparrows in modified human habitats.
In Europe, with the help of citizen scientists, sparrow species population had shown bad decline. It showed how anthropogenic events like industrial revolution, spur in pesticide usage and use of unleaded petrol had all spearheaded the decline of this bird. Inspired by this study, Dr. Jayapal and his team did a similar survey assessment in India, over a span of three years. The study found high populations of these in rural and semi-urban spaces. It also reiterated the fact that the birds species is synanthropic and cannot live without humans. However, there was a fall in the population was observed owing to reasons like electro magnetic radiation.

The talk was a door to a lot of information and opened our eyes on the diverse threats to house sparrows. However, later on, a discussion on the nativity of this species was raised by Dr. Sanjay Molur. This made us think if bird is actually worth the rescue and attention.

Followed by him, post a scrumptious lunch at the SACON mess hall, Dr. Ankita Bhattacharya, a scientist working in the Trans Himalayan landscape, talking to us. She explained us the project she had taken up under the Biodiversity Conservation and Rural Livelihood (BCRLIP), funded by the World Bank. First she familiarized us to the study site, the common mammals there and then explained the study. A unique methodology called the vantage point count, a method they had improvised from another study done in Ladakh, was used. It follows a point count with an only difference that it is done standing on an elevation and moving 360 to sight the target animals.
She also threw light on the innumerable threats to the species as well as the landscape which included people collecting caterpillar fungus (believed to be an aphrodisiac), logging, poaching, poor

infrastructure planning amongst others. She also talked about pastoralism which also is believed to be one of the threats on the ungulates there. Thus, she explained the importance of shifting focus from species centric conservation to integrated landscape vision.

What followed next was an exploration of the state of Odisha. Dr. Bibhu P Panda took us through a visual tour of the landscapes of Odisha and the biodiversity it holds. He gave a very brief mention of the avian composition and the different protected areas (like Simplipal, Satkosia Gorge) of the state. He also mentioned of the various conservation efforts carried out there like the vulture breeding at Nandankanan and birds of Chilika, but no elaborate discussion was done on the same. Dr. Bibhu mentioned of the Odisha being house to big names like the Bhitarkanika and Bangagehana. The former is a crocodile paradise (and also a Ramsar site), while the latter is Asia's largest heronry with being the roosting site to a plethora of bird species. He also talked high of the Mighty Mangaljodi which is a swamp area in the state and how it has been losing its charm and the efforts being taken to revive it. In the talk, he mentioned of the importance of community conservation too. To know that poachers had turned allies in conservation felt like an achievement. However, he also said that they may also be feigning conservation and probably have vested interests. He also mentioned of tourism being a major threat despite causing a growth in the economy. However, this later lead to an abrupt end of the discussion to solutions narrowed to just awareness spreading.

After a series a lecture, our first day ended with a long walk through the sprawling campus of SACON. Ms. Sowmya, a nature educator working with the institute and Siddhesh, a project associate, guided the trail walk. Unfortunately, all through the trails, most plants we saw were invasive. Though we did come across some native species, but they were horrendously outcompeted by the sheer number of the invasives. We hope the institute takes an initiative to manage this invasive menace in its backyard and apply the same across the country.

Day 2 at SACON

More enthusiastic than the previous day, we entered the campus and soon sat for the first talk of the day. Next was Dr. Shomita Mukherjee. A wild cat specialist with over three decades of experience, Dr. Shomita is a senior principal scientist at SACON. Knowing that her audience were from diverse fields, she delivered her lecture in the easiest way possible with relatable examples. This made it rather simple to understand the movement of cat jaw movement where she compared them to a

good pair of scissors. Since fixed properly, the lower jaw of cats is immovable unlike ours and can cut smoothly through meat.

It was fascinating to know that cats had colonized India and had gradually established themselves at their current regions as they were palatable to their needs. She also shared some other very interesting facts. For example, variation in spots of leopard from place to place. Leopards in India have pale, small rosettes while those found in Sunda have small spots. Similarly, she pointed out the change in the length of the tail of cats according to the habitats they live in. While we briefly discussed the various morphological features (like dentition), habitats and movement of wild cats, some information were more fascinating to learn like leopards not being able to digest their prey's jaws and thus releasing it with their faeces. This in turn helps in identifying the prey composition of these wild cats. Talking about diet, we learnt that cats cannot generally taste sweet.

Not leaving behind one of the main stakeholders of conservation, that is communities, our next talk was on community conservation areas. Talking about communities and their role in conservation, Dr. P.V. Karunakaran, senior principal scientist at the institute, took us through the community reserves of Meghalaya. After giving an overview of what protected areas are and their very brief history, he talked about the various traditional actions of conservation, for example, sacred groves, sthala vriksha, and how they have been successful ways of conservation. Elaborating on these community conserved areas, he explained what they are and how they work. With an emphasis on community reserves of Meghalaya, he mentioned how most tribes found here have reserves. Additionally, he reiterated that these areas possess numerous endemic flora and fauna.

Otters made the next entry. An honorary fellow at University of KwaZulu-Natal, and also a scientist at SACON, Dr. Riddhika Ramesh gave a lecture on how otters act as indicators of freshwater ecosystem health.

She elaborated the study she and her team had conducted on the species in the Kaveri basin. They had used a variety of methodologies to collect evidence like tracks, faeces, camera trap etc. We thus got introduced to some unique methods that could be used in the freshwater ecosystem, for example, Secchi's disk to measure light penetration. Apart from the various results she found in their study, she also shared some bizarre observations of having seen otters in water tanks (which even Dr. Riddhika is unsure of how it happened). She also did a comparison between the two locations where otters were found: Tungabhadra and Coimbatore. So did she highlight the numerous threats to these animals including hydroelectric power plants, sand mining, and poaching.

Beginning with an introduction to conservation biology, Dr. Shirish Manchi graced the next talk. He gradually built on the foundation for successful conservation. He highlighted that the job of researchers does not end with proposing recommendations in scientific papers, whereas it only begins with that. He emphasized that in conservation, it is impossible to ignore the policy makers. Communication is the key. It is important that the problems be communicated to them in a way they understand. Thus, he requested every conservationist to know the policy process, regardless of one being not interested in it. He put forth a lot of suggestions which could help in better conservation action implementation. Firstly, be clear with what you want to covey to the policy makers, respect time, publish, be open to experiences and learn from them and not to waste time studying species which is thriving well. Apart from these, what he specifically mentions about is to listen to one's intuition, holistically approach a problem and promise commitment to the field.

Building on all this, he finally talked about his study species, whom he has been working on for over 20 years- the edible nest swiftlet. He shared the joys and challenges of having worked with the species and communities. Soon followed Praphul Gopal's talk on Wildlife crime. Though not a scheduled talk, but it turned out to be a majority of fellows only lecture where everyone was on the ball. For obvious reasons, we were discouraged from clicking pictures. The facts shared about how wildlife crime and poaching happen so rampantly on the sly was not surprising. He also shared experiences of failed and successful stories of catching the accused in wildlife poaching cases.

Given the stipulated time we had in hand for the day, Dr. H.N. Kumara shared with us the story of how he got introduced to slender lorises. He also shared snippets from his journey. Also, he briefly explained about slender lorises of India, its status and the conservation efforts on it. The evening ended with a final Q/A session with Dr. Kumara and Dr. Manchi. After a fruitful discussion on various topics, we finally bid farewell to the institute and its people but carried back a lot of memories and enriched knowledge.

Acknowledgements
I thank Pooja Patil, Akansha Mishra, Lakshmi Nair, and Tandrali Baruah for their help and input in the report. I thank SACON for giving us the opportunity to interact with one of the greatest scientists of the country. I am always indebted to Dr. Sanjay Molur for making me a part of RHATC.

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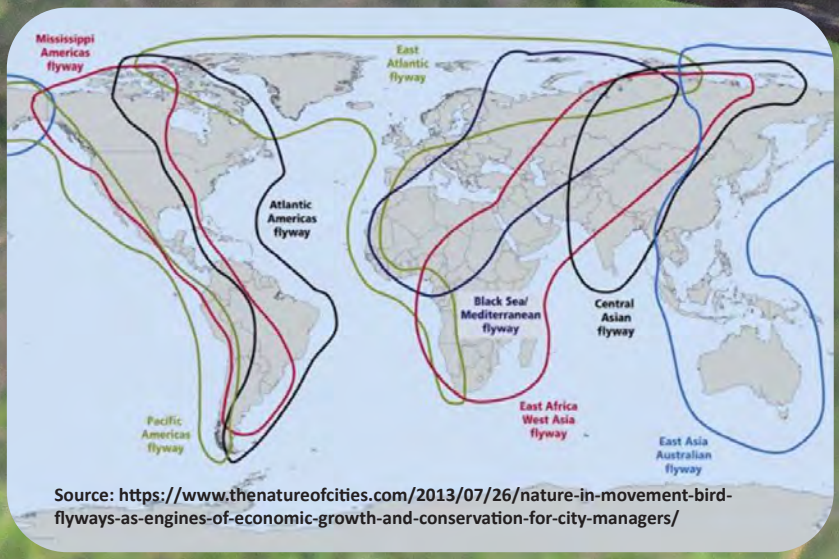

Source: https://www.thenatureofcities.com/2013/07/26/nature-in-movement-bird-flyways-as-engines-of-economic-growth-and-conservation-for-city-managers/

Black-headed Ibises and a juvenile Open-billed Stork.

Birds of different feathers

The RHATC trip to Rameshwaram was a visual treat - for the landscapes and the variety of birds. Over the course of our drives from one point to another, we stopped at every occasion to view flocks of birds – either resident or migratory, that one of us had identified with the trail of cars stepping out enthusiastically with binoculars and cameras.

Our first stop was the Vettankudy Bird Sanctuary, located in Sivaganga district. The sanctuary is a protected area consisting of small drainage basins which attract more than 8,000 winter migratory birds belonging to 217 species, mostly from European and North Asian countries. It is a breeding habitat for Grey Herons, darters, spoonbills, White Ibis, Asian Openbill Stork, and Night Herons. Over here, we also saw species like the Grey Heron, Oriental Darter, Little Cormorant, Little Egret, and Cattle Egret.

Understanding why these birds are present where they are calls for a brief lesson on bird ecology and the various flyways of the world.

Flyways are geographical regions within which a single or a group of migratory species completes its annual cycle – breeding, moulting, staging, and non-breeding. Flyways provide spatial frameworks for management and conservation across international borders. During the months of October to February, one gets to see these migratory birds. In the southeastern region of Tamil Nadu, birds like cormorants, openbills, darters, ibises, frequent the coastal areas. Other migratory species include the Black-necked Crane, Indian Skimmer, Lesser Adjutant, Masked Finfoot, Wood Snipe, Black-headed Ibis, Lesser Flamingo, Pygmy Cormorant, White-eyed Gull, Northern Bald Ibis, White-bellied Heron, and others. The state of Tamil Nadu is situated in the Central Asian flyway, which means that apart from Sri Lanka, it is one of the southernmost land masses that birds can visit in the migratory season.

Birds are key indicators of ecological and environmental changes. Some of the direct responses to environmental changes are behavioral and physiological manifesting as changes in the characteristics of the individual. Like a domino effect, the basic population rates: birth rate, death rate, and rate of dispersal are affected. Changes in these three primary population parameters then create changes in secondary population parameters such as density, population size, geographic range, habitat occupancy, age structure, sex ratios, or the proportion of birds that breed (Temple & Wiens 1989).

In the case of migratory birds, identifying movement routes and stopover sites is necessary for developing effective management and conservation strategies for migratory species. India is located at the heart of Central Asian Flyway (CAF) and hosts about 71

per cent of the migratory waterbirds of the CAF. India's wetlands play a crucial and conducive role in sustaining populations of migrating waterbird species which makes sustaining the health of these habitats crucial for maintaining the waterbird populations within the CAF.

Conservation of migratory waterbirds and wetlands has received considerable attention in national policy-making and programmes, as well as international commitments. However, much remains to be done for ensuring a healthy network of wetlands and securing healthy populations of migratory waterbirds in India and the CAF region. Being a signatory to several international conventions which directly or indirectly support wetlands and waterbird conservation is one of the routes taken towards conservation. Key amongst these is the Convention on Wetlands (Ramsar Convention), the Convention on the Conservation of Migratory Species of Wild Animals (CMS), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on Biological Diversity (CBD). (The Journal of Governance 2019).

We come back to the birds on our trip …

Our second bird stop was the proposed bird sanctuary on the way to Arichal Munai, the tip of the Rameshwaram island. The sanctuary was yet to be named; some contenders were Kothandaramar Bird Sanctuary and Rameshwaram Bird Sanctuay. During the north-east monsoon season which falls between October to January, various water birds migrate to these areas. In the shallow waters, we spotted the Slender-billed Gull, Brown-headed Gull, some plovers and stints, and lesser crested terns.

Valinokkam, a salt pan area was another proposed bird sanctuary that we visited. It used to be a paddy cultivation. The terrain was made up of dried-up algae mats with pockets of loose, marshy sand. The location is where Pink Flamingos visit but unfortunately, we couldn't catch the sight of them. We saw about 3,000 wader birds instead. Through Usha's macro lens, we saw the salt crystal patterns on the ground as well. Simply splendid.

The final stop was at the Therthankgal Bird Sanctuary, situated in Ramanathapuram. Most of these offbeat bird sanctuaries have a watch tower with two storeys to adjust viewing levels. The birds we spotted were a Honey Buzzard, Purple Herons, Pond Herons, Glossy Ibises, Cattle Egrets, water snakes and a pelican, gliding smoothly before our eyes before disappearing in the groves.

The importance of protecting these paths and habitats cannot be emphasised enough. Migration is an adaptation mechanism which helps birds overcome weather adversities from their places of origin and secure easier access to food and resources. Wetlands, terrestrial habitats, river beds, sand banks are all areas where migratory birds frequent.

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Acknowledgements

I thank H. Byju and Raveendran Natarajan, our main bird guides on the Rameshwaram trip. They have dedicated a significant portion of their time and effort in educating bird enthusiasts like me and continue to do so.

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Parachuting in pitch darkness

"A hairy venomous creature with eight legs lives in that tamarind grove, climbing and waiting for the right moment, hiding in the burrow of a tree, when you get close, it deliberately pounces, attaches itself to your neck and that will be your last day". – Fictional grandmother from Aryagundur village.

That afternoon Sanjay and Ravi, our mentors, were missing from our group, they had gone to the tamarind grove in Aryagundur Village in Rameshwaram to ask permission for the Ram Hattikudur Advanced Trainng in Conservation batch 2022–23, which I am very proud to be part of, to visit and survey the place for tarantulas, specifically the Rameshwaram Parachute Spider *Poecilotheria hanumavilasumica*, an old world arboreal theraphosid spider. When they returned my heart was beating fast, I was very excited because permission was approved, I was going to the tamarind grove, I was also unsure if we would be able to spot the arachnid because they reside in burrows high on the tree. On the evening before Christmas at 1830 h, we were instructed to carry torches and cameras. We boarded four cars and adjusted our seats and our minds to get prepared for a dopamine rush. But on the Pamban bridge, we were stuck in a traffic jam. I looked at the time it was 1900 h, I wish I could just run, I was feeling restless. Finally, we reached the grove enveloped by the night sky, an eerie first experience for me. Sanjay and Ravi led the path to the grove and when they opened the gate, my heart was Bolting.

We started our trail by pairing up. It was pitch dark, the dried leaves rustled with each footstep, anticipation was building up. Everyone was thoroughly scrutinizing each tree each branch. I am trying to tip toe and see as high as I can. As I was trying to look up, I was missing out on biodiversity right under our feet, other spotted and called my attention toward tiger beetles, millipedes, and two species of frogs Banded Bull frog *Kaloula pulchra* and Ornate narrow-mouthed frog *Microhyla ornata*.

From a distance I could see everyone gather around a tree; tarantulas are sensitive to vibrations so I tried to move fast but carefully, but it was a whip scorpion. Then a little later, with enthusiasm Sanjay called us close to him, everything became still and silent, there were no thoughts for a brief moment. The lesser-known but magnificent Critically Endangered Tarantula, the Rameshwaram Parachute Spider was peeking, with its fangs clearly visible from a webbed burrow of a Tamarind tree *Tamarindus indica*. The tree looked like it was hosting a rare exhibit with pride and confidence. Pointing our torchlights at the tarantula, we waited for it to ambush an unsuspecting prey at the mouth of the burrow. The tarantula was actually least bothered about us around it. Then Rajib Saha, one of the fellow mates, spotted an elegant wolf snake as it glid past gracefully along the bark.

We were privileged to witness 35–40 tarantulas, adults and juveniles. Sanjay explained to us some of its behaviours and recalled his experiences with tarantulas in different locations. We listened to Ravi share his experiences from the past surveys with Manju Siliwal in the mid 2000s, initial days when much data was available, the duo had courageously surveyed such pitch-dark places to gather data over several seasons. In general, Juveniles were about 2 inches and adult tarantulas were approximately 3–3.5 inches in length. We also spotted puff balls, the fruiting body of fungus, a stick insect, black widow spiders, and a palm civet cat.

I felt content with such a unique experience, I made a photo memory to be stored in my pensieve of memories. I enjoyed the trail to be remembered for a lifetime. This experience was about connection, a connection with an arachnid; this Rameshwaram Parachute Spider will act as a symbol which will take me close to conservation. I will visit this memory whenever I feel disconnected or doubtful.

Soham Parnaik, RHATC Fellow 2022–23,
Zoo Outreach Organisation, Coimbatore, TN, India.

Little Olives, coming alive...

On the 25th of December, we RHATC fellows got an opportunity to visit and observe the turtle hatchery near Kadaladi-Mundal village at 9.1416° N, 78.5913° E in Tamil Nadu at noon. The forest guard from Ervadi village, Ramnathpuram District, Mr. Somu Prasad, navigated us to reach there. The hatchery is managed by the local forest department, and well-managed and taken care of by staff Mr. Selvam and Mr. Murugavel, they are officially appointed by the forest department as the Anti-poaching wardens (APW). They contribute to the conservation of the Olive Ridley *Lepidochelys olivacea* species also commonly known as the Pacific Ridley Sea turtle which is one out of five turtle species in India.

Background

The smallest and most prevalent marine turtle is the Olive Ridley (*Lepidochelys olivacea*), Its shell has an olive-green shade, which gave rise to this name. This turtle can reach a length of 80 cm and weighs less than 50 kg. Females have a little more rounded carapace than males, although they both reach the same size as adults. The Olive Ridley Turtle has five to nine pairs of costal scutes and a pair of claws may be seen on each flipper. Males have a pair of curved claws in their fore flippers, helps them to hold the females while mating. Compared to those found in the Pacific and the Atlantic, Olive Ridley Turtles in the Indian Ocean are typically smaller.

Right now, they are the most common sea turtles in India. Mass nesting of Olive Ridley Sea turtles are found in Odisha from three places of the river mouth region, namely Gahirmatha, Devi, and Rushikulya along the coast of the Bay of Bengal. This mass nesting event known as “arribada” occurs when thousands of these sea turtles move to their breeding grounds at once to mate and lay their eggs. The largest turtle rookery in the world is Gahirmatha. Every year, between 100,000 and 500,000 turtles lay their eggs there, but after the 1990, there hasn’t been a significant mass nesting.

Sea turtles face a lot of threats ranging from accidentals catches to illegal poaching. They are caught in trawl fishing nets, near-shore mechanized fishing and suffer accidental drowning. In the past turtles were caught and

of locations where they nest, any disruption to even one of those beaches might have a significant impact on the overall population. As prey, consumers, competitors, and hosts, sea turtles play a variety of known functions in the development and maintenance of the structure and dynamics of marine ecosystems. They are also a crucial component of interspecific interactions in marine ecosystems. Additionally, they play a vital role in the movement of nutrients and energy both within and across habitats, and they have the power to significantly alter the physical makeup of marine ecosystems. They are a fundamental link in marine ecosystems and help maintaining the health of coral reefs and sea grass beds.

meat was consumed, eggs were harvested for consumption as well but since 1990's sea turtle harvest is banned. The nests are also destroyed by domestic animals like dogs and feral pigs. Another threat is ghost gear wherein sea turtles get entangled in it resulting in amputation of limbs, severe injuries and even death.

Owing to the drop in nesting in the 1990's many researchers have conducted studies on the Olive Ridley turtle nesting in Odisha and this has resulted in this species becoming more popular among the general public as well with an increase in awareness towards the plight of this species. Still a lot more work needs to be done to build a strong conservation strategy for this beautiful species similar to other charismatic species such as terrestrial large mammals.

So, the conservation of this species is very important. In India, forest departments, organizations and communities have come forward to protect the Olive Ridley Turtle. And one such initiative is the setting up of turtle hatcheries. Since 1992, Sahyadri Nisarga Mitra

Due to the restricted number

(SNM) has operated in Konkan as a recognised organisation dedicated to nature study, education, and protection. And since 2002, they are maintaining hatcheries in Velas, Mandangad taluka, Ratnagiri District, Maharashtra. Nesting beaches at Cuthbert Bay Sanctuary, Middle Andman Island, and other locations are moved to permanent hatcheries placed periodically along the coastline. Olive Ridley Turtle conservation activities are also seen along the Nagapattinam coast, Tamil Nadu, India. Local conservationists move eggs to a protected location or hatchery due to the significant anthropogenic and animal impact occurring on the Chennai coastline. East and west coastlines of India are home to *Lepidochelys olivacea* nests, with the state of Odisha hosting most of them. Olive Ridley Turtles sometimes lay their eggs along the coast of Andhra Pradesh, the state located directly south of Odisha, and it is thought that this area is in the turtles' migratory path. All these efforts are resulting in the conservation of Olive Ridley Turtles and hatcheries play crucial role in doing so.

Generally, Olive Ridley starts migrating toward shore from the month of December to March. Here, March will be the peak point of migration. Now that you have a good understanding of the status of the Olive Ridley turtles in India let me get back to our story!

During our visit to Kadaladi, as part of the Ram Hattikudur Advanced Training in Conservation, we also had the unique opportunity to observe a turtle hatchery. The staff recorded 30 turtles crawled to shore in last year. The transfer of the turtle's eggs from the nesting site to the hatchery must be done while they are still in their fresh, jelly-like form. Eggs must only be moved within a few hours of being laid (some studies recommend just two hours). After this time, there is a risk that membranes will be ruptured and the embryos will die.

The total area of the hatchery was approx. 16*16 sq. ft. It was barricaded with a green coloured fence made up of palm tree twigs of height 4–5 feet. They have made the row

by tying rope, in that row each artificial nest is 2 x 2 x 1½ cubic feet and will be separated by 2 feet between each of them. On our visit, we got to see one artificial nest enclosing 128 eggs. Also, we got to know amazing facts about the behaviour of an Olive Ridley Turtle. After laying eggs, the mother turtle dug out 3 to 4 more nests to fool the predator. They locate the turtle's mount in the sand by following its footprints. By softly poking the nesting site they will check whether the eggs are there or not. Then they take out eggs and within half an hour, shift them to artificial nests at the hatchery. We were of the understanding that while shifting to an artificial nest, it's important to maintain the order of eggs found in their original natural nest. And from our interaction with the staff, we realized that they too are aware of these intricate matters and ensure to keep up with it. They attempt to duplicate the nest as closely as they can by taking measurements of the depth, breadth, and length of the original site. In the nest, they also gather sand to fill it up in the hatchery. Until now the Gulf of Mannar reserve forest department has contributed to the successful hatching of 50,000 eggs in the past 9 years from different ranges of the reserve.

The hatchery is also covered by tarpaulin to provide extra care from dogs and to increase the survival rate of hatchlings. From our conversation with the staff we got to know that they have witnessed 90% survival rate. After creating artificial nests, the turtles would hatch between 45–50 days. The natural nests made by the turtles on beaches are unprotected since they are out in the open for easy extraction of eggs from local communities for consumption, predation by domestic animals like dogs, and other activities on the beaches. They made several more points regarding how humans and dogs are currently a hazard to turtle hatchlings. So, the staff ensures to guard the hatchery all the time. Around the hatching period, they stay more vigilant. They make sure that one should be present at the site. The hatchlings hatch around 3–4 am in the early morning. If it rains during the hatching period, then it affects and spoils the eggs.

They are doing a great job and besides that, they had also arranged a community awareness program, for the last 10 years, and now they have educated people. From all this conversation we got to learn so many things.

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Acknowledgements: I want to express my sincere thanks to Dr. Sanjay Molur for guiding me in the correct direction, inspiring me on a regular basis, and helping me recognise my talents. I wish to express my gratitude to H. Byju and Raveendran Natarajan for their time and expertise.

Pooja Ramdas Patil, RHATC Fellows 2022–23,
Zoo Outreach Organisation, Coimbatore, TN, India.

RHATC Campaigns

Gong for the Wetlands
ಜವುಗಿಗಾಗಿ ಜಾಗಟೆ

"Javugigagi Jaagate" is my awareness campaign aimed at the local communities that live in the vicinity of the numerous wetlands in the Shimoga district. The aim of the campaign is to make the people realize the importance of wetlands and get them into conserving the wetlands around them.

Melito Pinto, RHATC Fellow 2022–23,
Zoo Outreach Organisation, Coimbatore, TN, India.

My Awareness campaign to save the wetlands of Shimoga

Shimoga, a district in the malnad of Karnataka, is well known for many reasons. But in a district that is popular for the 'Jog falls', people are really ignorant about the numerous wetlands - small and large, that are present in this district. But it's not just the ignorance of the people that's the issue, but problems like plastic pollution, silt, and invasive species which are killing off many of these wetlands.

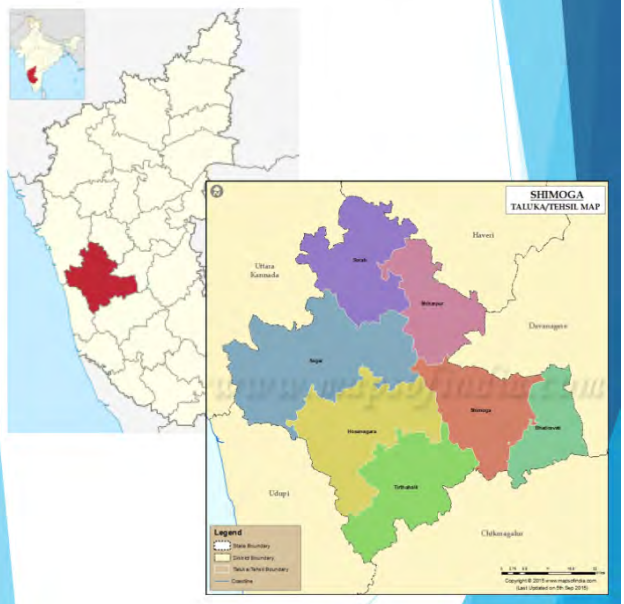
I spent two years at Shimoga during my Master's study at Kuvempu University. When travelling from my home to Kuvempu University, I used to see a number of wetlands in a really bad state, particularly at a place named 'Umblebylu'. Knowing the importance of wetlands, I wanted to restore these wetlands back to their original state. So one of the things that first came to my mind is 'people are the solution'. If they feel the urge and the responsibility to restore these wetlands, then anything is possible. Thus, I have designed my awareness program in a way that makes people realize that they are ignoring the wetlands, and it's time for them to wake up, realize their responsibilities, and become the protectors of these wetlands.

I came up with the concept 'Javugigai Jaagate' primarily because it sounds catchy in Kannada, and I felt the reason that the awareness must be done like playing the Jagate or Bong to reach out to people.

The awareness program is designed in a completely local manner. The mode of communication will be in Kannada. Folkstyles will be mainly used. Different forgotten folk arts will be used to reachout to people in very effective manner.

Local awareness Program

Area of Campaign: Shimoga, karnataka



Logo

The logo symbolizes a hand that represents the wetland ecosystem. The falling drop of water represents the last wasted opportunity to save the wetlands. So the logo collectively narrates that 'we are no longer going to let anymore wetlands die"

Tagline

ಜವುಗು ಭೂಮಿಯಳಿದರೆ ಬದುಕಾಗುವುದು ಮರುಭೂಮಿ

Without Wetlands, Life becomes equivalent to living in a desert

The tagline spreads the important message that if the wetlands cease to exist, then our existence is in trouble

Objective

- Shimoga has a good number of wetlands. But these wetlands are suffering from plastic pollution, silt, and invasive species like Ipomea. With such problems, these wetlands are drying up before summer.
- These wetlands need to be cleaned and protected

Target

- To make the local communities aware of the importance of wetlands.
- To make them understand that these wetlands are a crucial part of their lives.
- To empower them in a way that they voluntarily take up cleaning and protection of wetlands

Audience

Local communities living in the vicinity of the wetlands, and the communities that are dependent on these wetlands

Tools

Following are the tools I wish to use for raising awareness

- Songs
- Puppet shows

Collaborators

- **School children (From class 8 and higher)**
  Since they'd be able to understand about the wetlands and become ideal allies in spreading awareness.
- **University students**
  Particularly the ecology students. Since they understand different ecological systems, not only will they work for it, but also there are possibilities that an out-of-the box plan may popup
- **Folklore artists**
  Not only does this increase the diversity of the group, but also helps to create a better impact through art.
- **Puppeteers:**
  Something that has become really rare in recent days. They are the best to Convey stories in an effective manner
- **Environmental activists :**
  Because we need someone who can raise their voice for a cause
- **Local media:**
  To reach out to different people, spread the message and create an impact.

Timeline

- Duration of 3 months:
- I feel that this timeline would be sufficient to reach out different villages and campaign
- Campaign would be done on each Sunday: Since most of the people would be available on Sundays to listen to the campaign.

Songs with folk artists

ನಾವು ಬಂದೇವ , ನಾವು ಬಂದೇವ
We have come here, we have come here

ನಾವು ಬಂದೆವ ನಿಮ್ಮೂರ ನೋಡಲಿಕ್ಕ
We have come here to see your village

ನಿಮ್ಗ ಜವುಗು ಭೂಮಿ ಬಗ್ಗೆ ಹೇಳಲಿಕ್ಕ
We have come here to tell you about the wetlands

ಗೀಯ ಗೀಯ ಗಾಗಿರ ಗೀಯ
Geeya Geeya gagira geeya

ಜವುಗಿಗಾಗಿ ಜಾಗಟೆ
Gong for Wetlands
ಜವುಗಾಗಿ ಜಾಗಟೆ ಇದು ಕೇಳಣ್ಣ
Listen O Brother, This is the gong for the wetlands

ಬತ್ತಿ ಹೋಗುತಿದೆ ಜೀವಜಲ ಒಮ್ಮೆ ಕಣ್ಬಿಟ್ಟು ನೋಡಣ್ಣ
Open your eyes and see, the water's drying up
ಜವುಗುಳಿದರೆ ಮಾತ್ರ ನಾನು - ನೀನು
We can live only if the wetlands live
ಜವುಗುಳಿದರೆ ಮಾತ್ರ ಬೆಳ್ಕಕ್ಕಿ, ಆಮೆ , ಏಡಿ , ಮೀನು
Egrets, Turtles, crabs, fish all depend on these wetlands

ಮೂಡಲ್ ಕುಣಿಗಲ್ ಕೆರೆ ಎಂದು ಹಾಡು ಹಾಡುವೆ,
You sing about the Moodal - Kunigal lake,
ನಿನ್ನ ಸುತ್ತಮುತ್ತಲಿನ ಜವುಗಿನ ಸ್ಥಿತಿಯನ್ನು ಎಂದು ನೋಡುವೆ?
But why are you showing a blind eye to the wetlands around you
ಕೆರೆಗಳು ಒಣಗುತಿವೆಯೋ ಮಾರಯ್ಯ !
Please understand that the lakes are dying
ಇವುಗಳನ್ನು ರಕ್ಷಿಸಲು ನೀ ಒಮ್ಮೆ ಬಾರಯ್ಯ
Please come at once to protect them

ಏಳು ನೀ ಎಚ್ಚೆತ್ತು , ಹೂಳೆತ್ತು
Wake up, remove the silt
ಜವುಗುಭೂಮಿಗೆ ಕಸವು ಬಂದು ಬೀಳದಂತೆ ನಿನ್ನ ಕೈಯೆತ್ತು
Raise your hands that no pollutant falls into these wetlands
ಅಳಿಯದೆ ಚೆನ್ನಾಗಿ ಉಳಿದರೆ ಈ ಜವಗು,
If these wetlands remain healthy
ಆಗುವುದು ನೋಡು ನಿನ್ನ ಬಾಳು ಪ್ರಕೃತಿಯೊಂದಿಗೆ ಸೊಬಗು
You will see that you are living as one with the nature

Puppetry shows

Social media campaigning

- This would include different social media platforms like whatsapp, facebook and Instagram.
- Using whatsapp to let people know the schedule of our awareness program
- Instagram page for 'Javagu Jaagate"
- Story and post feature opportunity for anyone who shares the restoration of their nearby wetlands.

In the whole process there would also be exchange of local knowledge and tradition between the communities and the campaigners

Final step

To ensure that the local community have realized their responsibility and taken up protection of these wetlands

If this happens, the purpose of the campaign is fulfilled. Furthermore, there would be evaluation that would be done to see if the campaign was effective

Na Garvi, Na Atmagarvam (My Garvi, My Pride)

I am Aishwarya and I take special interest in working on the lesser known, elusive and ignored species which face the brunt of anthropogenic activities (like habitat loss). One such is the Jerdon's courser. Endemic to Andhra Pradesh, these birds are also critically endangered. All these reasons validate the importance of campaigning for their conservation.

Aishwarya S Kumar, RHATC Fellow 2022–23
Zoo Outreach Organisation, Coimbatore, TN, India.

Background

- Jerdon's courser (*Rhinoptilus bitorquatus*) is a critically endangered bird.
- It is found in scrub jungle habitats.
- Very shy, it is active in the night, and has limbs adapted to run.
- It is only found in the eastern ghats (recorded till now only from Sri Lankamaleswara Wildlife Sanctuary, Kadapa District, Andhra Pradesh).
- Due to this, it has attracted many birders around the world and the locals, before 2000s earned money out of being nature guides. This ceased post the construction of the Telugu-Ganga Canal near Sri Lankamaleswara Wildlife Sanctuary and Sri Penusula Narasimha Wildlife Sanctuary. Thus, habitat loss is the major threat known yet.
- The bird was last recorded in 2008.
- Researchers believe it could still be detected from various unsurveyed parts of Andhra Pradesh.

Target

- Make people of Chapadu Mandal (Kadapa distict) aware about the existence of this unique bird and their threats.
- Help them act on minimizing/eradicating the bird's known threat.
- Take help from the people living here (in the fringes of Sri Lankamaleswara Wildlife Sanctuary) for detecting and thus surveying more presence of the bird there.

Collaborators

- Dr. P Jeganathan, Scientist, Nature Conservation Foundation
- Andhra Pradesh Forest Department
- Mandal Parishad and Panchayat samiti of villages in Chapadu Mandal.
- School head and teachers of these villages.

Audience

- Communities living in the Chapadu Mandal, Kadapa District, Andhra Pradesh.

Timeline

- 1- 2 years (since it involves adding in the school curriculum)

Tools

- Create a mascot out of the species for the area.
- Incorporate catchy information about the species in school curriculum.
- Make banners and physically go, present the issue to the residents of the place.

Meet Garvi,
the Jerdon's courser.

Garvi called Andhra Pradesh her home.

In fact, Garvi's whole lineage is from this state. Which means they are all Telugu, unlike any other bird in this whole big world!

And thus, before 2000, number of birdwatchers (including foreign enthusiasts) came to visit the area to see Jerdon's Coursers like Garvi.

Thus, eco-tourism was a thing; providing job to many locals.

But instead of the warmth and pride that Garvi deserves, she has always been gifted with curses.

All these have been slowly pushing her, family and friends to extinction. She was last seen in 2008. Since then, there have been no sighting. Maybe she's hiding from further gifts?

What to do now?

According to the Recovery Plan implemented by NCF in 2010, the Jerdon's Courser might still occur in many potentially suitable regions in Eastern Ghats.

What you can do:

- Practise controlled grazing
- Protest against Illegal constructions

What you can gain:

- Job opportunities
- And Pride

Because,
#NaGarviNaAtmagarvam
#MyGarviMyPride

Sources

- Jerdon's courser image: Simon Cook, Birdlife International (modified at graphical level)
- Map of Andhra Pradesh: Sergey Nikitin, Dreamstime (modified at graphical level)* (not copyright free)
- Background: Jeganathan, P. , Rahmani, A. R., Green, R. E., Norris, K., Vogiatzakis, I. N., Bowden, C., & Pain, D. (2008). Quantification of threats and suggested ameliorative measures for the conservation of the critically endangered Jerdon's courser *Rhinoptilus bitorquatus* and its habitat. *Journal of the Bombay Natural History Society*, 105(1), 73a.

The First People is a localised awareness and action campaign to highlight the stories of people adversely affected by anthropogenic activities. The objective is to increase awareness of the impacts of climate change and its manifestations.

Lakshmi Ravinder Nair, RHATC Fellow 2022–23, Zoo Outreach Organisation, Coimbatore, TN, India.

Background

Humans, as an apex predator species, are in quite a colossal mess. We are heavily dependent on nature and wildlife species for almost everything that concerns daily living. But the rate at which we are consciously and unconsciously destroying ecosystem services is dumbfounding. Our mindless consumption patterns are threatening delicate ecological balances leading to irreversible forest loss and extinction of species. Sadly, we think we have time to save the world because the destruction is not visible or tangible enough, in most cases.

The First People campaign aims to inform decision-makers, chiefly business owners and middle-class income groups (producers and consumers) of the slow but impending collapse of living systems in and around their cities/villages. The campaign shall highlight stories of people who have directly witnessed the effects of climate change and have been economically impacted by them. In a sense, the first people to be affected by anthropogenic activities.

The hashtag for the campaign will be #thefirstpeople to encourage the audience to be an agent of change before it's too late and participate in local conservation programmes.

Target

The target of the campaign is to build the momentum for local conservation action through collaborations. This is intended to be achieved through the stories of the first people, and supporting evidences like scientific information, land-use change maps and other corroborative narratives.

The pilot state for this campaign would be Tamil Nadu, India's most industrialised state. Most of the State's industries are in the manufacturing sector comprising automobiles, components, electronics, textiles, chemicals, leather and non-leather manufacturing products. Source: https://www.cnbctv18.com/economy/tn-has-most-factories-in-india-says-rbi-report-as-state-plots-path-to-a-trillion-dollar-economy-15254991.htm

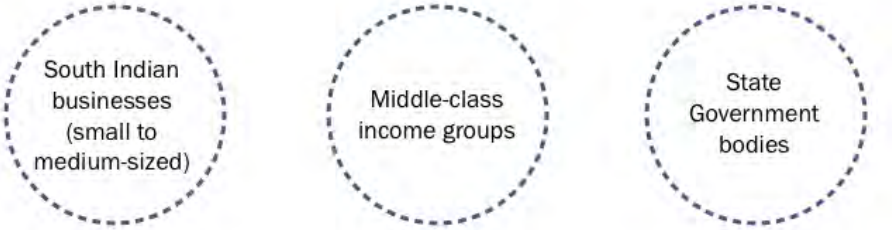
This growth ambition surely comes with pressures on natural resources and the intangible costs associated with such activities.

It is envisioned that businesses and consumers should demand change from Governmental bodies through this campaign.

Collaborators

Sourcing narratives
- Primary workers (Farmers, Fishermen, Agriculturists) - Local Residents and Community Heads - Wholesale businesses (Buyers of raw materials)
Validation of narratives
- Scientists (Biologists, Hydrologists, Conservationists)
Amplification of narratives
- Local news platforms (The News Minute, TV9) - Offline city/village events - Relevant business events (TiE conferences) - Local Government agencies - NGOs - Photographers, Videographers – Sachin Rai (Wildlife photography), Auditya Venkatesh (Portrait photography) - Writers (Meera Subramanian, Amitav Ghosh)

Audience



Tools

- Multi-lingual information packages on the campaign objectives
- Concept notes with supporting information on the effects of land-use change, extinction of species and other key issues.
- Categorise required action for each stories. Eg; plastic dumping, partnering with NGOs
- Digital Media
  - Social media accounts - Instagram and LinkedIn
  - Setting up other avenues - Blog sites, online partnerships
- Print Media and Offline Channels

Timeline

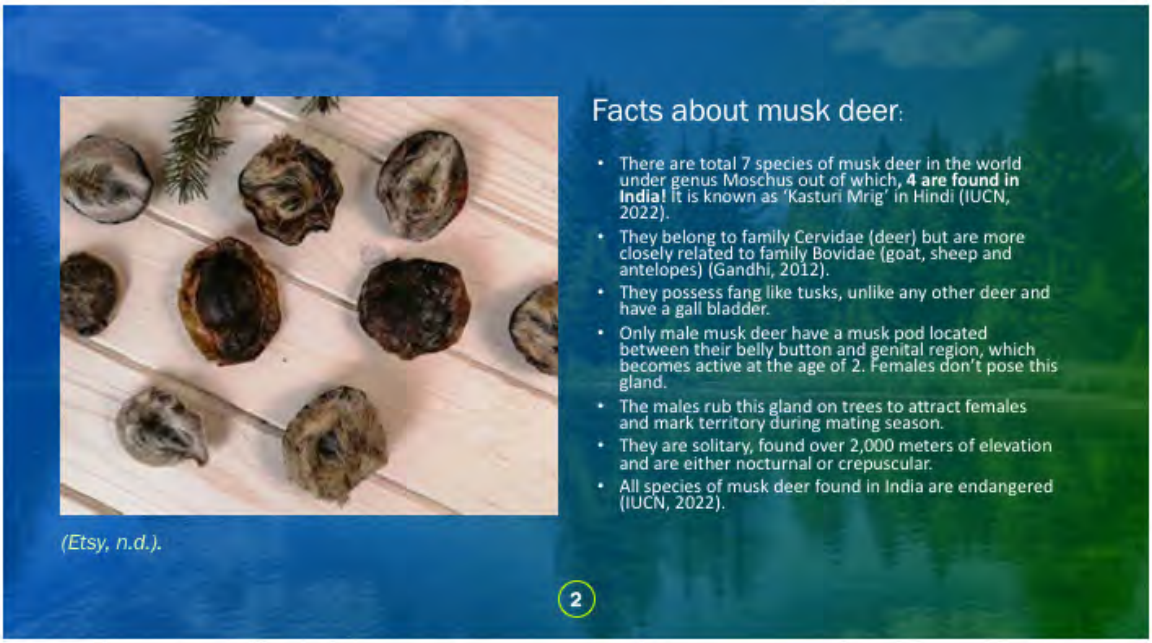
Setting up social media accounts and other channels of amplification	2 months (P)
Identification of the first people	3 months (P)
Data collection and drafting story format	4 months
Publishing across digital and print media	2 weeks
Outreach and follow-up	1 month

Legend: P indicates activities that will go on in parallel

Know your musk

My name is Akansha Mishra. I have done my BBA in Project Management and have experience working at a bank. Besides my interest in wildlife and rifle shooting, I am also a perfume enthusiast and like collecting various fragrances, especially strong masculine scents. Based on which I have used some musk fragrances as well including Jovan White Musk and Arabic attars which had some percentage of actual musk in it. I got to know that actual musk is still being used today for various purposes only after joining RHATC. Being guilty of using musk, I wanted to understand more about the musk market, species of musk deer and efforts to conserve the 4 musk deer species that we have in India.
As these deer are so unique but endangered, I inferred that creating a campaign that focuses on awareness, pride and fundraising would be the best bet.

Akansha Mishra, RHATC Fellow 2022–23
Zoo Outreach Organisation, Coimbatore, TN, India.



Facts about musk:

- As this gland is located inside the body, musk deer's abdomen is cut, the musk pod is taken away and the deer is left to die in agony in most cases.
- To produce 1 Kg of musk, 40 – 45 adult male deer with sufficiently large musk glands are needed (Gandhi, 2012).
- Around 1900, the price of musk was estimated to be double the price of gold. Today, the price of 1 Kg musk is about $45,000 on an average in the international market (Animal hype, 2022).
- This musk has been historically used and is still used in the perfume industry (mostly in France), as an aphrodisiac and for traditional Chinese and Korean medicine.
- Not only deer, but some other animals also produce musk and equivalent substances – like civets, beavers (castoreum), hyraceum and Ambergris (Animal hype, 2022).

3

(Pinterest, n.d.).

In India, the protected areas in which musk deer is found are:

1. Kedarnath Musk Deer Sanctuary/ Wildlife Sanctuary, Uttarakhand
2. Kanchendzonga National Park, Sikkim.
3. Askot Wildlife Sanctuary, Uttarakhand and
4. Gangotri National Park, Uttarakhand.

Although white bellied musk deer is the State animal of Uttarakhand, only **few hundred individuals** remain today! (Times Now News, 2019).

Other alternatives of Deer Musk:
1. Plants like Malva moschata and Angelica sp.
2. Aromatic nitro musks, polycyclic musks and macrocyclic musks (Today I found out, 2018).

(Garageartsigns, n.d.).

4

Know Your Musk Campaign

#KnowYourMusk Campaign – Objective - An awareness, pride and fundraising campaign to protect the endangered musk deer, for people to know if they are consuming actual musk extracts in their perfumes and medicines and also raise funds for boosting breeding efforts of the musk deer in the Kedarnath Musk Deer Sanctuary.

Target: To raise Rs. 10,00,000 in order to boost breeding efforts of the musk deer in Kedarnath Musk Deer Sanctuary within 6 months and to increase consumer awareness regarding musk consumption.

Collaborators: Uttarakhand government and brand ambassador – Urvashi Rautela.

Audience: People of Uttarakhand and nationwide perfume/attar consumers. Global awareness.

Timeline: 6 months

Tools: Social media posts and trends

5

#KnowYourMusk Campaign

Statement of Purpose: To increase awareness, pride and funds for the conservation of musk deer in the Kerdarnath Musk Deer Sanctuary.

Platform: Conservation India for spreading information.
Fundraising: Impact Guru.
Social media platform and public participation: Instagram.

Identity: #KnowYourMusk and #KasturiPehechano in collaboration with Urvashi Rautela and the Uttarakhand Forest Department.

Social Media Strategy: Encouraging consumers to click a picture of the list of ingredients of their perfumes and deodorants to check for the presence of musk deer extracts, on the absence of which, they must proudly use the hashtag #KnowYourMusk.

#KnowYourMusk
#KasturiPehechano

Campaign ambassador – Former Miss. Universe India and Actress – Urvashi Rautela

6

THANK YOU!

For Donations: Go to Impact Guru/KnowYourMusk

For more info: Go to Conservation India/KnowYourMusk

Instagram
@Know_Your_Musk
Email
mishraakansha2001@gmail.com

Collaborative effort of

उत्तराखण्ड सरकार

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Gandhi, M. (2012). The Musk Deer of India. Retrieved from: https://www.britannica.com/explore/savingearth/the-musk-deer-of-india

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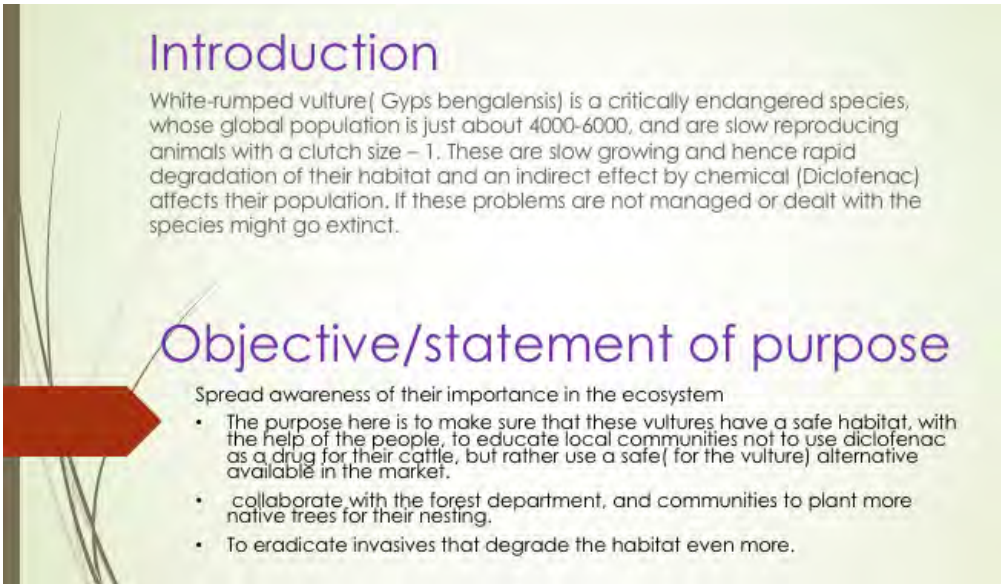
Times Now News. (2019). Essence of death: Only one male musk deer remains in captivity in India; who failed the state animal?. Retrieved from: https://www.timesnownews.com/mirror-now/in-focus/article/one-male-musk-deer-remains-in-captivity-in-indian-zoo-poaching-uttarakhand-kufri/378530

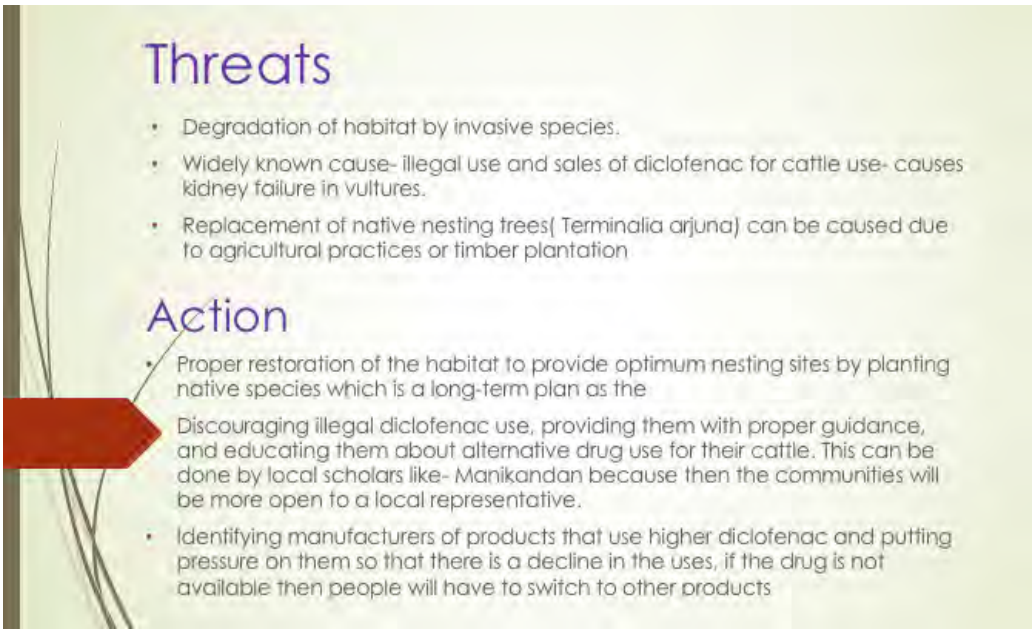
Today I found out. (2018). About That Musk... Retrieved from: https://www.youtube.com/watch?v=GwNz_5sjrHY&t=199s

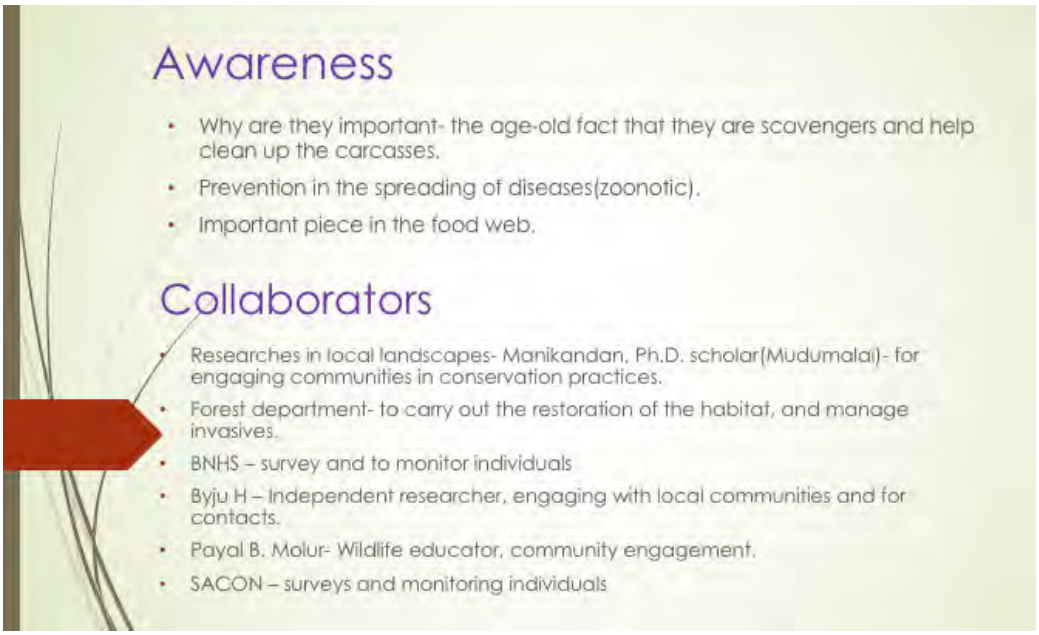
8

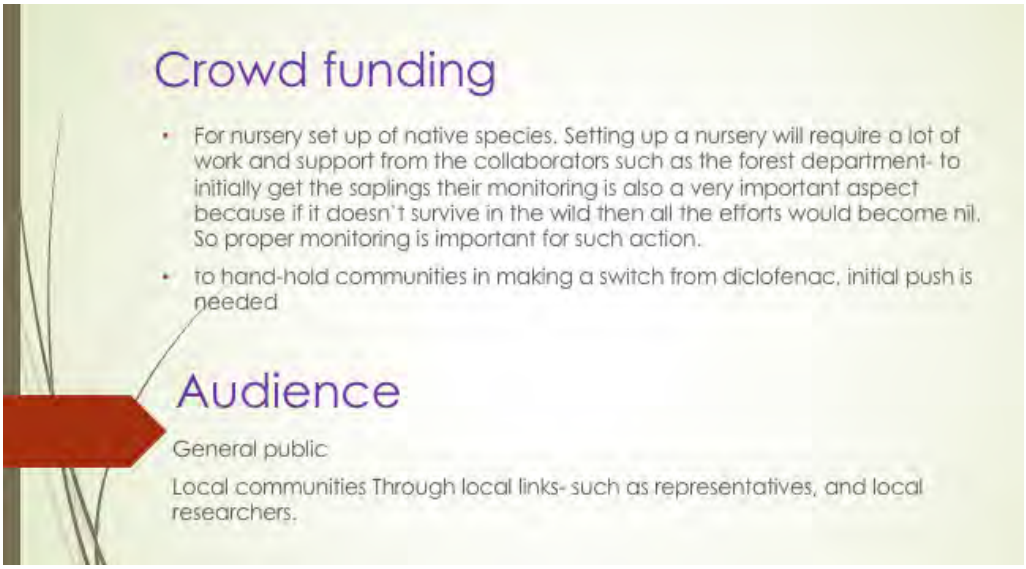
Gyps bengalensis is a critically endangered species that are affected by the drug diclofenac which is used as an anti-inflammatory drug in cattle and due to which when the vulture consumes the carcass it ends up having kidney failure which is a big threat to the already low population. Even though it is its veterinary use is banned, it is still in circulation. Another issue is the spread of invasives which affects the whole ecosystem and the food webs in it. It also possesses a threat to the nesting site as it mostly nests on native species such as Terminalia arjuna. This campaign is to spread awareness, make some action regarding the threats it's facing, and crowdfunding for the conservation of the white-rumped vulture.

P. Kritika, RHATC Fellow 2022–23,
Zoo Outreach Organisation, Coimbatore, TN, India.



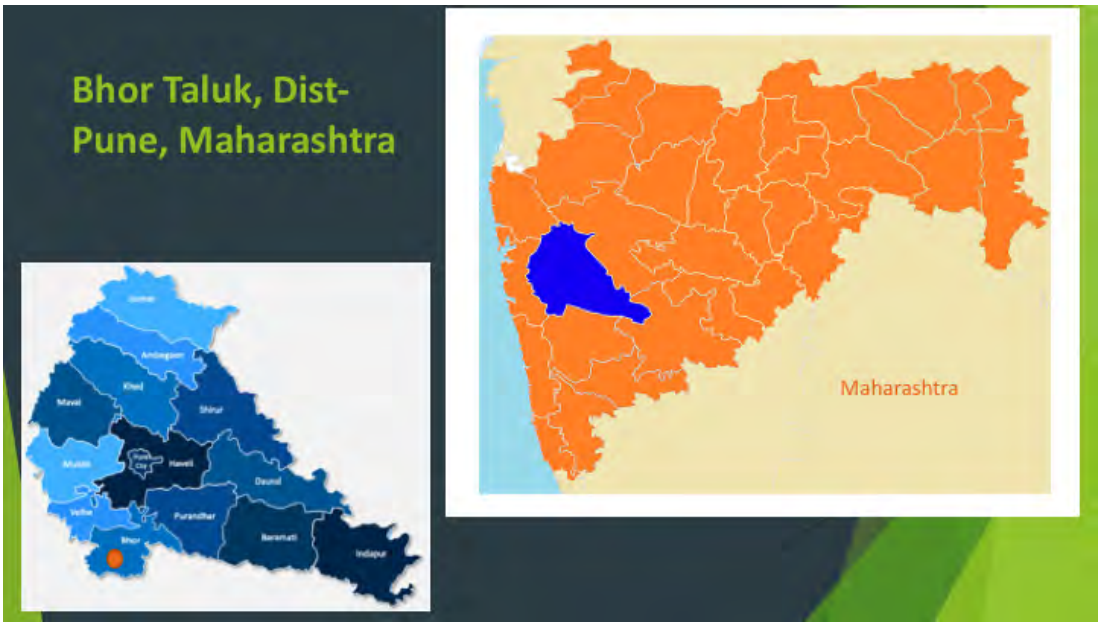

Threats
Degradation of habitat by invasive species.
Widely known cause- illegal use and sales of diclofenac for cattle use- causes kidney failure in vultures.
Replacement of native nesting trees(Terminalia arjuna) can be caused due to agricultural practices or timber plantation
Action
Proper restoration of the habitat to provide optimum nesting sites by planting native species which is a long-term plan as the
Discouraging illegal diclofenac use, providing them with proper guidance, and educating them about alternative drug use for their cattle. This can be done by local scholars like- Manikandan because then the communities will be more open to a local representative.
Identifying manufacturers of products that use higher diclofenac and putting pressure on them so that there is a decline in the uses, if the drug is not available then people will have to switch to other products

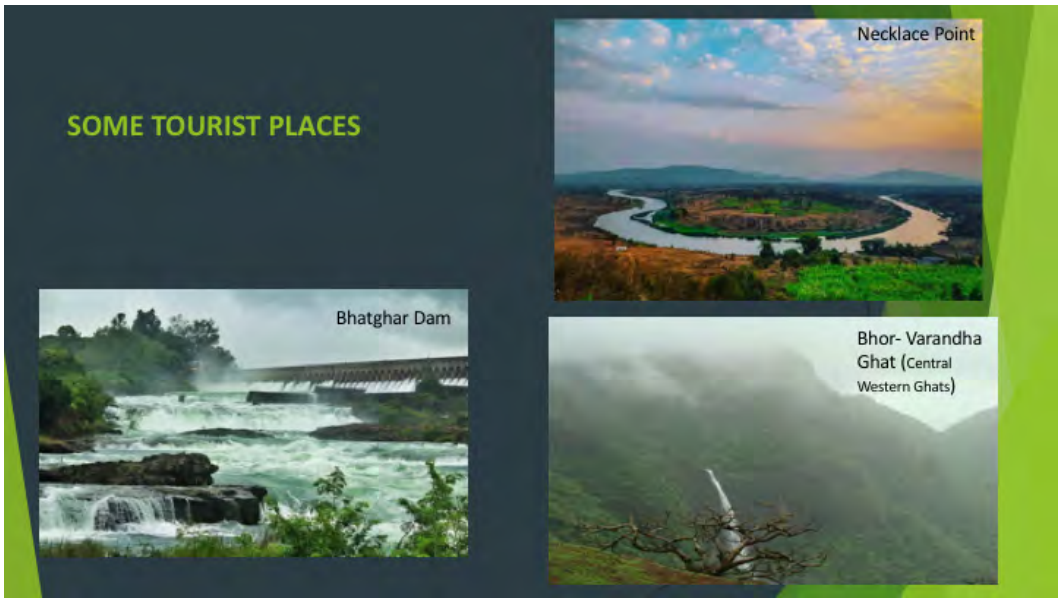

Awareness
Why are they important- the age-old fact that they are scavengers and help clean up the carcasses.
Prevention in the spreading of diseases(zoonotic).
Important piece in the food web.
Collaborators
Researches in local landscapes- Manikandan, Ph.D. scholar(Mudumalai)- for engaging communities in conservation practices.
Forest department- to carry out the restoration of the habitat, and manage invasives.
BNHS – survey and to monitor individuals
Byju H – Independent researcher, engaging with local communities and for contacts.
Payal B. Molur- Wildlife educator, community engagement.
SACON – surveys and monitoring individuals


Crowd funding
For nursery set up of native species. Setting up a nursery will require a lot of work and support from the collaborators such as the forest department- to initially get the saplings their monitoring is also a very important aspect because if it doesn't survive in the wild then all the efforts would become nil. So proper monitoring is important for such action.
to hand-hold communities in making a switch from diclofenac, initial push is needed
Audience
General public
Local communities Through local links- such as representatives, and local researchers.

The Western Ghats are close to Bhor, where I was raised. There are several tourist attractions. Locals manage hotels, homestays, and real estate sales. Therefore, the outsider constructs farmhouses and temples there. whenever I take little excursions. I observe an increase in the number of hotels and farmhouses. The regions are close to the western ghats, one of the globe's 36 hotspots. These lands are facing fragmentation and degradation problems. And because of this anthropogenic activities the problem of landslides have increased. And the ground water level is decreasing because of illegal borewells for the farmhouses. After seeing this all my heart cries out and I have come up with this campaign. Which will create awareness and change perspective of community that grassland is not wasteland. Instead of selling lands the local people can promote homestays, so that tourists also can feel the livelihood.

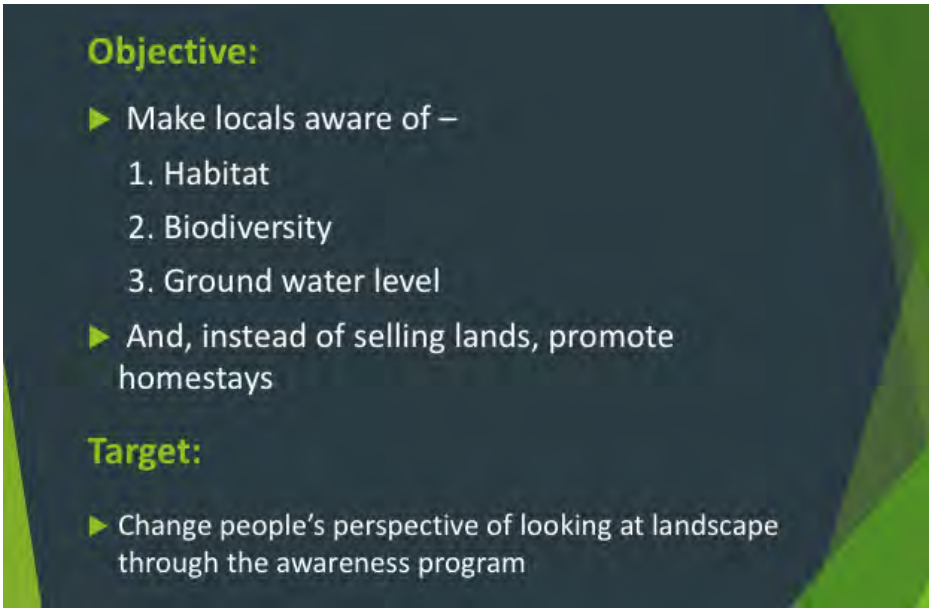
Pooja Ramdas Patil, RHATC Fellow 2022–23,
Zoo Outreach Organisation, Coimbatore, TN, India.

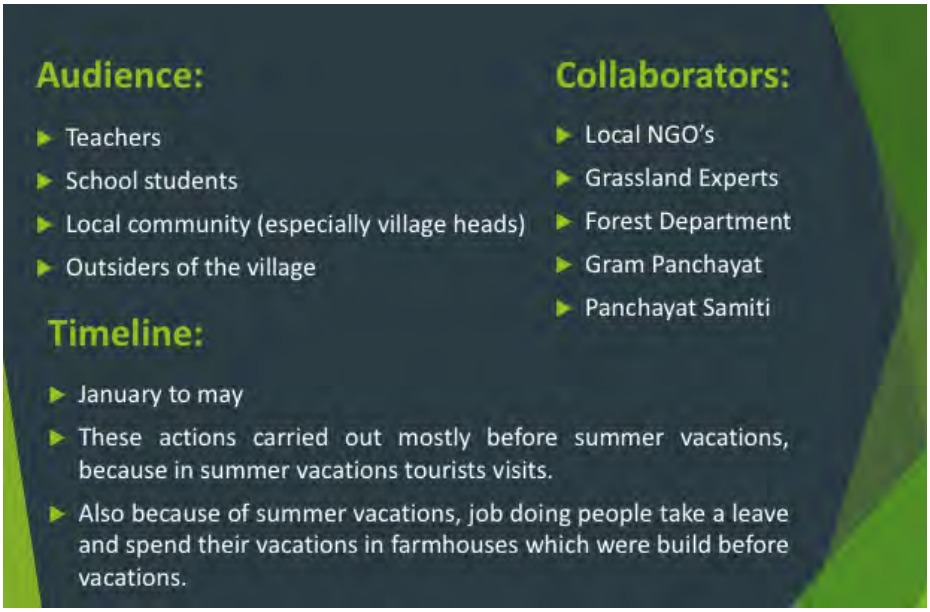




Background:

- Bhor Taluk Dist- Pune, Maharashtra is close to The Western Ghats.
- As a result attracts tourists.
- Due to which, a number of infrastructures have come up; managed by both locals and outsiders.
- All these affecting the habitats and thus biodiversity.
- Thus, there is a need to safeguard these habitats.
- However, Numerous endemic species. But Biodiversity hotspot- many yet to discover. The loss of habitat and other human activities possessing a serious threat to many species.
- Naturally high rainfall- catchment areas loss. The land facing fragmentation and degradation- affects the ground water level- increase in land slides.


Objective:
Make locals aware of –
1. Habitat
2. Biodiversity
3. Ground water level
And, instead of selling lands, promote homestays
Target:
Change people's perspective of looking at landscape through the awareness program

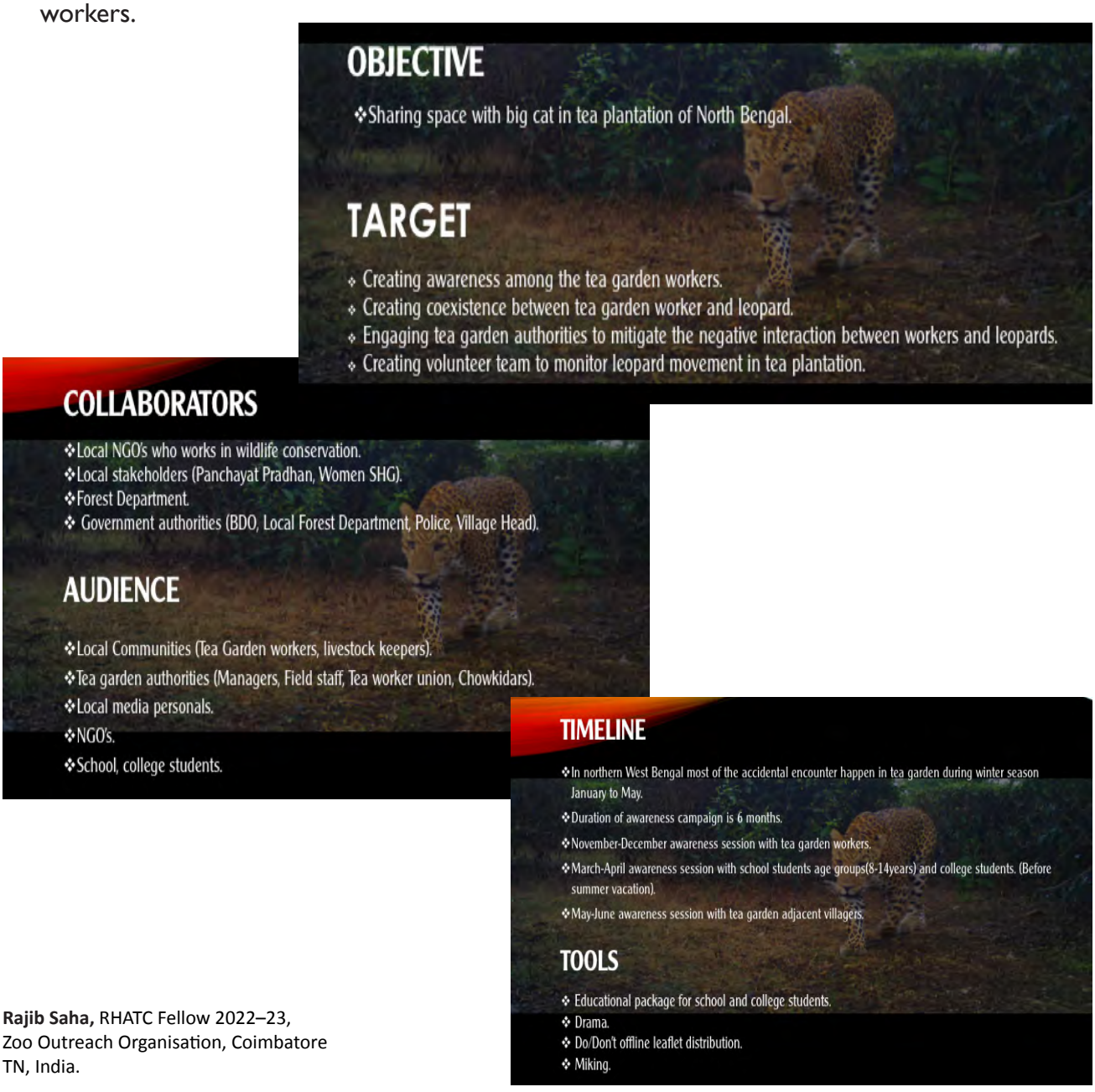

Audience:
Teachers
School students
Local community (especially village heads)
Outsiders of the village
Collaborators:
Local NGO's
Grassland Experts
Forest Department
Gram Panchayat
Panchayat Samiti
Timeline:
January to may
These actions carried out mostly before summer vacations, because in summer vacations tourists visits.
Also because of summer vacations, job doing people take a leave and spend their vacations in farmhouses which were build before vacations.


Tools:
Education packets- Introduction to Grasslands, games- Know your grassland, weekly walks to get know to grassland
Local Radio stations- Experts talk about Grasses and their importance
Town crier/ announcer- Do's and Don'ts
Social media –
Instagram- @ World's Heritage_ सह्याद्री
गवताळ प्रदेश वाचवा
सह्याद्री वाचवा, जागतिक वारसा जपा
(Tagline: save Sahyadri, preserve world's heritage)
#grasslandmatters

Big cat under the tea bush

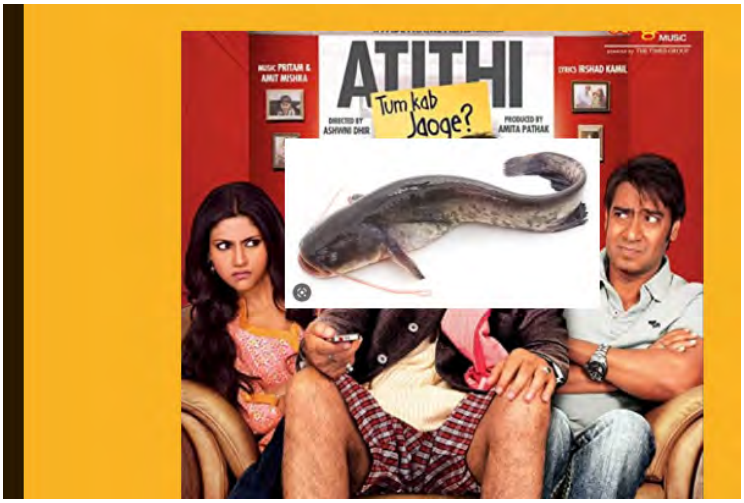
The North Bengal landscape is a mosaic of protected areas, reserve forest, tea estates and agricultural fields and has high conflict levels between human and animals like (Elephants and Leopards). Leopard as a very well adapted big cat, has always shared spaces with people across various part in India. In the northern districts of West Bengal, when vast stretches of primary forest were cleared to make room for tea plantations during the colonial era, leopards adapted to this novel landscape. The people who currently working in these tea estates were brought from the Chotanagpur Plateau region (now Jharkhand) during the British occupation of India. The leopards and people shared a common thread of being displaced from their homes, only to adapt to living in the tea plantations. Tea bush is ideal place for leopard to hiding, resting in daytime, raising their cubs and by using tea garden nullah leopard can move very easily from one section to another section without coming into contact with humans. Tea garden provide ample of domesticate prey like (cow, goat, pig) and wild species like (Black-naped hare, peacock) to leopard. However, things turn extremely ugly and aggressive when workers are injured due to accidental encounters with leopard,

Hence, it is necessary to take preventive measures and create awareness among tea garden workers.



Rajib Saha, RHATC Fellow 2022–23,
Zoo Outreach Organisation, Coimbatore
TN, India.

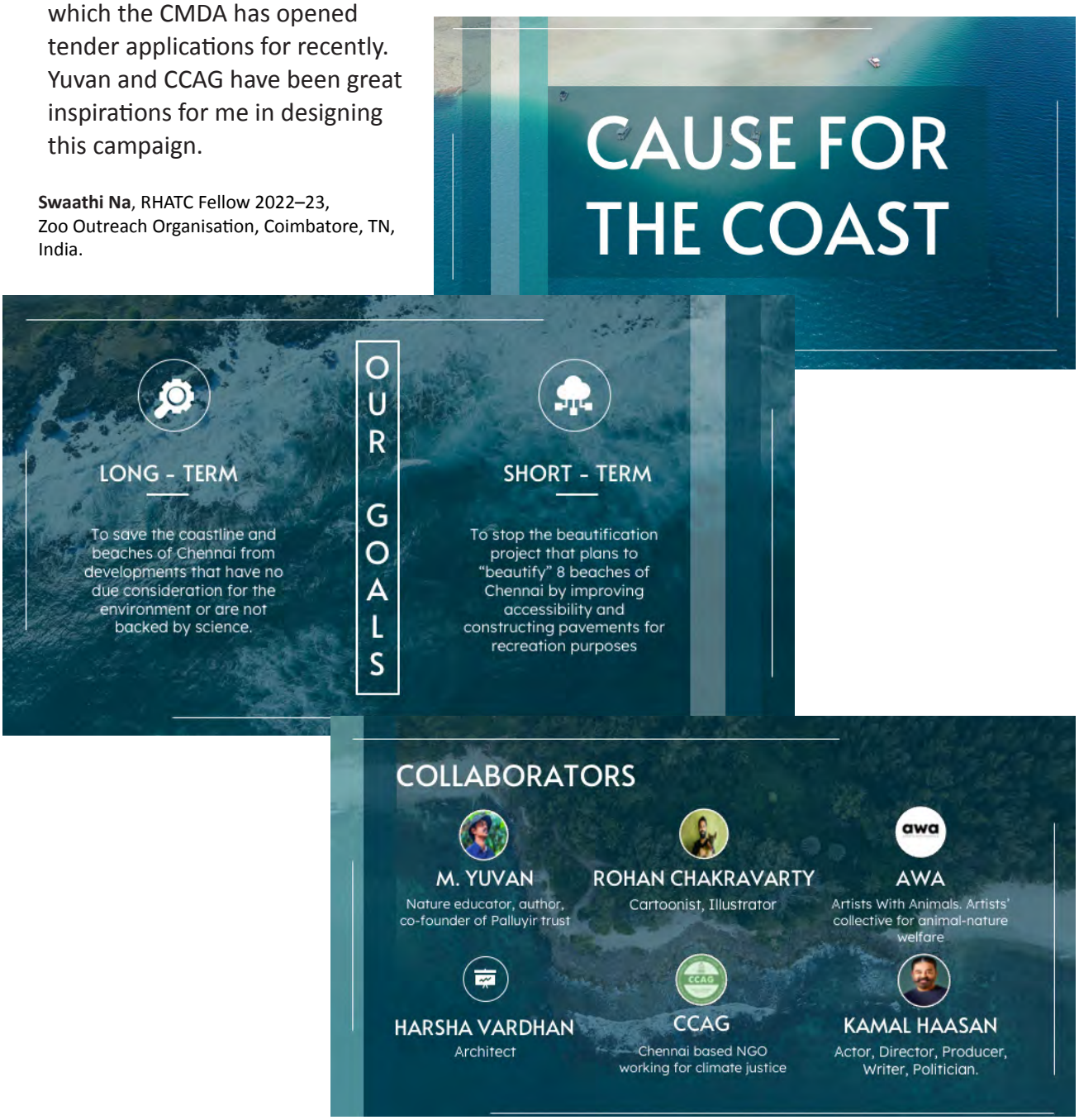
As per my observation many devotees and priests are unaware about Invasive fishes and I didn't see any campaign addressing the problem of Invasive Fishes in Temple Ponds. Therefore it occurred to me that an online lecture series can be started where every Thursday we will explore options to mitigate the threat of Invasive fishes. I will also make an App that has a Friendly User Interface for easy identification of Invasive Fishes in India. #thursdays4threat_mitigation, #AthitiBagao. This campaign will start a thought process and could scale up to policy change.

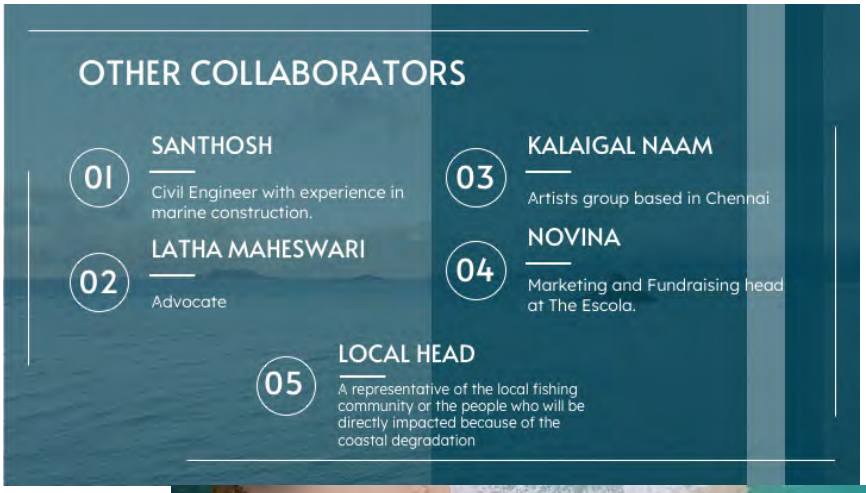


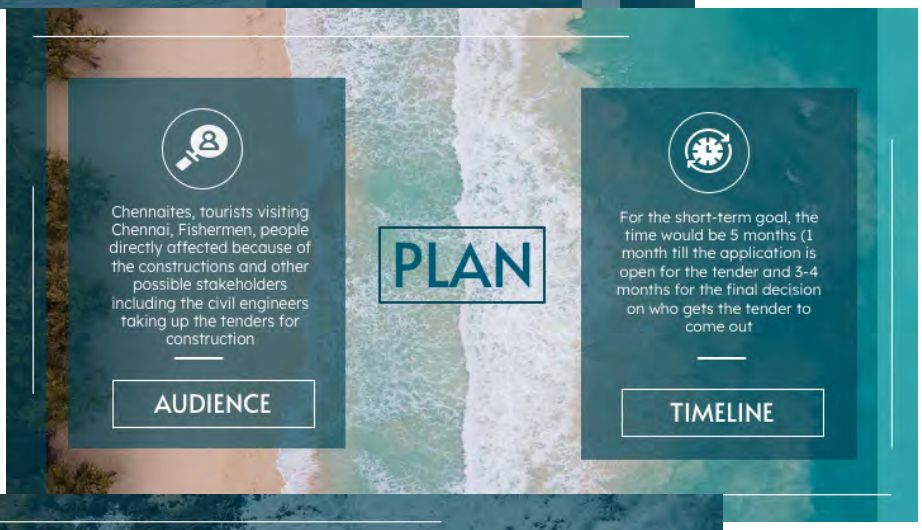
Soham Parnaik, RHATC Fellow 2022–23,
Zoo Outreach Organisation, Coimbatore, TN, India.

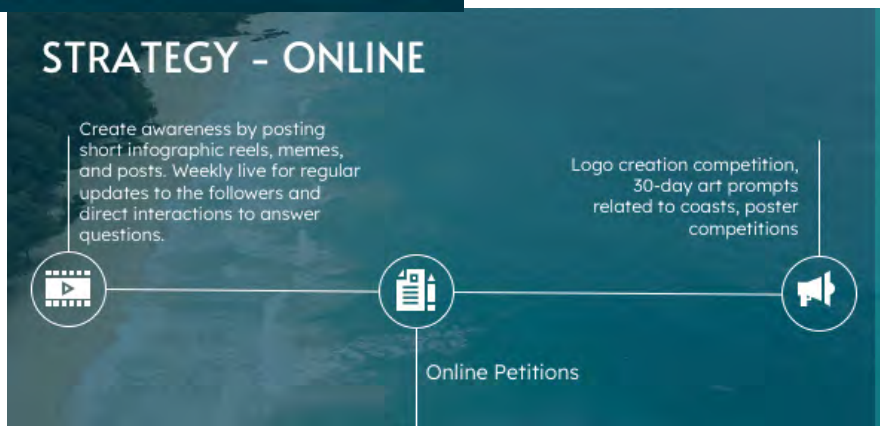
Growing up in and around Chennai, I have always had a very close relationship with its beaches. From going to beaches for chilly bajjis and balloon shooting wars with cousins to going there for the calmness that the beach offers and to play hide and seek with the crabs around, I have been around beaches my whole life. To a person to whom the coastline of Chennai meant only the Marina, Elliot's, or the Kovalam beaches, the eco-heritage walk organised by the CCAG opened my eyes to the other parts of the coastline which were greatly impacted because of the developments that are changing these landscapes. There is a unique beauty in the raw wilderness unchanged or untouched by humans which can't be matched or even replicated no matter how much money you spend on the so-called "beautification" of the landscape. I wanted my dream campaign to focus on awareness and action against the developments on the coastlines that have no due consideration for the environment or have no scientific backing behind the planning. The immediate target of this campaign would be to stop the beautification of the beaches project for which the CMDA has opened tender applications for recently. Yuvan and CCAG have been great inspirations for me in designing this campaign.

Swaathi Na, RHATC Fellow 2022–23,
Zoo Outreach Organisation, Coimbatore, TN, India.









Acknowledgments

Thanks to Cara Tejpal for teaching and guiding us on how to design a campaign. I would also like to thank the RHATC team for providing us with opportunities to interact with such great mentors. Slide template by slidesgo, flaticon and freepik.

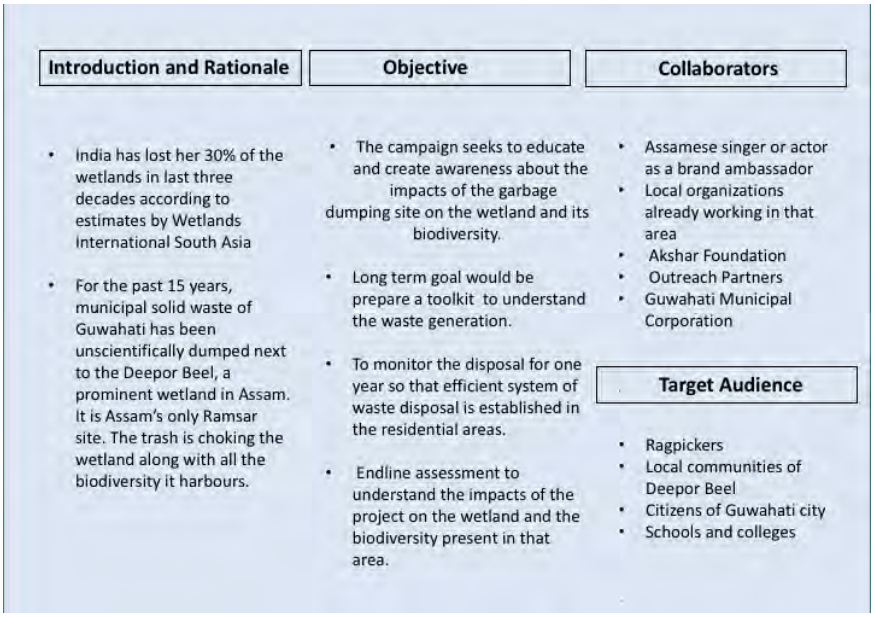
Deepor Beel Campaign

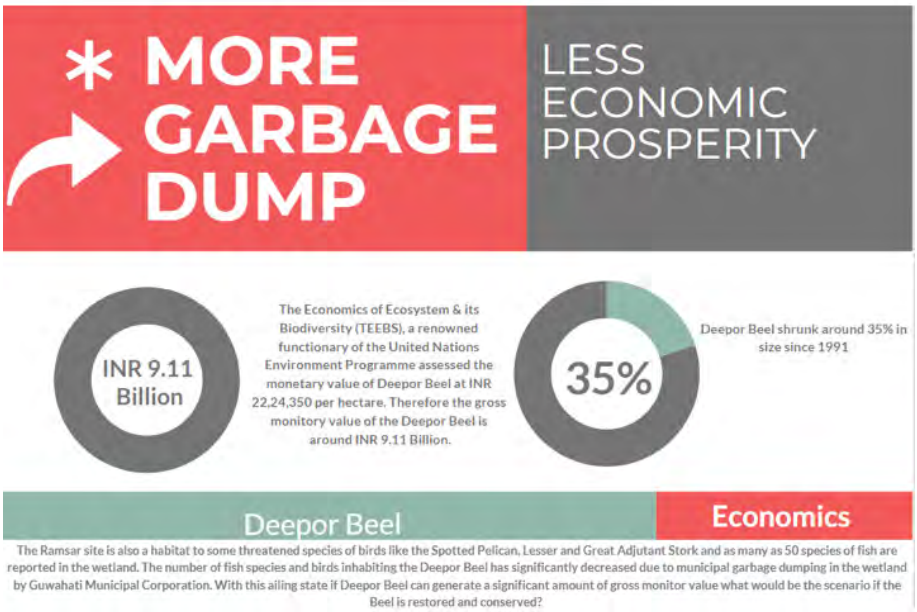
The concern for wetlands is growing concurrently over the world as new names are frequently added to India's list of wetlands. Wetlands clearly serve a critical role in preserving the natural equilibrium of the ecosystem. They protect numerous plant and animal species from extinction by housing them. They are beneficial to people because they stop floods and are a fantastic way to recycle organic waste.

Deepor Beel is one of the largest freshwater lakes in Assam and the State's only Ramsar site besides being an Important Bird Area by Birdlife International. However, for the past 15 years, municipal solid waste of Guwahati has been unscientifically dumped next to the Deepor Beel, a prominent wetland in Assam. It is Assam's only Ramsar site. The trash is choking the wetland along with all the biodiversity it harbours.

Therefore, conservation of the wetland is an urgent step that needs to be taken. It will require management of environmental needs with a holistic approach. Also, there should be people's participation and developmental activities should consider the immediate stress on the biota and the local community residing there.

Tandrali Baruah, RHATC Fellow 2022–23,
Zoo Outreach Organisation, Coimbatore, TN, India.





Awareness , Communication and Action Plan

Social Media	Media	Webpage	Ads
Campaign launch on wetland day	Press Release (English and Assamese Newspapers)	Blog entries	India marks its 75 years of independence-75 Ramsar sites 75 species present in deepor beel and pledge to save them
Video Messaging- Explainer 2D animation	Press Release- Partnerships/ Collaborators	Essays on communities	Importance of waste source segregation at home
Assamese+ English Posts	Target few community radio	Interviews of experts	**Action Plan**
Education Podcast (Suno India)		Listicles	Plog run drive in Deepor Beel with the ambassador
Blogs and social media pledge posts		Fundraising page/Products	Waste footprint with ragpickers of Guwahati city and showcase the contribution of the ragpickers
Ambassador Post		Wetland literacy toolkit	Interaction with local communities about the biodiversity present in Deepor Beel

মানুহে মানুহৰ বাবে
If man wouldn't think for man
With a little sympathy
Tell me who will — comrade?
CAMPAIGN SLOGAN BY LOCAL COMMUNITIES OF DEEPOR BEEL

Changes in Dhanushkodi region in the Gulf of Mannar over decades

Dhanushkodi is a small town in Rameswaram of Tamil Nadu. It is about 24 km away from Thalaimannar of Sri Lanka. In 1964, it was wiped out by a cyclone. Google Earth imagery 1985 shows Arichal Munai, an end point at Dhanushkodi still submerged under water. After 2017, artificial sandbars and roads were created starting the development in this area. These developmental activities were done purely from the tourism point of view. The unique position of Dhanushkodi lying in between the Palk Bay and Gulf of Munnar, its nearness to Sri Lanka, and the developmental activities being planned over there, especially a railway line, makes this place an important place to study the effects of changes to the sea on biodiversity.

The place that was submerged until 2017, saw a drastic change in the land. In 2017, the artificial sand banks and roads that were constructed purely from tourism point of view, would come in the form of consequences which were unnoticed.

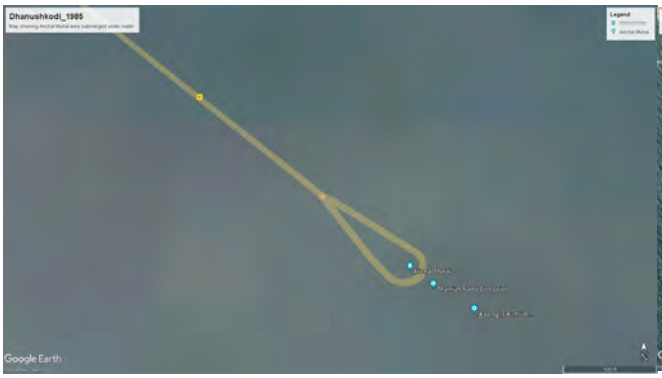
Dhanushkodi map. © India water portal.

From geological perspective

The naturally occurring structures like the beach rock and rocky coasts at Dhanushkodi have played an ecologically significant role. A study by Ravindran & Selvam (2014) revealed that the increase in percentage of beach rock decreases the percentage of influence of seawater intrusion. The beach rock and rocky coast acts as dyke rock and disallows the infiltration of the seawater into the coastal aquifer. So, any developmental activity that happens at Dhanushkodi can threaten these natural barriers and upset the ecosystem they were previously protecting. A study by Natesan et al. (2015) found that along the Palk Bay Coast, the eroding shorelines at Dhanushkodi are prominent, except at Arichal Munai where it is reversing along GoM.

From the perspective of biodiversity

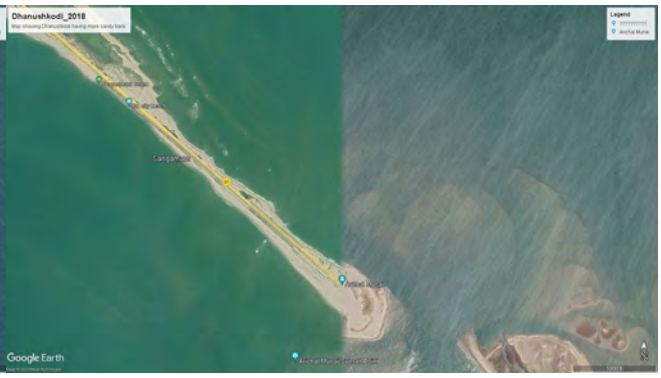
Since there are very few studies available that were done on the biodiversity of this area during 1985, it is difficult to assess the extent of biodiversity loss in this area. But there is certainly, a negative phenomenon that is



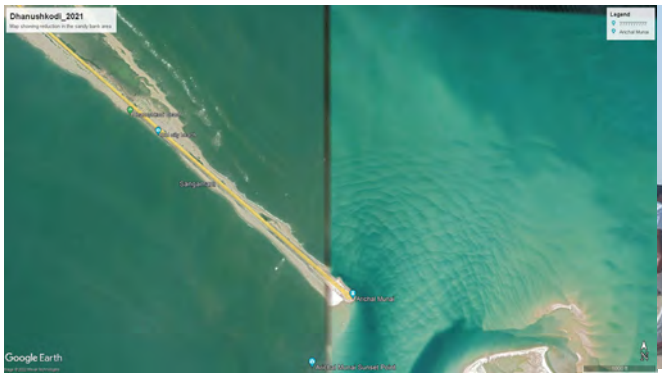
Dhanushkodi showing Arichal Munai submerged in 1985.

Roads and artificial sandbanks created at Arichal Munai in 2017.

Arichal Munai still submerged underwater in 2009.



Extension of sand banks in 2018.



Sand banks eroded along the Palk Bay in 2021.

Arichal munai now. © Melito Pinto.

happening which is observed through the following:

The imagery from 2021 shows that there has been a decline in the width of the sandbank. This sandbank is not a natural one. First, by creating artificial sand bars, the natural formation of sand bars by tide action is prevented. As a consequence, the foraging area for the wading birds and migratory birds was lost.

Turtles were one among those suffered the most. Olive Ridley *Lepidochelys olivacea* and Leatherback Turtle *Dermochelys coriacea* were reported to be breeding in these shores. But the developmental changes such as the creation of road has made it difficult for them to cross from one end to the other. Adding to this, the everyday flux of tourists and pilgrims leading to littering everywhere has led to an increase in the number of domestic dogs. This has become a huge threat to the nesting of these turtles, leading to decline in their numbers.

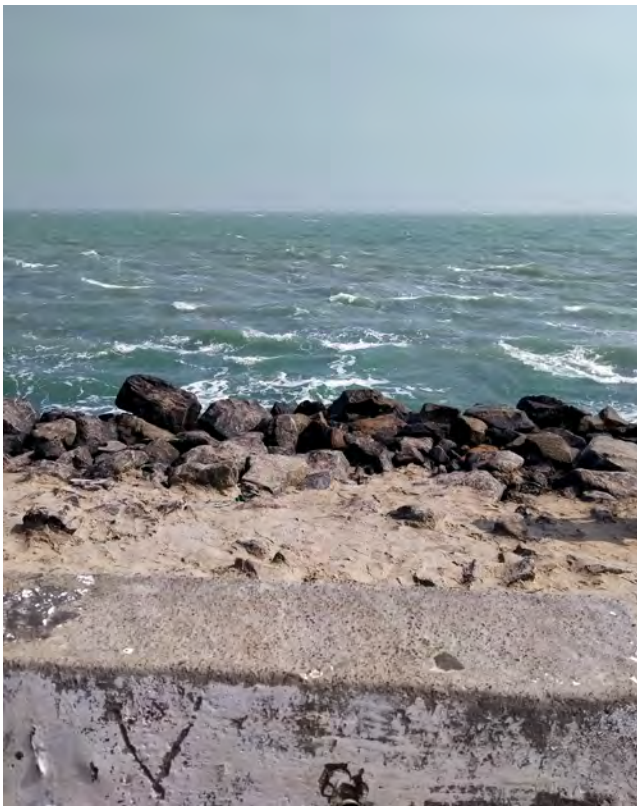
From the perspective tourism

A paper by Rao (2014) recommends the

restoration of Dhanushkodi and mentions that railway lines must be restored for pilgrimage access. This paper speaks on the developmental perspective at Dhanushkodi, saying that although the one existed before cannot be revived, it can at least be restored, and calls for infrastructure development instead of homage. With roads constructed, and railway line at plan, there is a huge influx of pilgrims to this place. This consequently has led to a number of shops being opened in this place, and the careless behavior of the people has led to plastic pollution here. Although sustainable tourism strategies were discussed by Saville (2002), there seems no signs of sustainable tourism in this place.

Conclusion

Over a course of 30 years, the land of Dhanushkodi has seen drastic changes. The creation of artificial sandbanks has made many wader and migrant birds, and turtles lose their breeding sites. Permanent structures such as roads have made it difficult for the sea turtles to move safely.



Artificial sandbanks at Arichal Munai. © Pooja Patil.

With the experts working in the Dhanushkodi area, we have also come to know that railway line that is being planned in the area, which would come as a larger ecological disaster. The impacts of the development we have observed could be far less than what has actually happened, because there is no extensive study done on the biodiversity loss in this particular area. The productivity of the land has also decreased leading to fishers going off to Sri Lankan coasts for fishing and this causing numerous conflicts. The rate at which the *Prosopis juliflora* has spread in these landscapes, and no one bothers about, is also a matter of concern. With the railway line being planned in this area and more and development coming in to promote tourism, the future of Dhanushkodi looks totally compromised.

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Acknowledgements

We are grateful to Dr. Sanjay Molur and Payal Molur, Zoo Outreach Organisation for taking us on a trip to Rameswaram. We are especially thankful to H. Byju and Raveendran Nataraja for being with us and showing us around the wonderful destinations at Rameswaram. We are also thankful to Trisha Bhattacharjee, Usha Ravindra from first batch, and the fellow mates of second batch for being wonderful peers.

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Aspects of CSR in India

HOW can we engage with fund managers to make them understand the nuances and challenges of conservation?

Introduction

In April of 2014, the Ministry of Corporate Affairs (MCA) included an amendment to the Companies Act of 2013 which makes it mandatory for companies over a certain turnover to spend 2% of their average net profit generated in last three years towards corporate social responsibility (CSR) activities. Companies with net worth of INR 500 crores or more, turnover of Rs. 1000 crores or more, or net profit (before tax) of INR 5 crores or more were included under the law. The compulsory imposition of CSR was done with an ambition to bring an exclusive funding channel for CSR activities and contribute to societal betterment. With regard to collective operational impacts of corporations, their impacts go far beyond green house gas (GHG) emissions. Over time, compounded actions from industrial and consumer activity pose visible dangers like floods, drought, fires etc and invisible threats like the extinction of species that are critical to biodiversity. Forest loss and habitat degradation is also an unfortunate effect resulting from rapid development of infrastructure for human use.

The urgency of taking action is critical to discuss because these losses are occurring more frequently, more intensely and unnoticeably. As we enter 2023, we have already crossed four of the nine planetary boundaries[1]. Climate change and loss of biosphere integrity are considered core boundaries - the altering of which would trigger irreversible changes to the Earth system.

Status Quo

Ever since the introduction of the CSR amendment within the Companies Act, Indian companies have been supporting many developmental activities depending on what interests them and are within their scope of operations. They also have the power to pick up unique CSR initiatives to build goodwill and give back to society and environments. From a regulatory point of view, an advantage that they have is that the central and the state governments cannot direct the corporates on how to spend their money towards the welfare of society which is why the decision completely rests on the Board on financial decisions.

There are a few frontrunners from India Inc. that have carried out initiatives in the field of conservation. For example, the **Tata Group** has run nation-wide initiatives on ecosystem restoration like rebuilding bird habitats, pond rejuvenation, wasteland reclamation & others, conducted along with their subsidiary companies, partners, & NGOs. **Mahindra & Mahindra** focuses on the education sector by assisting socially and economically disadvantaged communities. It also runs programs such as 'Nanhi Kali', which focuses on education for girls. The company has also launched a unique kind of ESOPs – Employees Social Option – that enables Mahindra employees to involve themselves in various socially responsible activities depending on their

[1] https://unfccc.int/news/scientists-say-planetary-boundaries-crossed

choice. **Ultratech Cement** CSR activities leans towards family welfare programs, healthcare, infrastructure, environment, education, social welfare, and sustainable livelihood. Over the years it has organized various medical camps, sanitization programs, plantation drives, school enrolment, immunization programs, industrial training, water conservation programmes as well as organic farming programmes. **BVC Ventures** started an annual tree plantation drive and reached their target of planting 1,000 'native' trees in Mumbai. **Apollo Tyres** has run initiatives to help in biodiversity conservation, ecorestoration, improving aquatic ecosystems, and restoring water bodies.

As per data on the CSR portal of the Government of India (https://www.csr.gov.in/), in FY 2020–21, more than 17,000 companies spent about INR 24,000 crores for causes like health & sanitation, education & livelihood, rural development, animal welfare, and many others[2].

From publicly available data, it is understood that education, livelihood and gender equality programmes are preferred avenues for funding, but focus also needs to go on restoring water resources, biodiversity recuperation, species conservation and other critical conservation actions.

Channelling CSR funds to manpower and skills-deficient fields like biodiversity conservation is essential for many reasons. Most organisations depend on natural capital, that is, forest, land and water ecosystems, to survive. Most of these pristine areas have already been compromised due to anthropogenic activities.

[2] https://www.csr.gov.in/content/csr/global/master/home/home.html

Bridging the gaps

In nature, nothing exists alone. Conservationists and scientists can help businesses see the larger frame into which all our actions fit. However, due to their limited reach to influence policies and funding, they require intermediaries to ensure the right environmental decisions are made. Opening up CSR funds is one of the many methods to execute restoration and conservation activities.

Most companies usually focus on the social aspects of CSR, only some of them work on environmental aspects. In reality, some of the CSR practices focussing on environmental measures can do more harm than good to the cause. This usually happens because of poor planning and not using technical experts like conservation biologists. Some actions are taken by reducing carbon footprints, for example, in work processes and products, sustainable management of resources and recycling, etc., but does not seem to be enough considering the time that we have left to act.

The general view is that investments into human-related activities like skill development and education yield tangible results with a clear return on principal amount while returns on nature-based projects are difficult to realise. Therefore, CSR investments don't trickle down to critical environmental solutions like conservation of species and habitats.
The gap in understanding the time criticality of nature-based investments can be shortened with educational outreach programmes and training to CSR fund managers so that they may influence decision makers within the company.

Roadmap

Scientifically managing protected areas, restoring reserves, supporting breeding and translocating programmes is made possible only through stakeholder participation and adequate funding. The returns on investment are not within a fathomable time frame which deters public and private participation. Governments underfund conservation because its political benefits are delayed, and undervalued. Many private and communal conservancies are funded through commercial tourism, but opportunities differ between sites and is unreliable. There are opportunities to turn things around. A roadmap to put conservation activities within the purview of CSR planning is presented below.

	Management measures	Expected output	Expected timeframe	Potential contribution to conservation*	Financial Costs*
1	Improve natural habitats in a scientific manner in and around offices and facilities	Lowered disturbances, increased forage availability, community participation, improved health of the ecosystem	5 years	High	High
2	Reduce human-related threats (For e.g., planting invasive species, deforestation, pollution, fires) to flora and fauna endemic to habitats in and around offices and facilities	Cleaner local environments, thriving ecosystems, better quality of life	2 years	Moderate	High
3	Community education and inclusion	Behavioural change, increased awareness, wider circles of influence and action	4–5 years	High	Low
4	Funding conservation and developmental projects through NGOs/researchers	Workable solutions to critical issues faced in urban and rural areas, holistic utilisation of CSR funds in the long-run	5–10 years	Moderate	Moderate to High
5	Build capacity for conservation	Critical skills development, creating employment	3–5 years	Moderate to High	Moderate
6	Better communication of ecosystem values	Clear information to act on, communicating criticality of action	<1 year	Moderate	Low
7	Carbon offsetting projects	Offsetting emissions for carbon-intensive projects, sustainability reporting	1–3 years	Moderate	Moderate

***Legend**

Potential contribution towards conservation

• Moderate – Increased chances of conservation activities in the form of further community outreach, and earmarked funds for conservation-related projects.

• High – Long-term effects of conservation projects OR Increased rates of regeneration of natural habitats, measurable after the stated timeframe.

Financial costs

• Low – INR 1–7 lakhs; • Moderate – 7–15 lakhs; • High – 15 lakhs and above.

(Note: This legend has been framed on the basis of past projects executed by NGOs working in conservation).

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History and impact of Oil Palm cultivation in southeastern Asia and India

Introduction

Throughout the world, there are around 42 countries that produce palm oil. Indonesia and Malaysia produce over 85% of global palm oil supply (WWF). These major palm oil producing countries lie in Asia. The continent of Asia is rich in biodiversity, but also faces the highest threat of deforestation and habitat loss. The expanding oil palm plantations are a major cause of habitat loss, particularly in the tropical countries (Koh 2011).

Palm oil is considered to be an efficient crop with high global returns (Goh 2016). To meet the rising global demand for palm oil throughout the world, palm oil plantations are being expanded in the major palm producing countries such as Indonesia, Malaysia and Thailand (Dallinger 2011; Wicke et al. 2011). In order to be self-reliant, countries such as India are trying to expand their palm oil plantations as well (Mathur 2021). This expansion comes at the cost of harmful effects such as wildfires (Hope et al. 2005), landslides (Sidle et al. 2006), reduction in water quality (Comte et al. 2015), reduction in soil fertility (Hedin et al. 2009), carbon loss from vegetation (Gibbs et al. 2007), and impacts on indigenous populations (Obidzinski et al. 2012).

In this paper, we look at the situation of Oil Palm expansion in different Asian countries and understand the effects these expansions have had on them and what India can infer from it.

History of Palm Oil and its Introduction to the World

Palm oil (from the African Palm *Elaeis guineensis*) can be traced back to more than 5,000 years ago. Palm oil was long recognized in western African countries. It is used widely among western African people as cooking oil. In the 17th century, European merchants traded with western Africa and occasionally purchased palm oil for use in Europe, but as the oil was bulky and cheap, and due to the much higher profits available from slave-trading, palm oil remained rare outside western Africa.

During the early 19th century, the decline of the Atlantic slave trade and Europe's demand for legitimate commerce (trade in material goods rather than human lives) obliged African countries to seek new sources of trade revenue. In the Asante Confederacy, state-owned slaves built large plantations of palm oil trees, while in the neighbouring Kingdom of Dahomey, King Ghezo passed a law in 1856 forbidding his subjects from cutting down palm oil trees. Palm oil became a highly sought-after commodity by British traders, the oil being used as industrial lubricant for the machines of Britain's ongoing Industrial Revolution, as well as forming the basis for various brands of soap such as Palmolive. By 1870, palm oil constituted the primary export of some West African countries such as Ghana and Nigeria. By the 1880s, cocoa had become more highly sought-after, leading to the decline of the palm oil industry and trade within these countries.

The oil palm *Elaeis guineensis* is not native to Malaysia. Palm oil was first introduced to Malaysia (then Malaya) in 1870 as an ornamental plant. Its use as a crop was developed in 1917 when the first plantation was established. Then the palm oil plantations were mostly operated by English landowners. From the 1960's a major palm oil plantation scheme was introduced by the government mainly to eradicate poverty. Each settler was allocated 10 acres of land planted either with palm oil or rubber, and they were given 20 years to pay off the land.

India

Areas under palm oil cultivation in India

Andhra Pradesh, Goa, Karnataka, Assam, Kerala, Gujarat, Tamil Nadu, Maharashtra, Mizoram, Tripura, West Bengal, Telangana, and some areas of Andaman are on the list of palm oil cultivation in India. Out of these, Andhra Pradesh, Goa, Karnataka, Kerala, Mizoram, Tamil Nadu, Telangana are the States that share the maximum production of Crude Palm Oil (CPO) in India in the past five years.

Varieties of Oil Palm in India

There are 3 major varieties of oil palms available. These are -

1. Tenera: this variety is the ruling hybrid type and basically is a cross of shell-less Pisifera (female) and thick-shelled Dura (male). This variety has thin shells and is cultivated across the globe.
2. Dura: this variety is not commercially cultivated and it has a thick shell of 2–8 mm.
3. Pisifera: this is a shell-less fruit-bearing variety.

In India, 94.1% of its palm oil imports are used in food products, especially as basic cooking oil (Sagar et al. 2019). It is well-established that India is looking to reduce its dependence on palm oil imports from Indonesia, Malaysia, and others by cultivating its own palm oil plantations. This comes at a huge ecological cost. Government support in the form of subsidies is made available to farmers. Up to 85% of seedling costs and 50% on irrigation, chemical inputs, and processing costs (Srinivasan & Velho 2018). Kerala has two accessions of American Oil Palm *Elaeis oleifera* which were introduced from Malaysia and Costa Rica and planted at Palode, near the capital city of Thiruvananthapuram (Pedapati et al. 2013).

According to Mongabay, Kerala plans to double its palm oil cultivation in the next four years, as it just has one processing unit located in the southern area of the state (Joseph 2021). Oil palm cultivation is considered a threat to biodiversity if expanded in northeastern India, especially considering the fact that northeastern India and the Himalaya are one among the biodiversity hotspots in the world. The palm oil plantation in these regions is also harmful considering the 'land use change' policy,

According to Srinivasan et al. (2021), India has the potential to grow and expand its oil palm cultivation in certain areas without affecting biodiversity. They have estimated 7.86–38.8 Mha of land for palm oil cultivation. But this would require different compromises such as the conversion of marginal paddy fields to palm oil cultivations if biodiversity is to be spared.

Effects of Palm Oil cultivation on biodiversity in other Asian countries

Malaysia (Mainland)

Malaysia is the largest exporter of palm oil in the world, producing about 15 million tonnes of palm oil a year. It ranks next to Indonesia at 19,516 thousand tonnes of palm oil produced every year (FAO 2018). Palm oil production in Malaysia has increased significantly from 10.8 million tonnes in 2000 to 19.8 million tonnes in 2020 (FAOSTAT 2020). It now accounts for approximately 47% of global palm oil production and 54% of world exports. As one of the biggest producers and exporters of palm oil and palm oil products, Malaysia has been playing an important role to satisfy the international demand and to stay competitive in the world's oils and fats market. In 2004,

Malaysia produced nearly 14 million tonnes of palm oil, from its mere 3.8 million ha of plantation area. This has contributed to more than 1/3 of the agricultural GDP or 2.9% of the national GDP. The sector has become one of the most crucial foreign exchange earners for Malaysia. The current total forest area per total land area in Malaysia is 58.17%. There is a significant increase in the proportion of forest areas under legally established protected areas at 17.63% from 9.43% in 2000 (FAOSTAT 2020). However, the palm oil industry plays a crucial role in Malaysia's economy and livelihood. To increase palm oil production, palm oil plantations are increased. Palm oil plantations are known to be one of the leading causes of deforestation (Wilcove & Koh 2010). In Malaysia, the expanding palm oil production not only causes deforestation, but the burning of lands to make space for palm oil plantations threatens its peatlands (Evers et al. 2017; Jaafar et al. 2020). A study by Garrity et al. (1996) through the presence of *Imperata cylindrica* showed there is a large number of degraded land in Malaysia, as the plant Imperata invades and establishes the degraded lands.

In Peninsular Malaysia, Johor has the largest area of land (745,630 ha) planted with oil palms followed closely by Pahang (732,052 ha). According to Wicke et al. (2011), the loss of forest cover in Malaysia varies per region. In recent years, forest cover has been affected most by the conversion of forest lands to agricultural land and oil palm plantations. According to McMorrow & Talip (2001), such distinctive change in Malaysia is due to the autonomy of Malaysian states when it comes to land use and resource policies. Although there is relatively less deforestation compared to Indonesia, there has been a sharp increase in land use for oil palm cultivation in Malaysia (Wicke et al. 2011).

The oil palm plantation also threatens the peatlands of Malaysia which are home to highly diverse flora and fauna. According to Evers et al. (2016), the biodiversity in the peatlands of Malaysia includes an array of uniquely adapted taxa including more than 200 freshwater fish species (Posa et al. 2011) many of which (more than 102 species) are stenotopic and found nowhere else (Giam et al. 2012), such as Paedocypris progenetica, the smallest known vertebrate in the world (Kottelat et al. 2006). These habitats are also important habitats for a range of endangered large and charismatic fauna (Posa et al. 2011). These peat forests are

also important for the Proboscis Monkeys, the flat-headed cat, Sunda Clouded Leopard, the Marbled Cat, and the Sumatran Tiger, as well as being the preferential habitat of the endangered False Gharial (Cheyne et al. 2009; Wibisono & Pusparini 2010).

To reduce the negative effects of oil palm plantations on biodiversity, there have been attempts to make palm oil cultivation more sustainable. But few studies have shown that this is not achievable easily. In a review paper by Tang & Al Qahtani, they report that oil palm plantations in Malaysia fall short of sustainability. A study done by Edwards et al. (2010) found that the abundance of imperilled bird species was 60 times lower in fragments and 200 times lower in oil palm plantations than in contiguous forests. Thus proving that the idea of forest-friendly plantations does not actually work. Rather, the focus must be given to keeping the existing forests contiguous.

Borneo (Malaysia)

Land Areas: 743,330 km^2 (287,000 square miles, 74.33 million ha, or 183.68 million acres).
Human Population: 17.7 million, of which 17% or 2.2 million is indigenous Dayak.
Countries:
• Malaysia (states of Sabah and Sarawak) (26.7%)
• Brunei (Sultanate) (0.6%)
• Indonesia (Kalimantan - West, Central, South, and East) (72.6%)

The third-largest island in the world, Borneo, originally had a thick canopy of rainforests. A large portion of the region was nearly inaccessible and undeveloped, with hilly interior and marshy coastal parts surrounded by mangrove forests. Up until a century ago, headhunters governed the island's interior. Borneo saw a dramatic transformation between the 1980s and the 1990s. At a rate never before seen in human history, its woods were destroyed. The jungles of Borneo were used to make garden furniture, paper pulp, and chopsticks that were exported to developed nations like Japan and the United States.

The world's most prolific oil seed is the oil palm. When cultivated in huge plantations, a hectare of oil palm may produce 5,000 kg of crude oil, or about 6,000 litres of petroleum, making the product incredibly profitable. Large areas of land are being transformed for oil palm plantations as a result. More than 8.6 million ha of oil palm were cultivated in Indonesia in 2015, up from 600,000 ha in 1985 (FAOSTAT 2020).

Peat fires started for land clearance have also had a significant negative impact on Borneo, particularly Kalimantan. Over the past 30 years, millions of hectares of peat, brush, degraded forest, and rainforest have burned to the ground.

Some types of land in Borneo are:
Mangroves - Mangroves are found in estuaries and coastal regions. These are estimated to cover around 1 million hectares in Borneo, a small fraction of their original extent due to conversion for agriculture.

Peat swamp forests - Swamp forests appear in places where dead vegetation becomes waterlogged and too wet to decompose, hence, they accumulate as peat.

Montane forests - Montane forests are generally found at an elevation from 900 m to 3,300 m in Borneo. Trees in these forests are typically shorter than those of lowland forest, resulting in a less-developed forest canopy. Langner & Siegert (2005) estimate that in 2002, about 70 percent (1.6 million ha) of Borneo's original montane forests (2.27 million hectares) remained.

Heath forests - These forests are characterised by certain tree species tolerant of the poor, acidic soil conditions and are considerably "stunted" in comparison with typical rainforests. Heath forests are also less diverse than the other tropical plant communities. MacKinnon et al. (1997) estimate that Borneo was once covered with 6,688,200 ha of heath forests. Today this area is so diminished, the World Bank estimates that almost no heath forests will remain in Borneo by 2010.

Dipterocar forests- Lowland Dipterocarp forests are the most biodiverse and most threatened forests in Borneo. These giant trees, often exceeding 45 m in height, are the most valuable source of timber in Borneo and have been heavily logged since the 1970s. Langner & Siegert (2005) estimated that just under 30 million ha of lowland dipterocarp forest remained in Borneo in 2002.

In Borneo, interest in oil palm farms started to grow as valuable timber became harder to find. Even though the first oil palm trees were planted in Indonesia in 1848, it wasn't until the mid-1990s that the industry truly began to take off. Oil palm plantations expanded in Malaysia, which is currently the world's largest producer of palm oil, from 60,000 ha in 1960 to more than 3 million ha in 2001. In 2004, 13% of these were in Sarawak, and 30% were in Sabah, where the plant may thrive in perfect circumstances. However, due to Peninsular Malaysia's extensive usage of suitable land, development is anticipated to take place mostly in Kalimantan and Malaysian Borneo. In Sabah and Sarawak, oil palm agriculture has expanded from 186,744 ha in 1984 to 1,673,721 hectares by the end of 2003. Oil palm cultivation has grown even more quickly in Kalimantan, from 13,140 ha in 1984 to around one million hectares at the end of 2003.

Oil palm is a low-risk venture for big estate owners because of its minimal maintenance requirements, expanding demand, and lack of other viable economic choices in the area, despite the fact that much of the new land brought under cultivation is not optimal for the crop. Subsidies that help large plantation owners include those for crude processing facilities and roads. The fruit of the palm tree, which may weigh 40 to 50 kg in clusters, is used to make palm oil. A single hectare of oil palm may generate 5,000 kg of crude oil, or approximately 6,000 litres of crude oil that can be used to make biodiesel, as opposed to 100 kg of oil seeds, which normally yield 20 kg of oil.

Borneo was seldom ever inhabited by people for the most of its history. Populations were tiny and dispersed due to the harsh environment and thick jungle. This has all altered in the last fifty years. The population of Borneo has doubled as a result of the more than 500,000 transmigrant arrivals over the previous 30 years, and there is now a huge labour shortage. When the forestry and rubber industries failed in the

middle (Malaysia) to late 1990s (Kalimantan), job possibilities for the majority of the local population dried up. Despite this, Borneo continued to see hundreds of fresh visitors each week. In Borneo in the late 1990s and early 2000s, rising unemployment was a major worry, and ethnic strife was raging in several areas of Kalimantan at the same time. Many locals and governments viewed the quick rise of the oil palm in the late 1990s and early 2000s as a welcome opportunity. The entire price of the sector's quick expansion is just now becoming apparent to observers.

Environmental Impacts

Beyond the obvious deforestation that results from clearing lowland rainforest for plantations (86 percent of deforestation in Malaysia from 1995–2000 was for oil palm plantations), there are other environmental impacts of oil palm cultivation. Several studies have found a significant reduction (on the order of 80% for plants and 80–90% for mammals, birds, and reptiles) in biological diversity following forest conversion to oil palm plantation. Further, many animals will not move through plantations while others, like orangutans, become crop pests putting them at risk of defensive poaching by plantation managers. The use of herbicides and pesticides can also impact species composition and pollute local waterways.

Drainage systems required for plantations (oil palm plantations in Borneo are often established in swamp forest) may lower water tables, affecting neighbouring forest areas. Further, destruction of peat lands increases the risk of flooding and fire. Land-clearing fires set by large oil palm plantation owners were the single largest cause of the massive 1997–1998 fires in Borneo.

According to current research, eating palm oil poses the biggest damage to the greatest number of species. A few species, such as palm civets, rats, and leopard cats, may thrive in monocultures, but the vast majority of rainforest species—more than 80% when compared to intact forest—are forced to find other habitats or perish. The cause? By eradicating the canopy, ruining intricate nutrient cycle systems, and converting clear-flowing streams into filthy receptacles for fertilisers, pesticides, and industrial chemicals, conversion to oil palm destroys entire niches in the forest. The industrialization of palm oil threatens many rare species, including the fishing cat and the flat-headed cat, whose only habitat is the swampy lowlands of Peninsular Malaysia, Borneo, and Sumatra. These two species are so rare that Jim Sanderson, the foremost expert on small cats, has only seen photographs of one and three individuals in the wild, respectively.

Four of Borneo's five cat species are vulnerable or endangered, Palm oil is the greatest threat to their survival. The rising demand for palm oil is also harming Borneo's "pygmy" elephants, who are called that because they are smaller than the elephants found in mainland Asia. The number of elephants harmed by snares set by plantation workers trying to augment their income by selling boar and deer meat to restaurants or eating it themselves has increased, according to the Sabah Wildlife Department, which maintains parks in the state of Sabah in Malaysian Borneo. Elephants fall into the traps and get caught in them. The ensuing wound may get infected

and potentially end in death of the animal. At Nyaru Menteng in Kalimantan, in the centre of Indonesian Borneo, the consequences of palm oil growth on orangutans are particularly evident. For the simple reason that appropriate habitat in Borneo is being deforested so quickly that it is becoming more and more difficult to identify areas for reintroduction, Nyaru Menteng is now more like a sanctuary rather than the rehabilitation centre it was designed to be. Study of the community of ground-dwelling ants in different plantations in Sabah, Malaysia, over two years using tuna baiting, revealed that the oil palm plantation ground ant community was severely reduced in species richness in comparison to the forest interior, regardless of age, undergrowth cover, or proximity to neighbouring forest.

Oil palm development has had an adverse effect on some of Asia's most iconic and endangered species, including Sumatran rhinos, tigers, Borneo pygmy elephants, small cats, and the well-known red ape, the orangutan.

Indonesia

Palm oil cultivation is on the rise, and Indonesia boasts the highest production of palm oil with Malaysia in the entire world, around 85% (Orangutan Foundation International 2022). Among these, 96% of Indonesia's palm oil comes from the islands of Borneo and Sumatra. Although most of it is grown commercially for international export, palm oil has also replaced coconut oil, which was traditionally used for cooking in Indonesia and contributes to 11% of the country's export earnings (Orangutan Foundation International 2022). Sumatra is the 6th largest island in the world and is home to a vast range of biodiversity, many of which are endemic to Sumatra and are highly threatened based on the IUCN Red List. Also, it is the only place in the world where orangutans, elephants, tigers and rhinos live together. Sumatra and Borneo primarily have peat land and get heavy rains, which is ideal for growing palm. The palm oil cultivation is done on primary forest lands instead of degraded lands of grasslands as it requires less maintenance and economic investments like that of fertilisers, etc. Also, as the forests are cleared by fire, the ash acts as good fertiliser for the land, but at the same time, it creates massive air pollution and carbon deposition through the swamps (Orangutan Foundation International 2022).

Sumatra is home to rare and distinct species like the Sumatran Orangutan *Pongo abelii* (CR), Sumatran Elephant *Elephas Maximus Sumatranus* (CR), Bornean Pygmy Elephant *Elephas maximus borneensis* (EN), Sumatran Tiger *Panthera tigris sumatrae* (CR), Sumatran Rhinoceros *Dicerorhinus sumatrensis* (CR), Sunda Clouded Leopard *Neofelis diardi* (VU), Sunda Pangolin - *Manis javanica* (CR), Crested Black Macaque - *Macaca nigra* (CR), and Malayan Tapir - *Tapirus indicus* (EN) (Palm Oil Investigations, n.d.). This list also includes the newly discovered Tapanuli Orangutan - *Pongo tapanuliensis* (CR), which was discovered in 2017 on Sumatra Island. Proboscis monkey, sun bear, flying fox bat are some of the 201 mammals, 580 bird species and around 15,000 known plant species found there (WWF 2020).

In the past 22 years, Sumatra has lost 50% of its forest cover, which is around 12 million hectares of forest (WWF 2020). Most of this

forest is cut down to get land for growing palm oil to meet its global demand. This leads to habitat loss for forest dwelling species, hence making them susceptible to poachers, forcing these animals to come to cultivation, farms and civilizations for food and increasing human – wildlife negative interactions. Many threatened charismatic species are endemic to either Sunda or just Borneo and/or Sumatra. There are only around 300 Sumatran Rhinos, less than 400 Sumatran Tigers, around 1,600 Bornean Pygmy Elephants (smallest elephant subspecies), 2,500 Sumatran Elephant and all of the 6,000 Sumatran Orangutans living in the wild found on the island of Sumatra (Palm Oil Investigations, n.d.). Due to habitat loss by deforestation for palm oil, these animals are either killed or exported for various purposes.

Orangutans are exported globally under exotic pet trade or are killed as pests by locals when they come to their farms for food (Palm Oil Investigations, n.d.). For Sumatran Tigers, elephants and rhinos, even today poaching remains the main threat, but habitat loss to palm oil has made them more prone to poachers. Sometimes, even locals kill these animals (e.g., elephants) to prevent them from coming near human settlements and farms and also take out their tusks to make it look like the work of poachers (Tropical Conservation Fund, n.d.). All these things together make it difficult to conserve these species as habitat once lost, cannot be reversed. Even though National Action Plan for Sustainable Palm Oil was implemented in 2019, and has developed three provincial platforms in Riau, northern Sumatra, and western Kalimantan, and three district platforms in Sintang, South Tapanuli and Pelalawan, species habitat once lost, cannot be restored by any afforestation methods (UNDP 2022).

Thailand

Thailand is one of the major oil palm producers in the world. Located in the Indo-Burma biodiversity hotspot, the country contains high species richness. A study by Jaroenkietkajorn et al. (2021) was done on the impacts of oil palm plantations on bird and insect species from land use in five regions of Thailand. Data from Global Biodiversity Information Facility (GBIF) and Thailand's Land Development Department (LDD) were used for species occurrence and land use data, respectively.

As per the study, bird and insect species were considered as an adequate representation for other animal species affected by oil palm plantations in Thailand. It concluded that impacts like water scarcity, soil degradation, among biodiversity loss were a direct result of deforestation to cultivate palm oil. Land-use change caused destruction in habitats with endemic species left in the lurch. Local and regional characterization factors were used to estimate environmental impacts.

Local characterization factors based on site comparisons and taxon affinities for specific land use types were estimated for each forest type. The regional characterization factors considering the wider landscape also depended on the local factors. With regard to species density, the differences between forests and ageing oil palm plantations are higher than between forests and all oil palm plantations. The study found that species density decreases with the age of

plantations. Also, the differences are higher for birds than for insects. However, this could also be due to research data gaps for insects. (Jaroenkietkajorn et al. 2021).

Indian states under palm oil cultivation and impact on their wildlife:

Goa

A total of 953 ha was covered for palm oil plantation, up to March 2018. And the union territory produces about 305 metric tons of palm oil in the year 2020–2021 (MoAFW). As oil palm is a water-guzzling species and has a greater impact on the soil in which it is grown in, and as this is a monoculture crop the land cannot be used for any other crop, which is not desirable. And the impacts it has on the clearing of forest and the species in it is also very damaging.

Kerala

In India, 94.1% of its palm oil imports is used in food products, especially as basic cooking oil (Sagar et al. 2019). It is well-established that India is looking to reduce its dependence on palm oil imports from Indonesia, Malaysia and others by cultivating its own plantations. This comes at a huge ecological cost. Government support in the form of subsidies is made available to farmers. Up to 85% of seedling costs and 50% on irrigation, chemical inputs and processing costs. (Srinivasan and Velho, 2018).

Kerala has two accessions of American Oil Palm *Elaeis oleifera* which were introduced from Malaysia and Costa Rica and planted at Palode, near the capital city of Thiruvananthapuram. (Pedapati et al, 2013). According to Mongabay, Kerala plans to double its palm oil cultivation in the next four years, as it just has one processing unit located in the southern area of the State. (Joseph 2021). Oil palm cultivation is linked to irreversible consequences to biodiversity and adverse effects of climate change. However, the short and long-term impacts on species and habitats have not been researched in detail for the State of Kerala.

Tamil Nadu

The Government is trying to increase the area available for the production of palm oil in Tamil Nadu and is offering many subsidiaries to farmers starting from irrigation costs to maintenance cost to reduce the oil import from other countries. Farms that are already being used for coconut cultivation and other oil seeds are encouraged to be converted into palm oil plantations but farmers are uprooting the palm trees because of problems faced in irrigation in spite of the subsidiaries provided by the government, and it is here that a number of people who had started growing the crop are shifting back to coconut. The primary reason is that — as a fast-growing and large plant — a palm requires lots of water. Both Indonesia and Malaysia have an average annual precipitation of over 2,500 mm. India's average annual precipitation comes to a little over 1,000 mm. The demand for water cannot be met by rain alone, and needs irrigation systems. This, in turn, means greater strain on water sources, especially groundwater, which leads to a falling water table.

The government expects the expansion of palm oil to happen in existing farmland, replacing other crops, or — since the plant requires three to four years to mature — intercropping.

Table 4 : District-wise Area under Oil Palm in Tamil Nadu (2015-16)		
Name of the District	**Area in Ha**	**Potential Area Identified**
Thanjavur	614.68	25000
Thiruvarur	232.35	15000
Nagapattinam	206.30	10000
Ariyalur	205.72	
Perambalur	225.51	8000
Tiruchirapalli	183.38	2500
Karur	147.92	1000
Cuddalore	1393.65	25000
Villupuram	1771.76	20000
Tirunelveli	241.29	25000
Virudhunagar	25.50	
Pudukkottai	20.30	
Sivaganagai	9.80	
Dindugal	51.0	
Erode	68.0	
Namakkal	17.59	
Salem	97.0	
Theni	130.0	25000
Tiruppur	55.0	
Coimbatore	65.0	
Vellore	800.95	11000
Thiruvannamalai	170.0	
Kanchipuram	42.20	
Thiruvallur	17.0	15000
Krishnagiri	16.50	
Dharmapuri	29.50	
Total	**6837.90**	**182500**
Source : Directorate of Agriculture, Government of Tamil Nadu, Chennai - 05		

More than half the Indian farmers are totally dependent on rain-fed agriculture, with no access to irrigation. In short, this scheme is not for them. In fact, the leading players in palm oil production in India are corporate players such as Patanjali-owned Ruchi Soya, 3F Oil Palm Agrotech, and Godrej Agrovet. Several farmers spoke about having uprooted their palms as it became unfeasible – they lost money in keeping a farm that wasn't yielding enough to harvest – and it is possible that this rejection was a larger affair than admitted. In fact, the DOPR Vision 2030 glosses over this aberration with "So far an area of 1.94 lakh ha was covered under oil palm but only 1.64 lakh ha exists at present as about 30,000 ha were uprooted due to various reasons" of the conditions prevailing in 2010. This statement of the DOPR may hide crucial ailments in the scheme to portray palm oil as the ideal crop. Much of the oil palm plantations visited in the coastal belts of Tamil Nadu had water tables that were high. However, according to government reports, all the districts visited report high salinity (electrical conductivity more than 3000 µS/cm at 25°C), fluoride and nitrates beyond acceptable limits. On the whole, only landed farmers have benefitted from the palm oil plantations, especially those that had good and sufficient access to water. In almost all cases the farmers have been able to avail of all the subsidies from both the company as well as the government and the benefit of technical advice from the extension officers. However, certain problems have affected all the farmers. These have been:

a. A bad arrangement for the procurement of the harvested fruit and delayed or irregular payments.
b. The long distance between farms and the processing plant as there is only one processing plant in Ariyalur in Tiruchirapalli district for the entire state; this delay in procurement of the fresh fruit bunches from the farm has led to the bulk of the produce from the farms being used for the production of crude oil fetching lower prices.
c. The increasing expense of wages for farm labourers.

d. The number of male-flowering palms that the farmer did not envisage and hence lost out on the profits. Research has shown that that male inflorescence is promoted by water-deficit conditions. This point was also mentioned by a farmer in Theni district who cultivated 100 acres of oil palm; he also claimed that 120 litres a day was sufficient for a palm. As in Malaysia and Indonesia, the water conditions vary little through the year, it probably does not alter the sex-ratio of the inflorescences, unlike in the drier conditions of India. The problem of an abundance of male-flowering palms that the farmers face could be related to water stress).

Karnataka

Oil palm was introduced as an ornamental crop in 1860 and planted at National Botanical Garden, Kolkata. Research on oil palm in India started during 1960 with the establishment of a research station at Thodupuzha by the Department of Agriculture, Kerala with Dura and Tenera germplasm imported from Malaysia and Nigeria. In 1981–82, Tenera accessions were introduced from Nigeria, Ivory Coast, and Zaire. Some Tenera hybrids were also imported and planted under the 'All India Coordinated Research Project' on palms at four centres, one each in Andhra Pradesh, Karnataka, Maharashtra and Tamil Nadu during 1987–88.

A total potential area of 1.93 million ha in 18 states has been identified for growing oil palm in India with diverse agroclimatic conditions. Karnataka produces 2% of the nation's total output. The area under oil palm is shrinking in Karnataka. The potential area in the State of Karnataka for oil palm development is 2,60,000 ha. Under various schemes implemented by Govt of Karnataka, about 36,000 ha were developed, which is only 14% of the potential area available. At present, only 11,983 ha (about one-third of the developed area) under oil palm is existing in the State. About 67 percent fall can be observed from the area developed under oil palm. This means, about 24,000 ha of area under oil palm has been converted to grow other crops.

Oil palm Impact in wildlife and environment in Karnataka:

- The fragmentation of natural forest habitats and the invasion of palm oil development are connected issues that have led to severe conflicts between humans and wildlife like elephants.
- Forest burning to clear land for planting oil palm and other plantations is an annual event. Draining and burning of carbon rich peatland areas also causes the release of significant volumes of sequestered carbon, which adds to the level of greenhouse gas (GHG) emissions.
- Apart from the impacts of deforestation on biodiversity, ecology and climate, oil palm plantations are also associated with ecological impacts from agricultural inputs and practices.
- Also, depletion of the water table, leaching of chemicals into groundwater sources, runoff into water bodies.

Current status oil palm cultivation in Karnataka:

Horticulture Minister B. Somashekhar visited the Central Plantation Crops Research Institute (CPCRI) in Kasaragod, Kerala, to interact with scientists. He had formed a committee headed by noted scientist P. Rethinam of the CPCRI to

study the feasibility in Karnataka. According to the committee's report, an area of 3 lakh ha of land could be brought under oil palm cultivation in the major irrigation command areas of the Thungabhadra, Upper Krishna Project, Malaprabha and Ghataprabha, Bhadra, and Cauvery. "The committee had recommended that a processing factory should be established under the public sector for every 2,000 ha of land within a radius of 40 km so that it would be possible to process the produce within 24 hours of harvesting. But despite such aspirations, the scheme did not succeed as the subsequent governments did not show much interest. This resulted in several farmers even removing oil palms from their fields", said Mr. Somashekhar.

Potential areas:

A total area of about 28 lakh hectares was determined to be suitable for oil palm agriculture in India in 2020 by the reassessment committee of the ICAR- Indian Institute of Oil Palm Research (IIOPR) 2020. 18.37 lakh ha of the overall 28 lakh ha of potential land are in the general states, and 9.62 lakh ha are in the northeastern states. The states having potential areas according to the report are Andhra Pradesh, Gujarat, Chhattisgarh, Goa, Karnataka, Odisha, Tamil Nadu, Telangana, Kerala, Bihar, Madhya Pradesh, Maharashtra, Uttar Pradesh, West Bengal, Arunachal Pradesh, Andaman & Nicobar Islands, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura with a total of 284 districts. Currently, the three states that cultivate the most oil palm are Andhra Pradesh, Telangana, and Kerala accounting for 98% of the production. In addition, Gujarat, Mizoram, Odisha, Tamil Nadu, and large portions of Karnataka, also grow palm oil in sizable areas. Recently, oil palm plantations were also launched in Arunachal Pradesh, Assam, Manipur, and Nagaland (National Mission on Edible Oils -Oil Palm n.d.).

Mizoram

In Mizoram, palm oil has been considered a crop of immense economic promise. The state has 78 percent of the total land under oil palm cultivation in northeast India. However, the threat to biodiversity and soil fertility due to palm oil, has environmentalists, economic planners and farmers divided regarding the expansion of this crop in the biodiversity-rich state. The state government has been aggressively promoting oil palm cultivation since 2005 under its New Land Policy. Recently, the union cabinet also approved the National Mission on Edible Oils - Oil Palm with a special focus on the northeast region and the Andaman and Nicobar Islands.

Dampa Tiger Reserve, one of the last remaining tiger habitats in Mizoram, has been cultivating oil palm for the past seven years. Forest guards do not get remunerated regularly and thus have to indulge in alternate occupations like cultivating palm oil, areca nuts, rearing animals, running shops, among others to keep their families afloat. To sell palm oil fruits, they have to drive 30 kilometres to West Phaileng in Mamit district, incurring heavy transportation charges. Because of this, many farmers have given up the cultivation of palm oil and switched to areca, pineapple and banana which are easier to sell. Environmentalists agree that palm oil is harmful to the local ecology of northeast India, which is rich in biodiversity and home to a number of endangered flora and fauna. Many

experts believe that replacing wildlife habitats with palm oil risks eradicating globally important plants and wild animals. In a 2016 paper co-authored with Jaydev Mandal, a researcher formerly affiliated with Gauhati University and now an assistant professor at Madhab Choudhury College, wildlife scientist T.R. Shankar Raman of Nature Conservation Foundation (NCF) states that palm oil plantations (in Dampa Tiger Reserve) had the lowest forest bird species richness (10 species), followed by teak plantations (70).

As palm oil plantations lead to permanent loss of forest cover, the density of species is lower there. There is also an increase in human-wildlife conflict. Farmers keep complaining about how rodents and porcupines destroy palm oil crops. Previously, such conflicts were uncommon. Jhum fields were open, and fallows and regenerating forests provided habitat for ungulates such as barking deer and sambar, which served as a food source for carnivores such as tigers and clouded leopards. As a result, we can conclude that palm oil does not support the majority of wildlife.

Palm oil is a significant threat to soil fertility in addition to its impact on biodiversity. Nutrients, enzymes, and carbon are found in much lower concentrations in soil after palm oil extraction than in other types of forests.

The effect of jhum cultivation on mammalian species distribution was investigated using a transect survey for scat, camera trapping, and burrow counting. The most common visitors were barking deer (27%) and wild boar (24%). The carnivores with the greatest abundance (3-5 scat samples per jhum field) were Leopard cats and Indian Palm civets based on documented sightings. Abandoned jhum fields, 2–5 years old, were found to be a suitable habitat for large herbivore movement. The frequency of scat decreased as the jhum's age increased beyond 5 years. Clouded leopards frequented the roadside, trails, and primary forest near the active jhum forest. The encounter rate for active and old rodent burrows was 3.56 km^2 and 2.68 km^2 in 1–2 year old, recently abandoned jhum fields, respectively. Camera trapping yielded 36 images of various animal species. Mammalian distribution is aided by increased spatial heterogeneity.

Andhra Pradesh

The biggest importer and the second biggest consumer - this is where India stands with respect to palm oil. And wonder which state in India produces the oil the most? Andhra Pradesh (Horticulture Department 2018). It contributes to 83.5% of the total palm oil production of the country (Pandey & Aggarwal 2021). With plantations spread over an area of 1.62 lakh ha (which is the highest area in the country), the state sees an average productivity of 19.81 tons per ha from the bearing plantations. The plantation helps over 1 lakh farmers earn bread (Horticulture Department 2018).

Initially cultivated on lands which were once paddy fields, this water gulping plant flourished in Andhra Pradesh (even in water scarce areas of the state) due to the rampant supply of groundwater (Ramnath 2018). As of now, a total of 229 mandals in nine districts (Srikakulam, Vizianagaram, Visakhapatnam, East Godavari, West Godavari, Krishna, Nellore, Ananthapur,

and Chittoor) have been identified for the palm oil cultivation (Horticulture Department, 2018). However, the state has been facing water scarcity, and as a result, farmers have now slowly begun to shift from it (Pandey & Aggarwal 2021).

Effects on nature in Andhra Pradesh:

Grey literature on palm oil plantation/ cultivation's effect on habitat is close to none. Thus, an inference cannot be made. In a recent study by Sreenivasan et al. (2022), there are explanations of how palm plantations in north-east India is not a good idea. However, in the case of Andhra Pradesh and Telangana, there is no such mention of completely avoiding plantations from there. The only suggestion made was to regulate the cultivation so as to save the habitat and the species, e.g., Indian Wolf *Canis lupus pallipes* and Lesser Florican *Sypheotides indica*, which could face threats otherwise.

Telangana

The state of Telangana stands 6th in the palm oil arena. It's the second largest producer of the Fresh Fruit Bunches (FFBs) (the ripe palm fruits from which the oil is extracted), only after Andhra Pradesh (Horticulture Department Telangana, 2018). Here, the oil plantation is spread across 36,421 ha of land and 23,000 farmers are employed in the cultivation. The state also stands 1st in Oil Extraction Rate (OER) in the country (Pandey & Aggarwal 2021). By providing employment to over thousands, palm oil plantation assures income which is fixed by the Government adhering to the Oil Palm Act 1993 and AP Oil Palm (Regulation of Production and Processing) Rules 2008 (Horticulture Department 2018; Pandey & Aggarwal 2021). In addition to it, subsidies on irrigation equipment, fertilisers, and intercropping are provided (Pandey & Aggarwal 2021).

However, these subsidies cease to exist after four years when the palm trees start bearing fruits. Thus, to sustain the plantations, farmers have to use groundwater. A mature oil palm tree requires 200–250 litres of water. However, as seen in Andhra Pradesh, water scarcity is an issue in Telangana as well. And thus, farmers have started shifting to other alternatives (Pandey & Aggarwal 2021). In an attempt to achieve more than the target given by the union government, the Telangana government has now planned to cultivate palm oil in 80,937 ha of land in the next four years. That is, to increase 22 times the existing cultivated area (Pandey & Aggarwal 2021).

Effects on nature in Telangana:

Though there are mentions of plantations to be one of the causes of loss of forest cover in Telangana, no literature has yet mentioned palm oil plantation specifically. Reddy et al. (2015) in their study highlight the high levels of forest cover loss that has taken place between 1975–2013 in 2 districts of Telangana - Khammam and Nalgonda. Both of these districts are known to have the most palm oil plantations (Pandey & Aggarwal 2021). From this, it can be inferred that the plantation that is leading to mass forest loss as mentioned in the paper could most probably be of palm oil. Simply put, palm oil cultivation causes forest clearance. No literature on wildlife affected due to this could be gathered for Telangana.

Latest Developments:

1. Agreements with the governments of Assam, Manipur, and Tripura for the development and promotion of oil palm farming by Godrej Agrovet (Oil Palm Cultivation, n.d.).
2. In order to increase their cooperation in promoting the use of palm oil, the Indian Vegetable Oil Producers' Association (IVPA) and the Malaysian Palm Oil Council (MPOC) have signed a memorandum of understanding (MoU). The MoU is projected to boost the production and consumption of palm oil from Malaysia and collaborate in areas of shared interest.

Conclusion

Oil palm is considered to be an efficient crop with high global returns. To meet the rising global demand for palm oil throughout the world, palm oil plantations are being expanded in the major palm producing countries such as Indonesia, Malaysia, and Thailand. Palm oil is used in almost all packaged foods and other commodities due to its cheap price and ability to maintain freshness of shelved products. In order to reduce imports and increase self-sustainability, India started growing palm oil in different States like Andhra Pradesh, Goa, Karnataka, Assam, Kerala, Gujarat, Tamil Nadu, Maharashtra, Mizoram, Tripura, West Bengal, Telangana, and some areas of Andaman practice palm oil cultivation. However, farmers in these areas have shown desires to shift their cultivation to other crops due to certain difficulties in cultivation and the high water requirement of the plant, which is affecting the ground water levels in these States.

The issue of higher concern is that of cutting down forest lands that will lead to habitat loss of various species and thus, making them vulnerable to anthropogenic activities, poaching, hunting, exports, etc. If we look at the examples from Indonesia, Malaysia and Thailand, we can infer the amount of damage that palm oil cultivation causes to wildlife and vegetation. Borneo and Sumatra, which are collectively one of the largest producers of palm oil in the world, have compromised their endemic species like Bornean and Sumatran orangutans, pygmy elephants, elephants, tigers, rhinos and many other species to palm oil cultivation. However, stopping palm oil cultivation altogether is not an economically viable option, looking at the amount of market products that depend on palm oil. Hence, finding an intermediate way or a replacement is important for sustainable palm oil growth along with protection of wildlife and forests in the country.

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Acknowledgements
We would like to extend our gratitude to Payal Molur for introducing us to the topic of oil palm cultivation as a problem during an educative game; and to Dr. Sanjay Molur for guiding us and giving us an opportunity to work on this topic for our project.

Aishwarya S Kumar, Akansha Mishra, Lakshmi Ravinder Nair, Melito Pinto, P. Kritika, Pooja Ramdas Patil, Rajib Saha, Soham Parnaik, Swaathi Na & Tandrali Baruah, RHATC Fellows 2022–23, Zoo Outreach Organisation, Coimbatore, TN, India.

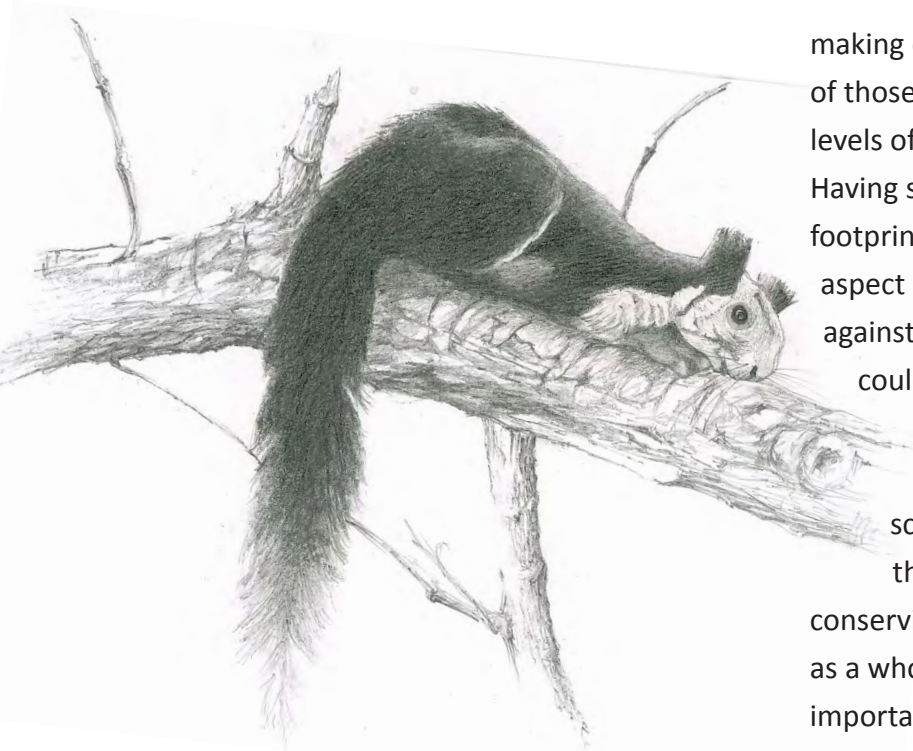
Animal Welfare versus Conservation Welfare

It is often believed that feeding or being friendly to street dogs, monkeys, or other animals is contributing to their welfare. Animal welfare is all about considering the welfare of an individual or a group of individuals in any given situation. It is giving voice to voiceless animals in a human-dominated world, it is about emotions, and it is about the well-being of that one particular animal. On the other hand, conservation welfare is more focused on the welfare of the species as a whole and not just a single animal. It is based more on science.

We can take the example of the Spotted Deer from a zoo that were released into the wild owing to their overpopulation from poor management at the zoo. This release caused the death of wild spotted deer, gaurs, and elephants due to anthrax spread by the released zoo animals. In such cases, animal welfare is directly at loggerheads with conservation welfare. The zoo people justified this release by saying that due to overpopulation the deer didn't have enough space and keeping them in would be inhuman, when in fact they wanted to release the deer so that they would have fewer mouths to feed. In such cases, human greed is being masked as animal welfare.

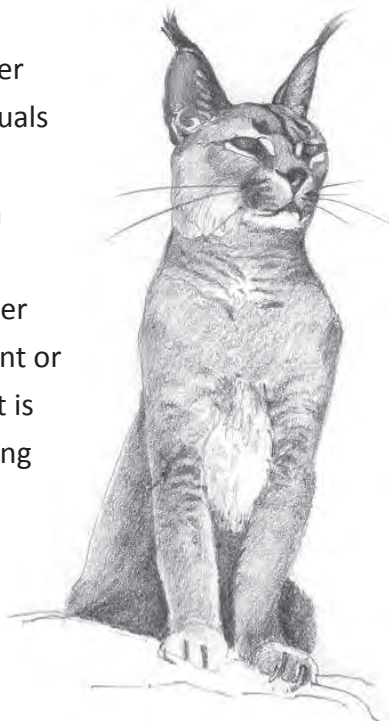
A debate on the differences between animal welfare and conservation welfare was opened up for the RHATC Fellows of the 2022–23 batch taking the problem of feral livestock as an example. The following are the points that came up during the debate.

Sterilization may seem like a less cruel act than straightaway culling of the individual but it defeats the purpose of the immediate call for action, it may work in the long run but conflicts due to the feral population will still be persistent and a menace to society until they meet their ends. Sterilization is also not very cost-effective,



as the feral population is usually much more in number and it's not possible to ensure that each and every individual has been sterilized, because even a few left unsterilized would make the whole effort ineffective. But on the other hand, an immediate solution would be culling the animal which everyone may not agree with but it would be economically effective, but then there is a drawback to the safe disposal of the carcasses of the animals as improper disposals might result in the spread of many diseases to other animals and humans as well. Countering that argument was a point that diseases can be spread from feral to wild animals even when they are alive.

Building an animal shelter for such feral animals can also be proposed but it will be the same as keeping an animal in a zoo and on top of that the cost of maintenance of that shelter will be too much and there will be no timeline to how long this practice can go. One other major problem with keeping the feral livestock population alive either via sterilization or by making enclosures for them is that neither of those two provide a solution for the high levels of methane produced by this livestock. Having said that, humans leave a bigger carbon footprint which has a negative impact on every aspect of the environment. These arguments against animal welfare and animal conservation could go on and on without an end but the solutions won't prove beneficial to anyone unless it is taken based on science and not on emotions. Though the welfare of an animal is important, conserving the species as a whole is more important. It is better to lose a few individuals for safeguarding the whole species like in the case of Avni or for safeguarding other ecologically important or beneficial species. It is way better than saving a few individuals in the name of animal welfare and ending up with the mass mortality of a greater population.



Illustrations © Arnab Roy

Acknowledgements
We extend our deepest gratitude to Dr. Sanjay Molur for giving us the opportunity to have this discussion and put forth our varied perspectives. Also, to help us give a gist of the problems faced by different stakeholders in the real world, and to give us a space to express our thoughts.

P. Kritika, Aishwarya S. Kumar, Akansha Mishra, Lakshmi Ravinder Nair, Melito Pinto, Pooja Ramdas Patil, Rajib Saha, Soham Parnaik, Swaathi Na & Tandrali Baruah, RHATC Fellows 2022–23, Zoo Outreach Organisation, Coimbatore, TN, India.

Imaginary species

This activity was the culmination of a series of educational experiences that taught adaptation, food webs, classification and animal behaviour. The Fellows were asked to create their own animal keeping in mind 5 key questions. 1. What does the animal eat; 2. Who eats it; 3. Where does it live; 4. How does it protect itself or attack its prey; and 5. What scientific name do you give it?

The activity played out over half an hour and served to reinforce the concepts related to evolution and design by having them apply what they have learnt. While designing their animal the Fellows realized that it is not an easy task while demonstrating the beauty of selection in evolution. It also allowed the Fellows to be creative and have some fun with the planning and being the architect of an animal that has to survive in today's environment and landscape. It forced the Fellows to consider factors such as protection, food availability, and foraging behaviour.

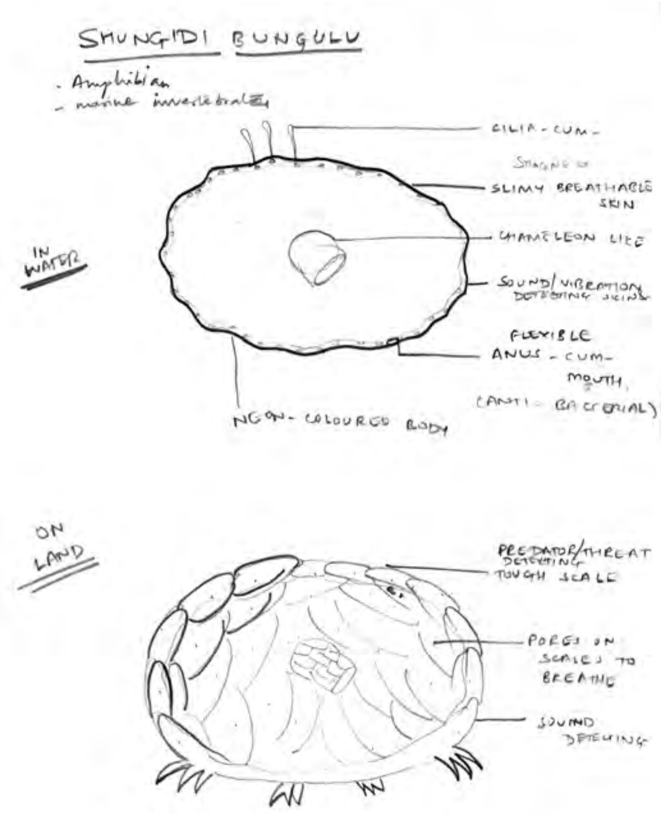
The Fellows came up with hilarious weird looking yet well-thought-out creatures.

◇◇

Shumbidi Bungulu

My reaction to anything that I find cute, bubbly or slimy always ends in a fancy language. That's how the name for my imaginary animal sprung up in my mind as soon as Payal asked us to draw one. Shumbidi Bungulu is super squishy/slimy/flabby. A marine invertebrate, this animal like an amphibian. In water, the animal appears neon in colour and the body resembles a slime with perforations all over. One of the perforations is quite big. It is its flexible anus-cum-mouth. To defend the animal from any pathogenic attack, just beneath the skin is an anti-bacterial lining which extends all over. The slimy breathable skin has cilia like structures which help it with locomotion. The skin also has the ability to detect any sound/vibration. In the middle, it has chameleon-like eyes protruding from each lateral side.

When on land, the animal looks like a pangolin ball. It has small plates/scales just underneath its belly. When entering land, from beneath, all the scales stack up all over the body like a shield. They also form sharp claws meant for locomotion and defence. Each scale has a small pore on it which enables the animal to breathe on land. The scale can also detect threat in the form of vibrations/ sound.



Acknowledgment: I thank Payal Bhojwani Molur for making us do such a wonderful activity! I loved making and presenting this creative work of mine.

Aishwarya S. Kumar, RHATC Fellow 2022–23
Zoo Outreach Organisation, Coimbatore, TN, India.

LiMaOthosaurus mishra

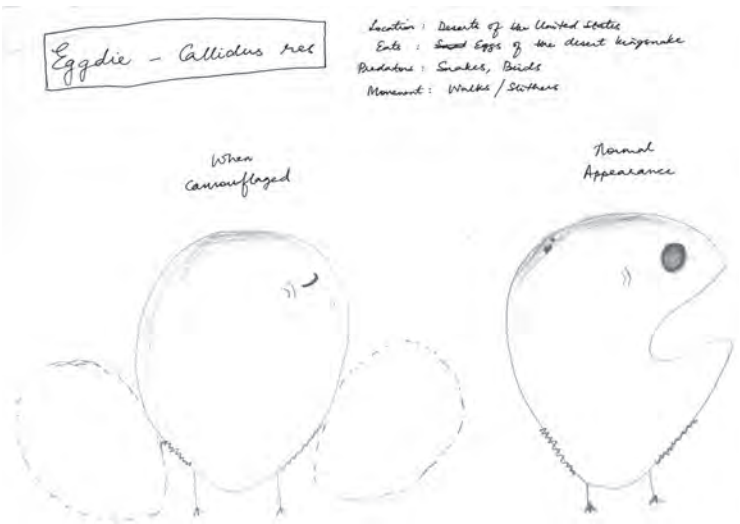
The name of this species is *LiMaOthosaurus mishra.* The species has this name as it is a mix of a lion, a macaw and an ostrich. It has a red coloured mane and an olive green coloured body. Only the males possess this red mane to attract the females. Females are plain olive green. The animal is big, about 1.5 – 2 meters in length and 1 meter in height. Their tail is like that of a sting ray, sharp, pointed and long. Their eyesight is good, and they have large eyes. They are carnivores and have sharp canines. Their feet is like that of an ostrich, and they have long legs, with longer hind legs for jumping and running. They have hollow bones that allow them to fly, and their wings are covered by hydrophobic feathers that allows them to stay dry after jumping in water to catch fish. They also have sharp claws to tear open meat, and opposing thumb, to perch on branches and holding things like a monkey. Their neck is of the same size as that of a lion. They have 6 limbs, out of which, 2 are modified as wings and 4 are feet. Their ears are small, and hearing is extremely weak. They have a strong-smelling ability. Their sound is a mix of lion roar and macaw call, which is a very loud, screeching yet terrifying sound. They are found in South American Rainforests, along the Amazon river banks. Their diet includes a large variety of animals, including fish, mammals, reptiles, amphibians, birds, eggs and juvenile *LiMaOthosaurus mishra* as well. They don't have any natural predators, and are themselves apex predators. However, there have been records of them being hunted by locals tribes of Amazon for consumption. Their defence includes spiny tail, teeth, claws and their demonic sound. Their modes of movement include flying, perching and a little running. The IUCN status for this species is that it is Data Deficient.

Acknowledgments: I would like to thank Payal Molur, who engaged us in this fun, yet introspective and educative activity of creating our own imaginary animal. Also, I would like to thank Tandrali, as by looking at her bottle, I got the motivation to colour my animals red and green. At last, I would like to thank Zoo Outreach Organization and RHATC for providing this platform to us, where we can meet so many resourceful people, learn new things, imagine bravely and put out those imaginations on paper, but with a pinch of science.

Akansha Mishra, RHATC Fellow 2022–23, Zoo Outreach Organisation, Coimbatore, TN, India.

Eggdie

The Eggdie (*Callidus res*) is an interesting animal. It is an egg-like creature that feeds on eggs. Eggdie lives in the desert and feasts on the eggs of the desert kingsnake in particular. To avoid predation from other snakes and birds, Eggdie camouflages like an egg and takes cover in the egg nest. Quite clever, right?



Eggdie has retractable legs and a leathery structure near its legs so that it can walk and slither across the desert sand. It has minute ear membranes beside its eyes that can help it detect ground predator movement and flee the scene. Eggdie is predominantly found in the deserts of the United States. Please do refer the image to see what this clever animal looks like.

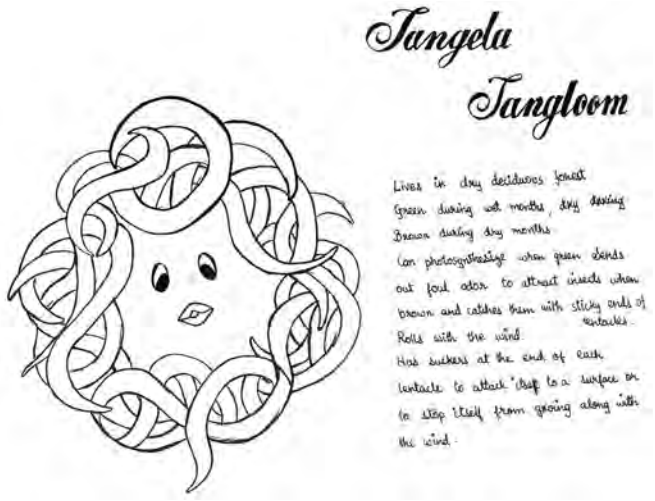
Acknowledgments: I would like to thank Payal Molur for conceptualizing an activity like this and bringing out my creative side. Special thanks to Latha G as well for helping the team publish all this on Zoo's Print.

Lakshmi Ravinder Nair, RHATC Fellow 2022–23, Zoo Outreach Organisation, Coimbatore, TN, India.

Tangela Tangloom

Tangela tangloom is a creature inspired by the pokemon characters Tangela and Gloom. It has a round body covered in tentacles. Each tentacle is sticky and has retractable suckers at the end. It is a terrestrial animal that lives in a dry deciduous forest. So, it changes colour according to the seasons. During wet months, it is green in colour and can photosynthesize. During the dry season, it is brown in colour. During this time, it sends out a foul odor to attract insects and catches them with the sticky ends of its tentacles. It rolls with the wind. The suckers at each end help it to attach itself to a surface or to stop itself from going along with the wind.

Acknowledgment: I thank Payal for making us do the activities that we would make the students do while carrying out an education program. This makes us understand the games better and also increases our understanding of the hardships that could arise. I also thank her for teaching us the various ways to make teaching interactive and fun for the learners and for making us better educators as a whole.



Swaathi, Na, RHATC Fellow 2022–23
Zoo Outreach Organisation, Coimbatore, TN, India.

Omniptopus Tranquiiansis

Acknowledgment: For me, this activity was exciting & allowed me to think freely, I thank Payal Molur for conducting this activity and I am grateful that I was part of the RHATC 2022–23 batch.

Soham Parnaik, RHATC Fellow 2022–23, Zoo Outreach Organisation, Coimbatore, TN, India.

Omniptopus Tranquiiansis- This creature is an evolutionary form of octopus that lives in the Deep ocean and has symbiotic relations with corals, it takes in carbon dioxide and releases oxygen, eats phytoplankton, and scavenges on dead materials. It understands the surroundings by touching with sucker arms. It pretends to be a stone to prevent predation. Offspring are generated by parthenocarpy. The most characteristic feature is its 'third eye' which can move to any part of the body to heal that part and scan the surroundings. Migratory habit- For eight months this animal is socially active but for four months it comes out of the water, develops the undeveloped wings in one week, and flies off to another place to be isolated.

Leoke

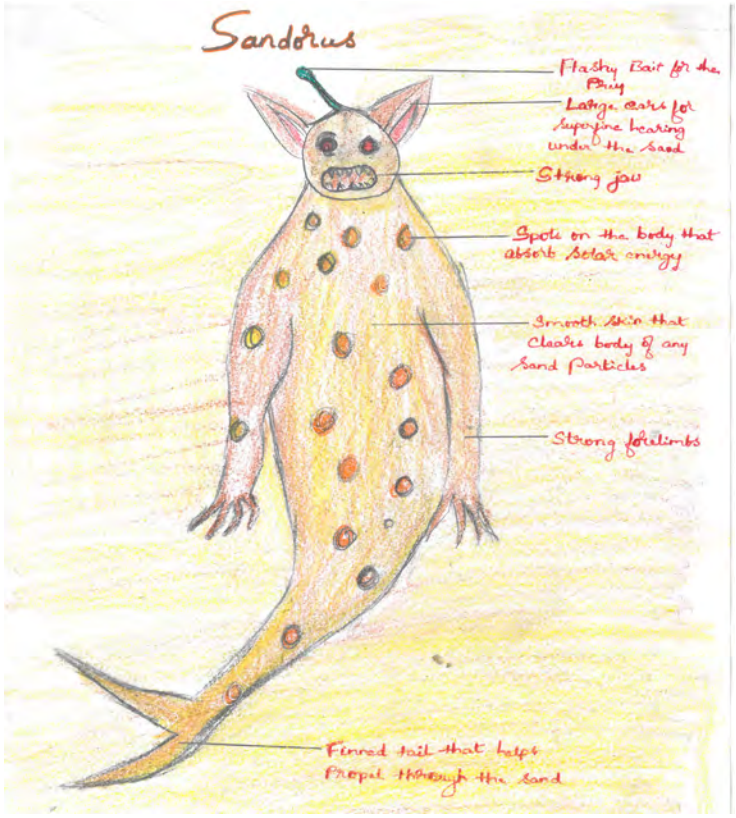
Leokus muishishi also known as Leoke is a result of an activity conducted by Payal. Leoke is a name that came after thinking about characters of leopard and snakes, the two animals which I personally think are very efficient predators. The animal has sharp teeth to hunt or to tear flesh away, it also has fangs that have venom to hunt a bigger animal than its size. Leoke has sharp claws, long ears, and a short neck. It is dull in color so as to camouflage with its environment. Its legs are also short- for it to hide in its habitat. It also has a hard shell covering its vital organs from a predator attack - like a tiger. It is a nocturnal animal and it hunts in packs. It is found mostly in moist deciduous forests.

Acknowledgments: I would like to thank Payal B. Molur for conducting this activity and for making the learning process a bit more fun. I would also like to thank the whole Zoo Outreach Organization team for their support.

P. Kritika, RHATC Fellow 2022–23
Zoo Outreach Organisation, Coimbatore, TN, India.

Sandorus

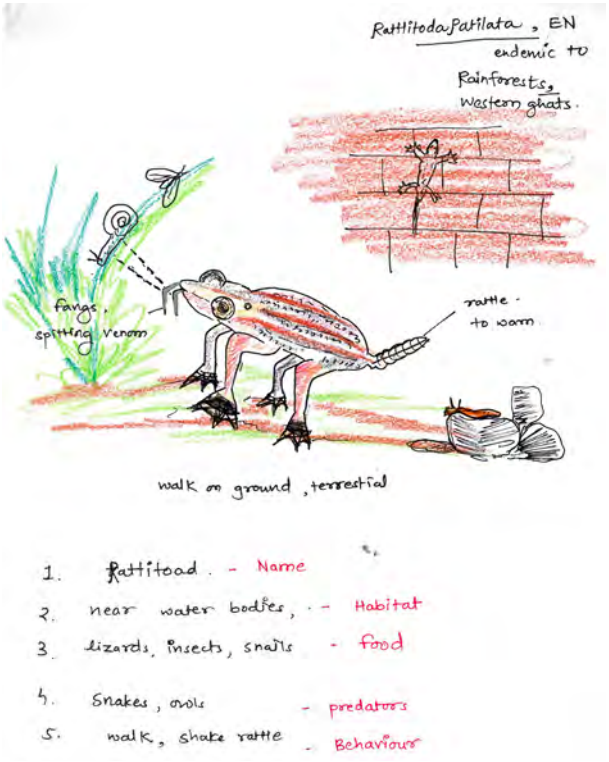
Sandorus is a creature of the deserts and is found in deserts throughout the globe. It lives beneath the sand, rests during the day, and searches for prey during the night. The spots in its body absorb the solar energy during the day and charge up the light bait antenna. It flicks this antenna out of the sand during the night, and when something approaches this bait, it quickly jumps out of the sand, chomps, grabs down the prey in its strong jaws, and dives bac in the sand, where it will slowly finish off its dinner. The long, finned tail helps it cruise through the sand at high speed. It has strong limbs to fend off any threat, thus it has no natural predators in the area.



Acknowledgments: I would like to thank Dr. Sanjay Molur and Payal Molur for making me think creatively while being ecologically conscious.

Melito Pinto, RHATC Fellow 2022–23
Zoo Outreach Organisation, Coimbatore, TN, India.

Rattlitoda patilata



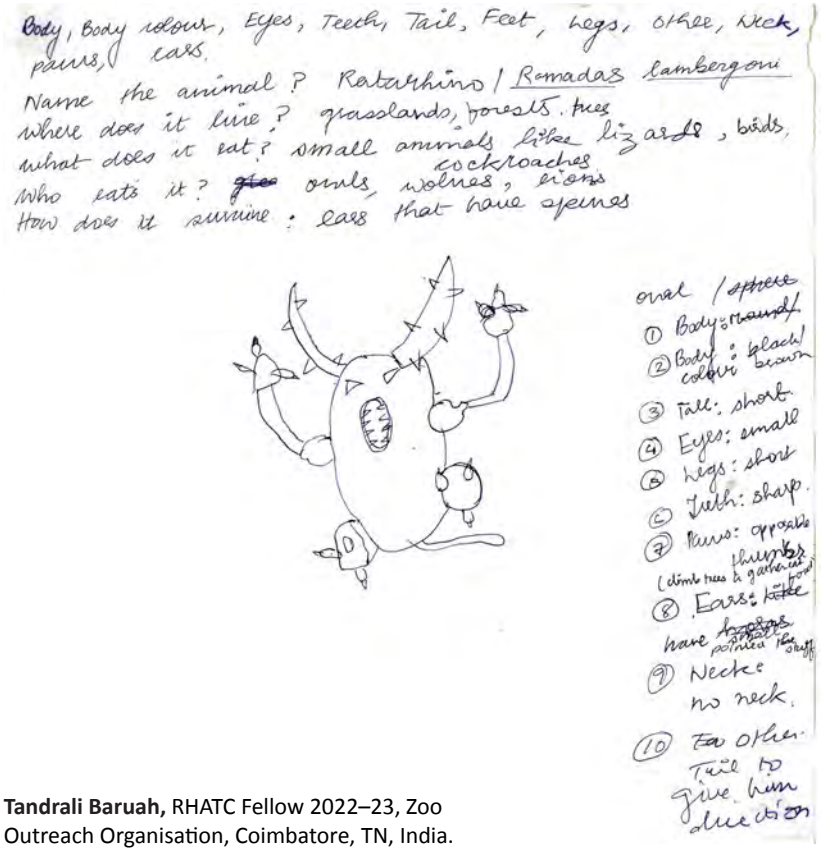
The name of my imaginary, fascinating animal is *Rattlitoda patilata*. It is only found in the rainforests of western ghats and so it is one of the significant endemic species. And because of the degradation of western ghats, it is in danger so the IUCN red list assessment declared it as Endangered.

The Rattlitoda looks like a Frog but has a rattle-like rattlesnake. So that is why named as *Rattlitoda patilata*. Also, it has fangs that spit the venom and attack on and then engulf the prey. It Shakes Rattle to warn its predators. The species has webbed feet which are helpful and used in swimming. But they also live on the ground so also known as terrestrial animals. They feed on small insects, lizards, and snails. They prefer to live near small water bodies. They also have to beware of their predators which are snakes and owls.

Acknowledgment: I want to thank Payal for inspiring me to think creatively and for giving me the tools to envision. Payal's performance of this feat was incredible. I remembered how inquisitive we had been as kids and felt like a kid again. Payal, thank you for keeping the kid alive in me.

Pooja Ramdas Patil, RHATC Fellow 2022–23, Zoo Outreach Organisation, Coimbatore, TN, India.

Ramadas lambergoni

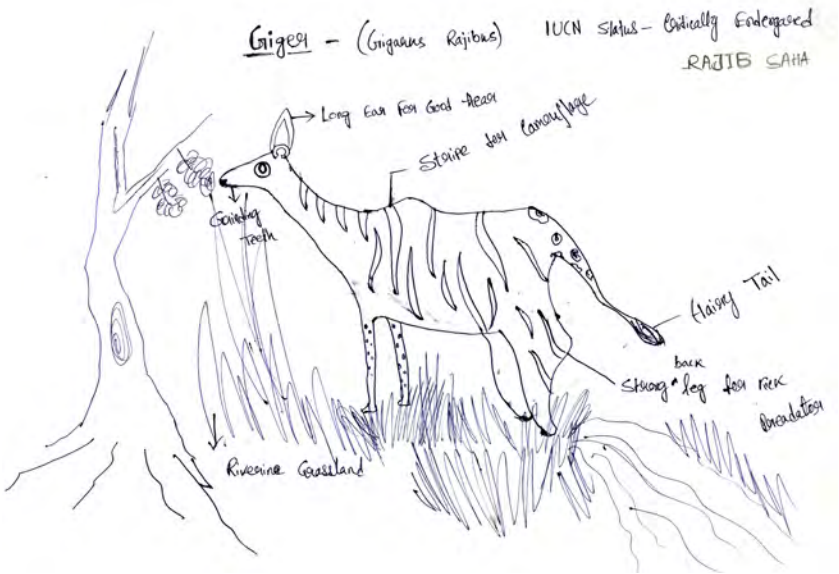


Tandrali Baruah, RHATC Fellow 2022–23, Zoo Outreach Organisation, Coimbatore, TN, India.

Ramadas lambergoni my imaginary animal is a medium sized, chiropteran which has small triangular eyes with horns. The motivation for this diagram came from the fact that on our way back from RHATC's first fieldtrip we got to witness the *Pteropus medius*. Bats are associated with diseases including rabies. My representation of the imaginary animal is an exaggerated version of what people perceive of them. However, bats play an essential role in pest control, pollinating plants and dispersing seeds. Therefore, through this imaginary animal I want to put out a message that bats are mostly misunderstood and bats do matter.

Acknowledgment: I would like to thank the Zoo Outreach Team especially Payal Molur to help me bring forward my creativity side forward.

Giger



My imaginary animal, Giger lives in riverine grassland. It mainly eats grass and different herbs. It has long ears for good hearing. It has stripes on the neck and abdomen for good camouflage in grassland. It has a long hairy tail, which is used to drive away flies and insects. Also, it has a strong and muscular hind leg that helps it defend itself against predators.

Acknowledgments: I would like to thanks Payal Molur for gave us the fun activity.

Rajib Saha, RHATC Fellow 2022–23
Zoo Outreach Organisation, Coimbatore, TN, India.

The snow plains of Ramanathapuram

An overview of the place

During drive through the Sikkal-Valinokkam road, one can see vast expanses of salt pans on either side of the road. Heaps of salt stand tall and make the majority of the view here.

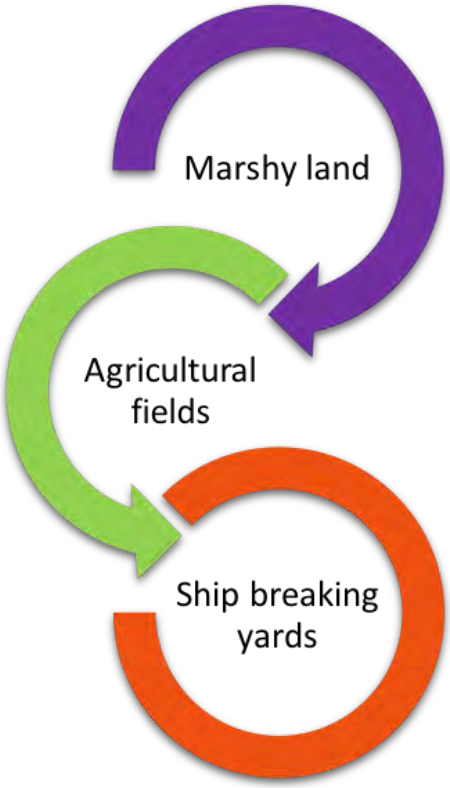
Forming a part of the Gulf of Mannar Biosphere Reserve, Valinokkam (situated in Ramanathapuram district, which is about 80 km from Rameswaram) is home to one of the biggest salt pans of Tamil Nadu. Close to these saltpans is a huge water body- Brahmankulam.

The saltpans and the waterbody now house a large variety of water birds and waders due to which it has been proposed as a potential bird sanctuary (Raveendran Natarajan & H. Byju pers. comm.).

A dive into the history

Before the lands were converted to saltpans, the areas near Brahmankulam served as sites to break ships apart (Raveendran Natarajan, pers. comm.). However, even before they served as one, these areas mainly had unused lands or agricultural fields (H. Byju, pers. comm.) which initially were lands of marshy vegetation.

The place held a lot many shore birds and several small mammals (H. Byju, pers. comm.). This abundance was exploited by the communities of the region who practiced rampant hunting (Raveendran Natarajan, pers. comm.).



The gradual conversion of land and its use till the 1970s.


© Aishwarya S Kumar


© Rajib Saha


© B. Ravichandran

The birth of the saltpan

It was not until the 1970s that saltpans came into existence. This is when the Tamil Nadu government converted a significant portion of these lands into saltpans (Raveendran Natarajan, pers. comm.). More recently, since 2011, an additional area of 2,320 acres has gone under the hammer of development (TNSC 2018). This area includes unused land area and other agricultural lands in the area. Today, Tamil Nadu is the second largest producer of salt in India, after Gujarat (TNSC 2018; TOI 2019).

Scenes since the rise of the saltpans

From the birds' points of view

While the shanks (red/green), sandpipers (marsh/ green), gulls, little stints, plovers (Little Ringed/ Kentish), and terns (Gull-billed) are found making merry in the salt pans, birds like egrets, Eurasian Curlew, and pelicans are found taking refuge in the water-laden reservoirs (Raveendran Natarajan & H. Byju, pers. obs.). Thus, the saltpans provide nesting and breeding sites for thousands of such heronry birds. They also make major wintering grounds for migratory birds (Nammalwar & Ramesh 2006). During the early 1990s, these saltpans saw over 1,500 Greater Flamingos and other waders (Balachandran 2006). From being an area, which supported thousands of flamingos, Valinokkam now hosts these pink visitors in very small numbers which could be due to the lack of food available to them (Raveendran Natarajan, pers. comm.). Nevertheless, there has been an increase in the number of other shorebirds found here.

From the agricultural point of view

The salt pans here are present at a lower elevation (Magesh & Krishnakumar 2019) than the nearby agricultural lands in the area. This along with the seasonal monsoons that Ramanathapuram receives regulates the salinity in the agricultural lands. Thus, at present, these saltpans don't have much impact on the agricultural lands in this area. Having said this, it will show impacts in the long run (H. Byju, pers. comm.)

Conclusion

Although these saltpans are artificial in nature, they do provide habitats for lots of large wading birds and migrant shorebirds in high numbers (Pandiyan et al. 2021). This makes them worthy enough to be recommended as plausible bird sanctuaries. It also provides livelihoods for a lot of people. But on the other hand, the conversion of this land to salt producing areas has led to drastic changes in the landscape, and it has caused the complete loss in the fertility of lands which were converted to salt brines. Though it doesn't affect the nearby agricultural lands right now it will have adverse effects on them in the long run. Many of the small mammals that were previously hunted by these communities are not found much (H. Byju, per. comm.).

Acknowledgement

We thank Raveendran Natarajan of Iragukal Amritha Nature Trust for sharing valuable information on the saltpans of Rameswaram. Our sincere gratitude to H. Byju for further elaborating us on the same.

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Aishwarya S Kumar & Swaathi Na, RHATC Fellows 2022–23, Zoo Outreach Organisation, Coimbatore, TN, India.

Do the Leaders in Profession help/ don't help in conservation? Why?

In 'Follow-The-Leader' initiative Payal and Karthikeyan enlightened me about the nature guide profession. This profession is aligned with the ecotourism industry which has both positive as well negative impact on wildlife.

I have analysed the perspective and enlisted my points referring to some research papers. Let's look at the positive side. Ecotourism has net positive impact on conservation because it creates revenue for conservation and contributes to increase in species survival (Buckley et al. 2016) it creates livelihood for local communities and aligns with sustainable development goals (Stronza et al. 2019) and acts as an educative initiative towards sensitisation towards wildlife, it seems the best collaborative strategy that promotes participation from locals.

There are criticisms of ecotourism as well, because conservation is just one aspect of ecotourism. The impacts it can have on protected areas can be:

- change in the land use by new resorts and lodges,
- increased pressure on resources increases as water and electricity are exploited for guest comforts,
- waste disposal can be hazard to wildlife species as well as nearby habitats, affects health of wild animals adversely (Holmes 2018),
- effects it has on behaviour of wild animals and makes them vulnerable (Geffroy et al. 2015).

Presence of more people in protected areas dilutes the intent of keeping animals undisturbed in natural habitats. Photographers and recreational tourists are interested in charismatic species that are bigger and appear vivid. Ecotourism is an industry that intends to encourage consumption and make profit; hence conservation measures are compromised often. The communities living around could be neglected because of lack of vocational skills, therefore upskilling, re-skilling becomes necessary.

Ethics followed by nature guides is subjective to individual perceptions, it contributes to the health of ecosystems because:

1. the tourists consciously/ unconsciously mimic nature guides behaviour.
2. assertiveness by nature guide is necessary in scenarios where money power may deteriorate ecosystems.

3. guides, hosts and guests are on boarded with some common but mostly different expectations, nature guides being executioners must advocate for conservation aspects of tourism.

From the above discussion I feel professionals in ecotourism depend on the guests or/ and hosts for their own livelihood unless they are entrepreneurs; it can become a deciding factor for conservation vs staying employed. These professionals do have good intent and help in contributing to conservation to some extent.

There is a possibility that local tribals/ rural populations could be forced by capitalists and bureaucrats to leave their local lands for construction of resorts. Lack of policy in ecotourism creates an ambiguity. Some ecotourism initiatives bloom with huge profits and some fail miserably, both are lose-lose for wildlife, too much profit equals resource exploitation and loss equals no funds for conservation.

There are also lack of

1. longitudinal studies that reflect impact of ecotourism on species conservation, habitat conservation.
2. information on anthropogenic threats of ecotourism.
3. ecological models to predict survival of species affected by ecotourism.
4. ecological models to mitigate issues in ecotourism.

There is a need to advance the theories in conservation science that contribute to the management of protected areas.

Therefore, a leader's profession, being a nature guide takes us back to the principles of conservation, sticking to ethics, being assertive, and balanced execution of programmes. Taking deliberate measures to prohibit steering towards commercial tourism is a challenge that can be taken up by a nature guide.

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Acknowledgements: Perspectives of leaders from diverse disciplines helped me to look at conservation issues in different ways. I express humble gratitude to Payal Mehta and S. Karthikeyan for showing me how a nature guide looks at conservation. I thank the Zooreach team for connecting us to resourceful people in RHATC.

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Management of the Nilgai population

The Nilgai, a large bovine animal in the Indian subcontinent has been in the news for a long time as it has destroyed livelihoods by raiding crops across farmlands. It is alleged that in Bihar alone over 3,000 Nilgais were culled during 2017–2019. From the perspective of conservation, this presents a conundrum whether or not culling of Nilgai is viable. Following are the things that need to be considered in order to assess culling as an effective method to control the Nilgai population:

Ecological issues: Nilgais are grassland animals. With the grasslands not available in the region and the absence of major predators of Nilgai such as the wolves and hyenas, the Nilgai population grows out of control. The major issue with reintroducing the predators is that the grassland habitats need to be restored. With the currently high Nilgai population in these areas, such efforts would prove ineffective.

Community issues: Crop losses - wheat, gram, maize, moong and other pulses are among the crops that are most damaged by Nilgai in States such as Bihar and Punjab. This drives farmers to kill the Nilgai. Another thing to consider is people's approach towards carnivores. The fear of getting into conflicts with carnivores such as wolves due to reasons such as attacks on livestock. This in turn makes it tough for the re-introduction of the carnivores back in those habitats.

Economic issues: Intervention measures such as solar fencing, relocation, transportation of the prey or the predator, setting up of slaughter houses demands financial resources. Even hiring professional shooters to carry out culling demands a large sum of money. Any other scientific method of intervention would need a lot of planning, funding and can be time consuming by which, things would be too late to act upon.

Proposed Conservation Strategies

The RHATC Fellows propose the following methods to manage the overpopulation issue in the States where the Nilgai is overpopulated.

Strategies that don't include culling:

Immuno-contraception: With the help of chemical interventions, the Nilgai's immune system can be controlled to prevent fertilization for around 2 years.

Relocation: Three types of relocation are proposed to contain the Nilgai population.
1. Nilgai relocation—As a prey species, the Nilgais could be transported to areas with natural predators to systematically feed on them.
2. Predator relocation—Depending on the Nilgai population size to be managed, predators could be introduced to their habitats to achieve ideal population size.
3. Community relocation—As a last resort, if the damage and destruction is unmanageable through human interventions, the communities could be relocated to other areas with similar living conditions as their previous habitats.

Building infrastructure: The following spaces could be constructed to evenly distribute the Nilgai population in suitable habitats.
1. Green corridors—Build new or restore vanishing wildlife corridors in and around the existing habitats of the Nilgais.
2. Solar-powered fences—Restraining the movement of Nilgais with the help of solar-powered electric fences by preventing/ limiting intrusions.

Education of communities: Communities are the strongest ally in tackling the menace caused by Nilgais. Through awareness programmes, educational materials and seminars on the use of scientific methods to prevent overpopulation, which may include coexisting with natural predators, cultivating crops to suit predator behavior, can go a long way in containing the problem at the source.

Strategies that include culling:

Monitored culling: Instead of giving a free hand to farmers to cull Nilgai, appointed and qualified personnel such as the forest departments must be given the responsibility to cull the population.

Nilgai meat: Nilgais could be explored as a possible food source to humans and captive animals.

Pros of using culling methods:
1. Immediate solution to control the population.
2. Introduction of the Nilgai as a food source for people and predator animals held in captivity.
3. Restoration of the ecological health of the grasslands that they were a part of.

Cons of using culling methods:
1. Over-culling can possibly lead to their extinction.
2. Irresponsible disposal of carcasses can lead to a public health issue.
3. Disease outbreak of zoonotics from other animals feeding on carcasses.

Conclusion

Culling of a species that wreaks havoc to croplands has been attempted in the past with no sustainable solution. Therefore, an integrated approach of using culling methods where it is economically and logistically and ecologically viable is recommended by the. For example, this could include monitored culling and construction of green corridors. Other factors to consider can be conducting carbon footprint assessments of the shortlisted conservation strategies, inclusion of stakeholder concerns and conducting regular awareness sessions with communities.

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Lala A.K. Singh

-- shaping wildlife conservation in basins of Mahanadi, Chambal, and Similipal and other achievements

In one more session of follow the leader, Dr. L.A.K. Singh was the speaker. He has been in conservation for 38 years. He was associated with the Odisha Forest Department and is now retired. The talk started with a brief introduction about L.A.K. Singh and before he started talking about his journey through life and through conservation, he was so kind enough to include a slide dedicated to the 10 fellows, our names, and what we told him on the inauguration and by going through our blurbs. He has shaped the conservation in the basins of Mahanadi, Chambal, and Similipal while researching in crocodile conservation (mainly gharial). Dr. L.A.K. Singh was involved in many research such as:

- the radio tracking of gharial,
- designing census techniques for gharial and Mugger,
- checklist and spatial distribution of wetland birds through seasons,
- refinement of tiger pugmark tracking,
- development of census techniques for elephants and other herbivores,
- planning of project elephant based on elephant habitats,
- and LTEM (long-term ecological monitoring) of species

He has been an instructor at Central Institute for Forest Officers. Other than crocodile conservation he was also a tiger researcher.

Dr. L.A.K. Singh has done many conservation activities – he was involved in the conservation and development strategies of gharial and crocodile, and he has done many surveys and monitoring of birds and helped in data collection on the population trends. He divided his presentation into various parts to represent various parts to explain to us how it progressed and he explained all the phrases in great detail. He talked about his childhood and the experiences he had in the nearby pond and how he developed an interest in wildlife. He has got five publications while his master's. He mentioned how one doesn't need sophisticated instruments to observe, and conservation and research go hand in hand. He believes one cannot conserve without knowing the or about the species which is absolutely true.

His next slide was about his next phase in life, where he got selected for the research position under the government of India (GoI)/Government of Odisha/ United Nations Development Programme (UNDP)/ FAO project for crocodile conservation and was selected for the five-day field test. Not only that, this was the first ever crocodile project in India in which he continued his journey. He talked about his life at Tikarpada forests located in Odisha, on the banks of the river Mahanadi, and the people he met in that village, there were activities of poaching gharial, and to keep control of that gharial guards were made up. Setting up a meteorological station and fixing posts in water to know the water levels in the rivers were the challenges that awaited him there. He started with only 42 hatchlings of gharial which he had to take care of till they grow to a certain length and then reintroduce the successfully.

Crocodile conservation was all about protecting the remaining natural population and rebuilding the population by head starting, monitoring the movement of surviving gharial in the river to achieve a high survival success of captive rearing and

developing a knowledge base about the crocodile, building up trained personnel and involve local communities also in the conservation action. GRACU (Gharial Research and Conservation Unit) was set up for that reason there were also proposals for crocodile farming for commercial utilization but later all three crocodiles were listed as scheduled-I species in the WPA. He also shared stories about the people of the villages he stayed in, the times he spent with them.

Egg collection, translocation, and incubation are one of the most important processes, the best time to collect eggs were within the first week or 50-55 days after the in-situ incubation, eggs were collected from muddy banks are those are the places gharial like to nest. Reptile eggs are very different from avian eggs, it has to be handled with even more caution, the orientation of the egg should be marked as they are kept in nature and it should be kept in the same orientation while incubating them. The eggs must be kept in a winter cover for the gharial hatchlings. After hatching the basic measurements are taken like size and weight. He mentioned that before handling the hatchlings one should use potassium permanganate so that the young ones don't contract any infections and remain healthy. And after the hatchling would grow about 3-4 feet in length, they used to release it in the wild.

He gave other information too on how to measure the gharial, measurement of scutes, and how to interpret these observations to identify an animal. They can also be identified by footprints and tail prints. Differences between a gharial (*Gavialis gangeticus*) and a mugger (*Crocodylus palustris*) how a gharial drags its body while walking and can't really lift its body weight due to weak limbs but a mugger can lift its body while walking. There are methods of identifying individuals from the scute arrangement and lengths on their tails.

Dr. L.A.K Singh also briefly describes the species of crocodiles found in Odisha (India)- which are the *Gavialis gangeticus*, *Crocodylus palustris*, and *Crocodylus porosus* and talked about the conservation activity he was involved with mugger and gharial in CCBMT field campus on river Chambal at the Deori campus near Morena. He shared a story of the gang of nine men who claimed they were the police but actually weren't, and the time they forgot to bring a matchbox on one of their trips and hence couldn't make any food. Radio tracking and long-term ecological monitoring of animals such as the gharial, the mugger, the Gangetic dolphin, turtle, large raptor, and non-raptor birds and their population trends were also done by him. By 1987 he was assossiated with CCBMTI for six years as an assistant instructor, instructor, research officer, assistant director, and officer-in-charge and by the same time there were 30 rearing centers, 11 special crocodile sanctuaries, and 20 other wetlands for crocodile rehabilitation had been developed by then.

Tracking

For the gharial radio tracking experiments, the first batch of gharial for the radio tracking experiment was brought from Kukrail to Deori. Techniques to attach the transmitter were developed in Deori Gharial Center, but that didn't sit so well with the locals as of the four transmitters – one wasn't traceable, one was on a treetop, one was found on a dead gharial. Wild-born gharials were captured at Pureini and fitted with transmitters on their tail which gave some understanding of their movements. When a successful method of putting the collar around the gharial came up, it was in its tail region, and the collar that was most useful was the solar collar because it can recharge as the gharial basks in the sun, and surveys were done by tracking the signals from the collar, which were mainly two kinds of signals, one was a stable slow paced signal which usually meant the animal was in a stable position, and the other one was an activity signal which meant that the animal is moving or swimming.

Tiger conservation

He was involved in the conservation of the tiger in the Similipal tiger reserve, where he was also involved in the mugger reintroduction, tiger color

studies, tiger population biology from tracking and herbivore population, giant squirrel nesting, and raptor studies. He talks about the melanistic tigers and developed fourteen color models for the coloration in the tigers and did a study where he predicted the melanistic tigers' population will grow in numbers and their implications because the melanistic tigers were a product of inbreeding depression and hence showed that the populations are severely fragmented and corridors should be built to link the tiger populations so that this could be tackled. Which was confirmed in some molecular studies done recently. He has written a book – 'born black' about melanistic tigers. He has written a tiger tracking pocketbook for forest officers and a guideline for tiger tracking. In his research in the Similipal reserve, he also suggested that the populations are getting stagnant and the carrying capacity is reached which will cause a decline in the population by the year 2008.

Pug marks

Dr. L.A.K. Singh also talked about the pug marks of tigers and leopards and how to identify the marks and tell the difference, the front pug is always larger than the hind pug and the middle two toes in the front pugs almost come to the same levels as the first. The gender of the tiger can also be identified from the pug marks the hind pug mark of the male is a biological square in shape and the pug mark of a female tiger's hind limb is rectangular in shape. Tiger tracker is a data sheet on which all the survey details are recorded and analyzed which was refined and developed with his help. Also, many other details can be extracted from pug mark details such as the nature of the population, there are usually 2-3 pug marks of female tigers with each male tiger pug mark and usually, with each female tiger, there will be a few cubs pug marks. From the pug marks of the tiger, it could also be identified if it's a cub, male or female. Pug marks also tell a story about population movement, mother- cub bond and separation, and territory shifts.

The session was very informative with much deep knowledge of the course of his life in conservation and what all he did and achieved. Many insights into his personal experiences were also given in the talk. His end note was that every species cannot be conserved everywhere in its previous range, and we have to think of ways in terms of how much effort we have to put to bring a species to green status.

Acknowledgments

I would like to thank Dr. L.A.K. Singh for taking out his time and sharing his knowledge and experiences on which the report has been made. I would also like to thank Dr. Sanjay Molur due to whom this interaction was possible. Finally, I would like to thank the whole RHATC team and Zoo Outreach Organization team for making this happen.

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Mohammed Ismail M. Rafi – Primates and Conservation

Mohammed Ismail M. Rafi is a primatologist who has done his Master of Research in Primatology and Conservation from Oxford Brookes University (Department of Social Sciences). He conducted a seminar on primates and conservation for the students of Ram Hattikudur Advanced Training in Conservation 2022–23 batch on 11 November 2022. The major topics discussed in the seminar were primates, their distribution, threats worldwide and Mohammed's work on Bonnet Macaques in association with Zoo Outreach Organisation.

Basic information on Primates

Primates are the highest order of mammals and there are around 512 species of primates in the world spread across 90 countries across the world. They are majorly found in tropical environment and can have a very high range of variations, both taxonomical and morphological. The smaller ones can weigh up to 30 g (Mouse lemurs) and the largest can go up to 200 kg (Silverback Gorillas). Primates are social animals and have a large brain compared to their body size, which is found in very few other species. Asia, Madagascar, neotropics and Mainland Africa are places rich in primate diversity and density.

Taxonomic Overview

In terms of the taxonomic overview, Primates can be broadly divided into Strepsirrhines (or Prosimians) and Haplorrhines (or Anthropoids) which are 'wet nosed primates' and 'dry nosed primates' respectively. Strepsirrhines are divided into Lemuroidea (consisting of Lemuridae, Cheirogalidae, Daubentoniidae, and Indriidae) and Haplorrhines into Ceboidea (with single family Cebidae), Cercopithecoidea (with sub-family Cercophithecidae divided into Colobinae and Cercopithecinae), Hominoidea (with Hylobatidae, Ponginae and Homininae) and Tarsioidea (Tarsiidae). Although Tarsioidea falls under Haplorrhines, it is considered Prosimian.

Threats

More than 65% of Primates are on the verge of extinction worldwide, and 75% is a declining population. The major threats to these Primates are 1. Habitat loss (contributing to 58% of the total global threats) 2. Logging, and 3. Hunting and illegal trade. Mining in India and palm oil production in Indonesia are major threats to primates.

The three species of Orangutan – Bornean, Sumatran, and Tapanuli Orangutans (discovered in 2017) face the major impacts of the over production of palm oil in Indonesia to meet the global demand and are all Critically Endangered, whereas Javan and Bengal slow lorises face threat due to pet trade. Also, gorillas and chimps are traded globally to meet the exotic food and pet demands of the wealthy class. As countries like India, Thailand and Indonesia with major primate populations are a part of Convention on International Trade for Endangered Species (CITES), they export their primates to countries that are not a part of CITES (e.g., Kazakhstan) which can trade very directly and openly by importing from India, Thailand and Indonesia and move it ahead from their airports to some other third country that is not a part of the CITES.

To track these trade patterns, we can visit the 'Trade Database Website' of CITES. It is amazing to see how proficient these traders are with their mammal and primate knowledge in order to still continue the exotic trade illegally. The trade language used by these traders is unique and cannot be usually understood by common people, like using numbers as words and words as numbers to post advertisements on Instagram and other social media apps. Ismail also told us that Russia is selling Woolly Mammoth's partially fossilized tusks under wildlife trade. Vincent Nijman who had done a lot of work on primates is always on the radar of trade mafias, which tells how tough and risky it is to work for the conservation of primates. Other major threats that these animals face along with all other wild species is cattle farming and ranching due to the increasing global demand for meat and dairy products, climate change, and increasing infrastructure and building of roads, railway tracks, & other development, not just because of deforestation and canopy loss, but also because of road kills.

The world's most threatened primate species are – the Javan Slow Loris, Grove's Titi Monkey, Coquerel's Sifaka, Skywalker Hoolock, Sahafary Sportive Lemur, Blue-eyed Black Lemur, Geoffroy's Spider Monkey, Cat Ba Langur, Buffy-headed Marmoset, and Gray Snub-nosed monkey (all Snub-nosed Monkeys are endemic to China).

Why Conserve Primates

Primates have various ecological functions like seed dispersal. In Madagascar, only third bird species contribute to seed dispersal. Most of the seed dispersal is done by the 101 primate species that call Madagascar their home. Primates are also 'models' to have an insight into human evolution and understand social and cultural relationships. They also contribute majorly to biomedical research to understand diseases and make vaccines (covid vaccine was first tested on a Rhesus Macaque). Besides this they are also 'surrogate species' and act as flagship species (charismatic species like Lion-tailed Macaque, Gorillas, and Orangutans), umbrella species (by saving one species, we can save other species as well) or keystone species (due to the ecological value that they share like seed dispersal).

How to Conserve Primates

We discussed many primate conservation methods with Ismail, out of which, some are stated here – Scientific work like minimizing taxonomic and spatial shortfalls, conducting conservation – critical behavioural research, responses to habitat disturbances, and connectivity in degraded / mosaic and fragmented landscapes are really promising and important steps needed for primate conservation.

Zoo's Print Vol. 38 | No. 1 137

For example, learning that Lion-tailed Macaque is an arboreal species that lives in wet evergreen forests of Western Ghats can help us understand their behaviour and affects of anthropogenic activities on their population numbers. Road kills are one of the major problems that this species face, hence from understanding their arboreal behaviour, we can make canopy bridges for them over roads and highways in order for them to travel safely. Investigating affects of global warming, trade analysis and IUCN assessments will help us understand the trends of future population of primates. Finally, implementing modern, non-invasive technologies in place of conventional approaches (like bioacoustics, drones and camera traps) can be revolutionary in primate conservation.

Activity session

Ismail divided the fellows into two groups and gave each group a unique situation and a common situation to work upon and find solutions. All these situations were either real or inspired from real issues. The common situation discussed about the issue of people getting too close to gorillas in a national park during covid, which could pose a risk of infection towards the primates. To this, most of the answers suggested towards strict covid protocols, setting up education and photobooths for visitors, not allowing selfies with gorillas or even altogether shutting down the national park till there is an ease in the covid situation. The other two unique situations were focussing on Bonnet Macaques, where the macaques were attacking coconut plantations in a hamlet and getting poisoned in one situation, whereas they were raiding houses in an ecotourism spot and dying while crossing roads near a village while waiting for passers-by to feed them.

In both the cases, understanding the behaviour of the macaques was the key element to find solutions. Growing other fruiting trees near plantations to divert the macaques, fencing, working in collaboration with the locals; proper disposal of garbage and waste management, educating people not to feed the macaques or throw food, creating speed breakers and making canopy bridges were some of the acceptable answers derived from the discussion. At the end, everything comes down to working with the affected communities, government and understanding macaque behaviour to find and implement plausible solutions.

Ismail's work

Ismail is currently working on a project on behaviour of Bonnet Macaques of Thenmala, which aims at:
1. Understanding behavioural changes in female macaques due to motherhood,
2. Determining the variation of maternal care in wild Bonnet Macaque Populations and,
3. Link between maternal behaviour and infant personality.

Bonnet Macaques live in multi-male and multi-female societies, with different group sizes, and follow a hierarchy. Females stay, while males leave the troop after maturity to join some other group. Also, females reach maturity at 2.5–4 years of age, while males reach maturity at 4.5–6 years. Both these factors avoid inbreeding in a troop, and hence increase genetic variability, which is necessary for species survival. Female gestation lasts up to 6 months and the birth season now usually ranges from March–June. Ismail and his team use focal data as a way to determine and record the behaviour of macaques. What they found was that infants with experienced mothers (multiparity) have a better survival chance as compared to inexperienced or first-time mothers.

They also found that female infants survive better than male infants, and that most infant mortality happens in road kills or electrocution. They also inferred that during the weaning period, when the infants go out themselves in search of food after six months of age, some males of the group and other females who are the friends of the mother of the infant, also look after the child, groom him/her and huddle. Some females even adopt other infants if their mothers are killed or die due to natural causes. Their future research plans are to look into genetic study of relations, parasites found in macaques, stressful life of females in the group and stress of females while finding food for themselves and their infants.

Conclusion

The seminar with Mohammed Ismail M. Rafi was a very informative and interesting session for all the fellows. It was an interactive time, with debates, group discussion, quizzes and presentations. We got to learn a lot about primates, their taxonomy, threats, ecological role, need for conservation, methods to use for conservation and some specifics about Bonnet Macaques. In conclusion, the overall session was very educative, fruitful and fun for all of us.

Acknowledgements
I would like to thank Mohammed Ismail M. Rafi - Master of Research in Primatology and Conservation to take time out of his busy schedule and give us a peek into the world of primates. I am also thankful to Dr. Sanjay Molur for inviting Ismail to guide us and to RHATC 2022–23 course for giving us the opportunity to meet and learn from so many experts.

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Under the sea with Trisha Gupta

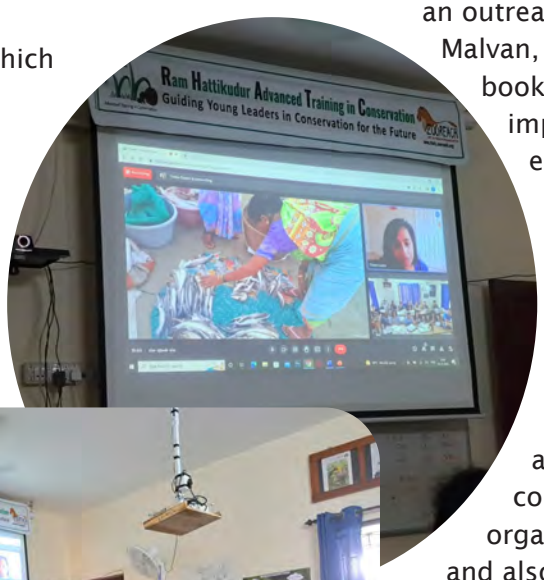
Trisha Gupta, a marine conservationist was always fascinated by the oceans from a very young age. Although she grew up in Bangalore far away from the coast, she was captivated by the sea. This inclination led her to complete her graduation in Zoology from Christ College and post-graduation in Marine Biodiversity and Conservation from International Master of Science in Marine Biodiversity and Conservation (EMBC). She is currently pursuing her PhD from University of Oxford where she is studying an interesting species in terms of having the best of both the sharks and rays which is the guitar fish and its behaviour. The RHATC team 2022¬–23 got the opportunity to meet the conservationist on 16 November 2022.

She started her presentation by asking us about how we picture sharks. Most of the responses were aggressive, large fish, cruel but none of them were true. We were stunned to learn more about these often feared, often misunderstood creatures of the deep. This misinterpreted creature along with rays belongs to a group named elasmobranchs who have slow growth, late maturity, low fecundity and her susceptible to fishing pressure and there are more than 1,150 diverse species of elasmobranchs globally. Trisha Gupta's internship at Dakshin Foundation and her work on the fisheries in Sindhudurg, a coastal district in south of Maharashtra that also hosts the main fishing centre in the region named Malvan exposed her to the real world of conservation which does not only mean saving the marine organisms but also about the lives of the coastal communities interacting with and dependent upon the ocean. This motivated her to study further on the reliance of fishing communities on catch, methods of fishing and marine ecosystems. She also touched upon the fact that while India has imposed a ban on shark fin trade and protected ten species (Pondicherry Shark, Ganges Shark, Green sawfish, Narrow sawfish, Porcupine ray, Speartooth shark, Whale Shark, Largetooth shark, Giant guitarfish, and Ganges sting ray) under the Wildlife Protection Act, 1972 these regulations are hampered by limited capacity for mortality and enforcement.

In the year 2018, the proposed framework for mitigation of fisheries bycatch in the paper "Translating the terrestrial mitigation hierarchy to marine mega fauna bycatch" helped her prepare a risk-based mitigation hierarchy framework for elasmobranch capture. The mitigation hierarchy is a framework for preventing and compensating for the negative impacts of development projects on biodiversity. The mitigation hierarchy prepared was used to critically assess a range of hypothetical measures for reducing elasmobranch capture in a trawler fishery on India's west coast. The trawler landing surveys were conducted over a period of two years where the captured sharks and rays were mostly smaller in size as they were composed of small-sized coastal species and juveniles of larger species like hammerheads. Challenges of gathering morphological data of the species as they

were laid out for sale and walking around with measuring tapes which led to a popular joke among communities that whether she was going to stitch a dress for the dead shark did not demotivate her from continuing her work. The assessments ultimately led to the development of the mitigation hierarchy framework as a tool for bycatch management. There were four steps in the mitigation hierarchy. They were avoidance, minimization, remediation and offset. Out of the all four mitigation strategies the management measure under offset was not feasible to be applied in the present content. The management measure under the other three steps of mitigation hierarchy were spatio-temporal closures for avoidance; net restrictions for minimizations; bycatch reduction devices; and live on board release for remediation. According to her feasibility assessment on board release may be one of the viable for fish species, as it would have moderate chances of survival and with minimal impact on earnings. While closures, net restrictions and Bycatch reduction devices may reduce elasmobranch capture, implementation will be challenging under present circumstances due to the potentially high impact on fisher income.

Her presentation which also included data from Dulvy et al., 2021 educated us about a global extinction crisis that we might have overlooked. In 2014 the first global assessment of species for Class Chondrichthyes that includes sharks, rays and chimeras concluded that one-quarter (24%) of species were threatened. However, in 2021, 32.6% species in the Class Chondrichthyes were threatened with extinction. It has been concluded that overfishing driven by human consumption is a key threat for these elasmobranch species and one third of the species are at the risk of extinction. Moreover, according to a report by WWF, it was estimated that between 2012 and 2019 US$2.6 billion of shark and ray meat was traded globally.



The presentation also touched on the bottlenecks in carrying out fieldwork as a woman. She explained how she intended to conduct surveys by on boarding fishing vessels to record precise catch locations and environmental data of the study species. However, she faced considerable challenges in conducting these studies as the fishermen were not comfortable taking women on board their vessels. She also explained the importance of participation and inclusion of the fishing community in conservation and management of the fisheries. Her team did that by developing an outreach book on sharks and rays of Malvan, in the local language Marathi. The book contained information regarding the importance of sharks and rays in local ecosystems. It also disseminates the findings of their study regarding species diversity, biology, and breeding of elasmobranchs.

The major takeaways from her session would be the importance of working with all stakeholders for a cause. In this case, with fishing communities, locals, non- government organizations, fisheries department and also the restaurant owners selling the meat of the sharks. Along with that it is also important to acknowledge challenges, have an open mindset, interdisciplinary skills and communication.

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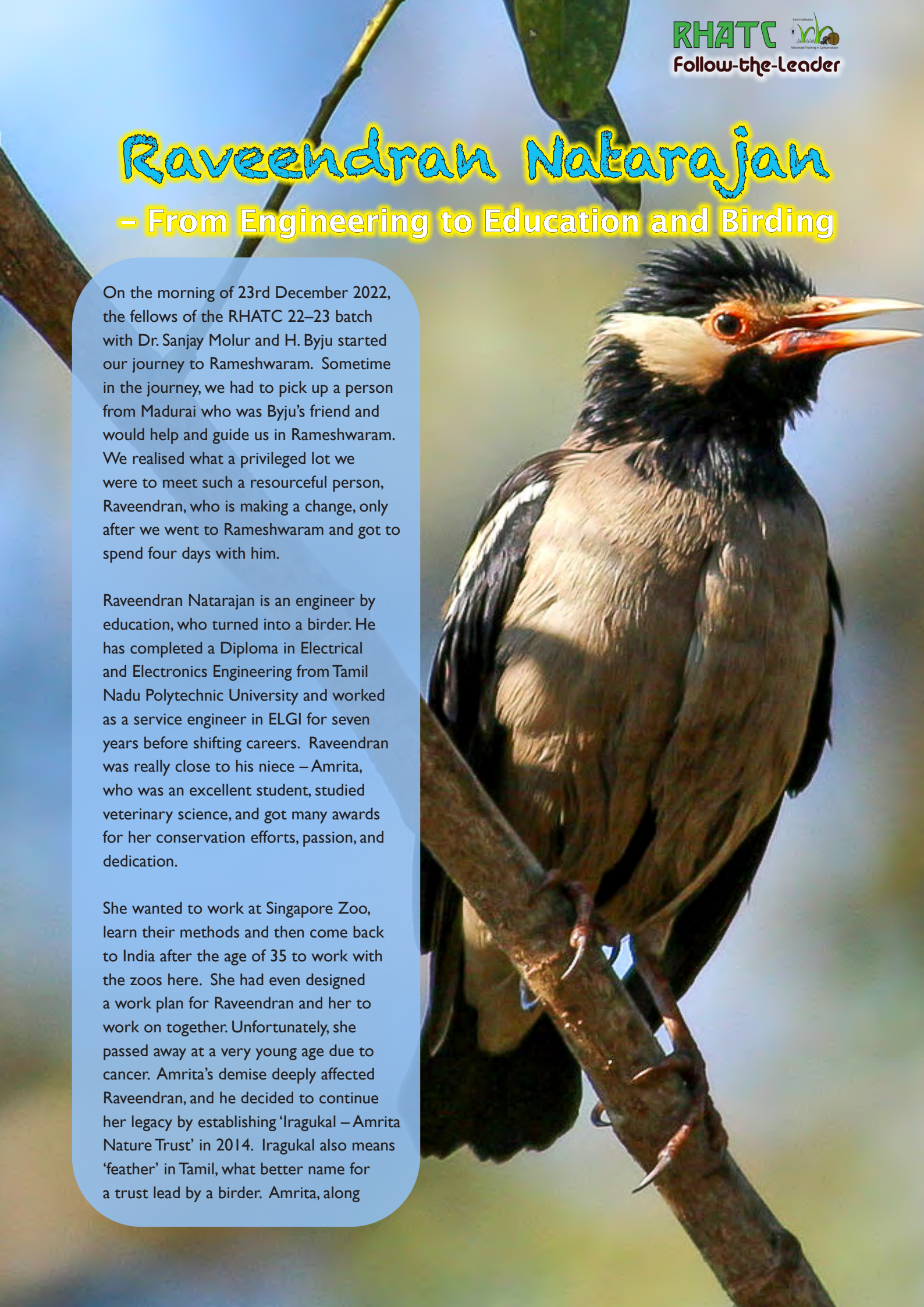
Raveendran Natarajan
– From Engineering to Education and Birding



On the morning of 23rd December 2022, the fellows of the RHATC 22–23 batch with Dr. Sanjay Molur and H. Byju started our journey to Rameshwaram. Sometime in the journey, we had to pick up a person from Madurai who was Byju's friend and would help and guide us in Rameshwaram. We realised what a privileged lot we were to meet such a resourceful person, Raveendran, who is making a change, only after we went to Rameshwaram and got to spend four days with him.

Raveendran Natarajan is an engineer by education, who turned into a birder. He has completed a Diploma in Electrical and Electronics Engineering from Tamil Nadu Polytechnic University and worked as a service engineer in ELGI for seven years before shifting careers. Raveendran was really close to his niece – Amrita, who was an excellent student, studied veterinary science, and got many awards for her conservation efforts, passion, and dedication.

She wanted to work at Singapore Zoo, learn their methods and then come back to India after the age of 35 to work with the zoos here. She had even designed a work plan for Raveendran and her to work on together. Unfortunately, she passed away at a very young age due to cancer. Amrita's demise deeply affected Raveendran, and he decided to continue her legacy by establishing 'Iragukal – Amrita Nature Trust' in 2014. Iragukal also means 'feather' in Tamil, what better name for a trust lead by a birder. Amrita, along

with Raveendran's brother (who is a shell collector and has collected around 3,000 different species of Indo-Pacific region) encouraged him to take up an ornithology course at the Bombay Natural History Society. With his passion for birds, guts to leave his engineering job at ELGI, and Amrita's dream, Raveendran decided to educate children and teachers about birds and biodiversity through Iragukal.

His goal is to educate 10,000 kids every year, and he has been achieving this goal for more than six years now. He tries to educate as many female students as he can, as he believes that, 'If you teach a boy, you only teach an individual. But when you teach a girl, you don't only teach an entire family, but three generations'. Besides this, he also educates teachers about local biodiversity as when teachers are themselves passionate, knowledgeable, and trained about biodiversity and wildlife, they can teach it better to their students. Citizen science is the future and the hope of conservation, and hence involving schools, colleges, teachers, and locals is the first step to acknowledge and appreciate biodiversity to ultimately conserve it.

Besides his work in capacity building, Raveendran's personal passion for birds is doing great service to the birds and other biodiversity of Tamil Nadu. He initiated a community bird count in January 2015 to celebrate birds during Pongal.

During our stay with Raveendran in his field station in Rameshwaram, he told us about how he and his friend Ravi, a veterinary doctor used to go from village to village on a bike to study species like woodcock and other migratory birds in the area. They could find sites and ponds where these birds were even seen on roadsides, and near human settlements. They found out important pathways for certain species to migrate from Ramnad to Sri Lanka. With the help of this information, he and his friend H. Byju, decided to work together, bring in scientific methods in their surveys and study to determine the different aspects of population decline in birds of Tamil Nadu. Being a native to the area it helped

them understand the landscape and by knowing the local language and how to interact with people; they were able to convince the local communities of Ramnad and the forest department to participate in population census. The forest department was more than happy to help them as they had more population data than the department, thanks to their standalone research on bike.

Asian Waterbird Census also conducts 'Wetland Bird Census' every year through BNHS, but they didn't do it in all areas. Again, Raveendran's personally collected data helped not only facilitate, but enhance this census by filling in data gaps. He himself recorded more than 256 species of birds in Madurai, as opposed to the official data of 170, recorded in the 1970s.

Ravindran has spotted many rare migratory birds like Egyptian Vulture, White Stork, Blue Throat, Siberian Stonechat, Common Stonechat, Red-breasted Flycatcher, Brown-tailed Grassbird, Lagger Falcon, and Lesser Kestrel. He is also the first person to record a Himalayan Griffon in Tamil Nadu and an Arctic Squaw (with Byju) in Dhanushkodi, Gulf of Mannar. He, along with Byju has proposed many potential bird sanctuaries in areas in and between Madurai and Rameshwaram – including Kodandaramar/Dhanushkodi Bird Sanctuary in Dhanushkodi, and Kilasagalar in Valnokam area (for flamingos). His findings and data are priceless for bird research and conservation in Tamil Nadu, and he, on the shoulders of previous records of 1980s along with the knowledge of some experienced researchers and his personal findings, might publish fresh bird records for the area in 2023 with Byju.

Besides his priceless contribution to education, data collection and conservation, Raveendran has also helped people come closer to nature during covid. He organised free online classes called 'Mr. Owl's Classroom', spread across 102 days for school and college students, to teach them about biodiversity, environment, flora, fauna, and migration. Students not only from India, but also from Myanmar, Qatar, and United States joined in. During lockdown, he engaged entire families and exposed them to birds and other biodiversity so that people have a way to appreciate and get close to nature in tough times.

Back in Rameshwaram, over dinner he once told us about an inspiring story of a man who was laid off from a prestigious airline during lockdown. The man had gotten into alcoholism and due to this, his family relations were getting bitter. His family then planned a birdwatching trip with Raveendran and the trip impacted him so positively that not only did he leave alcohol, but also became a full-time birder. Raveendran and his team need more people who are passionate and who understand conservation. In our trip, we could see the wonder in his eyes even when he saw the different marine species or even tarantulas in a tamarind grove. He reminds us that the sense of wonder and attraction towards nature and biodiversity is the driving fuel towards conservation. Although, natural habitats are getting destroyed in the name of development, we have to take a look at the existing biodiversity and understand and appreciate it in order to conserve it. There is still a lot to save, and it can only happen when more and more ecosystems are declared protected, and citizens learn to appreciate biodiversity. Rameshwaram is a pilgrimage site and tourism will never stop there, but to conserve the biological jewels there, we need to promote the biodiversity found in Rameshwaram in terms of birds, migratory routes, marine life and much more. We need more people like Raveendran and citizen scientists with passion, discipline, punctuality, understanding of the importance of biodiversity, and scientific temper to conserve biodiversity in Gulf of Mannar and Tamil Nadu.

Acknowledgements
I would sincerely thank Zoo Outreach Organization, RHATC and Dr. Sanjay Molur for taking us to Rameshwaram. A very special thank you to H. Byju for introducing us to Raveendran Sir and showing us all the work they have done together on the ground. I would also like to thank Mr. Raveendran Natarajan himself for spending so much time with us, guiding us and hosting us in Rameshwaram. Of course, without the team of Zoo Outreach (Priyanka, Usha, and Trisa), the trip would not have been the same without their help and support.

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Book Review - A concern towards the mighty carrion feeders

Author - S. Bharathidasan

Published 2021
75 pages
Publisher: Mrs. Chandra Sankar, Kalamkriya, Chennai

It's no secret that vultures are declining in India. But not many of us know about these magnificent birds, be it the different species of vultures, their ecology, and current status, particularly in the regional context. This is where the book by S. Bharathidasan 'In search of Vultures' sheds a bright light on. Many parts of the book reflect the author's experience with Arulagam, a Coimbatore-based NGO. It appears that Tamil Nadu's citizens were the intended audience for the book. The contents of the book are written in both English (left pages) and Tamil (right pages).

The author begins the piece with a note entitled "Let the vultures rule the skies again", in which he shares his memories of meeting vultures. Next, we get to know the etymological perspective of the vulture, and how the word "Paaru" suits perfectly the different aspects of a vulture. The author also gives us an account of the classification of vultures, a list of nine species that are found in India, and the ones that can be sighted in Tamil Nadu.

Throughout the book, on each page, we get to see high-quality images of different

vulture species. We also get to know the historical recording of vultures in Tamil Nadu, and vultures in culture where we get to know how these birds are an integral part of different cultures and religions. There is something noteworthy about the way the author describes the association between Thirukazhukundram, a village in Tamil Nadu located between Chennai and Thiruttani, and the Egyptian Vultures. The name Thirukazhukundram comes from the words 'Kazughu' meaning eagle and 'Tiru' meaning holy.

The Egyptian Vultures were perhaps thought to be eagles. The author also gives us the scientific facts that explain their decline in this region. Following this, we get to know the supreme adaptations of vultures. The author explains in a very simple manner what makes vultures such perfect carrion feeders. A major theme of the book is the dramatic decline in vultures throughout the world because of a number of factors, including vulture mortality, and the factors that led to this decline, along with the ways in which this decline was brought to light, and the conservation efforts that followed. Also revealed is Arulagam and their efforts to raise awareness and attitudes about vulture conservation.

Although this is a short book on vultures, it manages to cover their different aspects. In a time where our country is currently experiencing a dramatic decline in vulture populations, a book such as this can be quite useful in raising awareness of vultures in a concise and sweet way. I would only suggest that the order of the contents be rearranged, for example, placing the historical, and cultural background, together in the beginning, followed by the scientific content.

Rock-habitat ©Shashikumar B

Contact to order the book: S. Bharathidasan, Arulagam, 4/347, 60 Feet main road, NGGO colony post, Asokapuram, Coimbatore - 641022, Tamil Nadu, India. Ph:+91 9843211772

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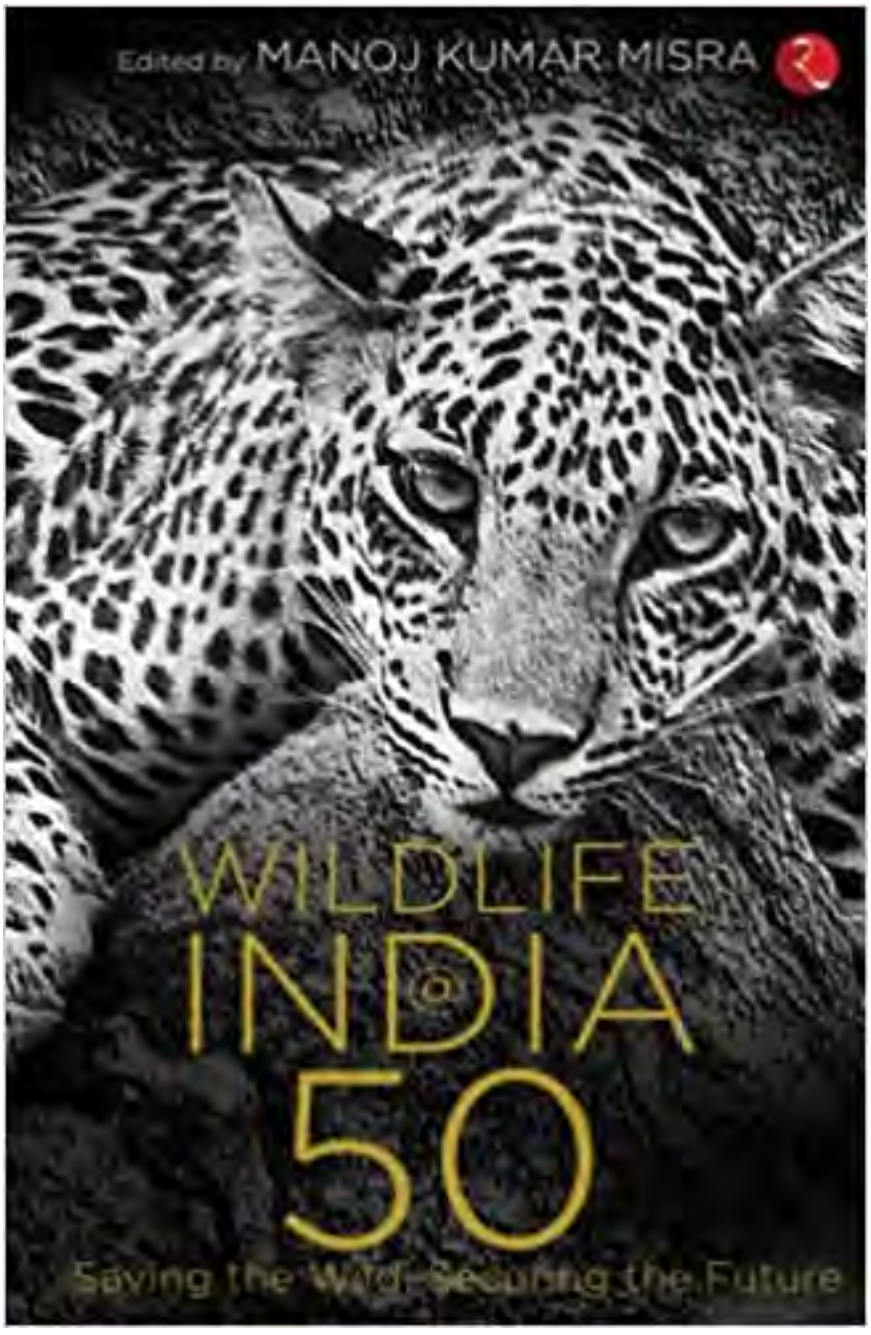
Book Review - A walk through 50 years of wildlife conservation

Editor - Manoj Kumar Misra

Published 2022
517 pages
ISBN-13: 978-9355205575
Publisher: Rupa Publications India Pvt. Ltd., New Delhi

While India celebrates 'Azadi ka Amrit Mohotsav', this book compels us to introspect about our efforts to conserve wildlife and natural habitats in India. The meditations are in the form of articles written by experts in the field of conservation.



The articles are an account of first-hand observations and experiences from fieldwork. Stories are written in an exuberant manner that build anticipation. The absence of jargon and captivating narration makes the book accessible to the general public as well.

Though individual chapters don't have images, the book gives us a visual treat with 25 photos about wildlife, tribes, and conservationists in India from different timelines. The Book narrates stories about genesis and evolution of wildlife legislations in India and the impact it has on the citizens of the nation.

experts. It is probably the only book that gives an overview of wildlife conservation in the last 50 years since the establishment of the Wildlife Protection Act in 1972. The book is edited by Manoj Kumar Misra, former IFS, who informs us about the journey of India in wildlife conservation. There are 30 chapters in this book which are divided into two parts:

- Part 1 informs us about topics that are related to the Wildlife Protection Act.
- Part 2 is about people, projects, and institutions working for wildlife.

A short summary of the chapters is presented in the next section.

Chapter 1: Changing shades of wildlife legislation in India

The book starts with a historical narrative of Wild Animal and Bird Protection Act of 1912, Wildlife Protection Act of 1972 followed by amendments in 1991 and 2003. Different political scenarios that occurred and how they affected the Amendment of the act. With a glimpse into the Elephant Project and the establishment of Central Zoo Authority author informs genesis and evolution of wildlife legislations in India.

Chapter 2: Securing Habitats for Ecosystem Revival

Padma Bhushan awardee, Mr. Hemendra Singh Panwar gives the reader an account of the different experiences he has had throughout his journey starting from the positions within the forest department to being the director of Project Tiger.

Chapter 3: Hunting for Answers

With a catchy title Harbhajan Singh Pabla opens a controversial argument in favor of hunting. He advocates hunting of crop raiding species through a regulated mechanism that will reduce human-wildlife conflicts and generate income for rural communities. For managing wildlife, keeping a check on the population is important. The writer compares hunting with alcohol where prohibition has pushed the practice underground.

Chapter 4: How far: long arms of the law

Arvind Kumar Jha gives us scenarios and points out the hypocritical and helpless nature of our legislative system. The author discusses a thrilling case, where an Assistant Collector is found to be involved with wildlife trophies/ skins and tells us to what extent the system is glitched and corrupt. Poor prosecution and conviction have made our wildlife legislation a nicely drafted document.

Chapter 5: Building Bridges: protected areas and people

Vinod Kumar Uniyal explains the politics behind the conservation issues and then chronologically moves to explain the remarkable ways in which they can be resolved. The author gives two other case studies from Parambikulam and Attappady to explain this phenomenon of how people's inclusion is necessary in nature conservation. The author does a commendable job in reiterating the perspective for involving locals in conservation and management.

Chapter 6: Conserving with People: Challenges and Opportunities of

Conservation Reserves, leaves us with the message of the key role that communities play in monitoring ecosystems. Keeping a watch on illegal incursions like poaching and hunting. Locals could be valuable contributors to governance and planning since they possess working knowledge of the forests. Community participatory approaches add emotional connection of locals to wildlife and forests.

Chapter 7: Commerce Most Foul – Illegal Trade in Wildlife

Saket Balota tells us about the sickening greed of humans to possess everything. He critiques India's role in CITES and enforcement challenges in our country. Wildlife trade is considered to be the fourth largest criminal activity in the world and there is a growing demand for wildlife products despite regulations.

Chapter 8: Managing Wildlife in Captivity

Sudha Ramen, talks about the ethical management of zoos in India.The chapter has tedious descriptions of the author's experiences in animal care at Vandalur Zoo.

Chapter 9: Unraveling the Unknown: Researching Chausingha in the Wild

Koustubh Sharma shares his fascination with Chausingha (*Tetracerus quadricornis*), the four-horned antelope; it informs us about behavior, morphology, dietary preferences, and sounds of Chausingha.

Chapter 10: A Life in the Jungles: Wildlife Documentation of Tourism

Joanna van Gruisen narrates her experiences as a wildlife filmmaker. Her engagement in pioneer and popular tv series 'Survival' is a fascinating read. She gives us an account of the state of wildlife tourism then vs now, the different situations where it helped in conservation, and the future potential it can have.

Chapter 11: From Commerce to Conservation: Saving Crocodiles while Ferrying as a Wildlife Researcher

L.A.K. Singh shares his experiences in the field of crocodile conservation and captive breeding in India. He talks about how technology like radio tracking can help in crocodile conservation.

Chapter 12: Saving Endangered Wild Mammals: Reintroduction Stories from Madhya Pradesh

The author Suhas Kumar peers over the shoulders of a former Indian Government Forest official wherein he mentions his experiences of managing wildlife. To explain the same, the author takes the reader through a long tour of India's Barasingha management program, of which he had been a part. The chapter includes details of the program, the ups and downs met by the program, and the lessons learnt from it.

Chapter 13: Betrayed locals and lions: the story of Kuno National Park

Faiyaz Ahmad Khudsar recollects the time he spent at the Kuno National Park and the role he played in the relocation of the local people who lived at the sanctuary, in preparation for the arrival of lions from Gir. It reflects how the efforts and sacrifices of numerous people have gone to waste due to politics.

The introduction of the African cheetahs is now a result of the failed execution of the reintroduction plan of the lions.

Chapter 14: Wildlife Law and Institutions In Fine Print: Vignettes From My Diary
Ritwick Dutta adds to our perspective of the WPA 1972 by giving an account of Judicial Interpretation and execution of the Law. He starts a narrative by explaining how this Law can be easily misused. A sloth bear from the wild ended up in the zoo only because it was albino. A 'Miscarriage of justice' happened when a bear was framed in crime of human-wildlife conflict and was imprisoned in captivity for lifetime. Even the documents were fabricated to report the Bear as dangerous.

Chapter 15: National Board For? Wildlife (NBWL) Prerna Singh Bindra courageously criticizes National Board for Wildlife (NBWL) and calls the situation 'Great Indian Sale of National Heritage'. The Article informs us about the structure of the Board and its functions and helps us understand loopholes in the system and how politics affects wildlife on the macroscale.

Chapter 16: Incredible Salim Ali
Contemplation of Dr. Salim Ali, the birdman of India, presented by Asad R. Rahmani who talks about the famous ornithologist's childhood and interests. Initially without a formal education Dr. Salim Ali learned on the field and became a rigid supporter for BNHS after 1947, he is credited for creation of Bharatpur Wildlife sanctuary now called Keoladeo National Park.

Chapter 17: In the Wilds: Reporter at Large
In this chapter, Usha Rai takes us through the personal experiences she encountered during her time as an Environmental journalist. She talks about the hardships of being a female reporter in the 1960s.

Chapter 18: More than Bricks and Mortar: Making of WII, Dehradun
Vishwas B. Sawarkar tells us the story of the Wildlife Institute of India, the early years of the Institute, the challenges it faced and how it became the capstone of excellence in the field of Wildlife Science. At the moment WII faces trouble because of the disengagement of funds from MoEFCC.

Chapter 19: Spawning a Generation of Conservationists: Reminisces of WWF-India
Sharad Gaur narrates his journey in the field of nature conservation from mere stipend holder to the being director of the Indira Gandhi Conservation Monitoring Center at World Wildlife Fund for Nature-India. The reader gets information about the programme division Trade Record Analysis of Flora and Fauna in Commerce (TRAFFIC).

Chapter 20: Paradise Regained: Story of the Panna Revival
This is a chapter that invites the reader to be astonished by the circumstances the author confronted while reviving the tiger population in the Panna Tiger Reserve, and the team's enduring efforts to reintroduce and revive the tiger population at the Tiger Reserve.

Chapter 21: Journeys in Arunachal Pradesh

Aparijita Dutta narrates her experiences in an amusing way, her encounters with Armed Forces (Special Powers) Act authorities during curfews, findings while exploration survey of the Leaf Deer (*Muntiacus putaonesis*), and experience with primatologist Anindya Sinha in describing a new species of Arunachal macaque (*Macaca munzala*).

Chapter 22: Shifting sands: diaries from the Gulf of Mannar National Park, Tamil Nadu

Multiple stakeholders express their perspectives about well-known places along the coast of Tamil Nadu. It tells us about the lives of the fishermen community, perspective of a tourist, learnings of seaweed collectors and reflections about development of Rameshwaram.

Chapter 23: Boomerang: When Success Begins To Breed Contestation

Ishan Kukreti highlights human wildlife interactions in Manegaon village where an increasing population of wolves are causing trouble for local people's income sources - goats. The locals have generated resentment towards wolves and the Forest department, so it shows the need for a targeted conflict mitigation approach. Today, Manegaon presents an example of community-led initiatives which has led to an increase in the number of Blackbucks and Spotted Deer and serves as a testimony to good conservation efforts.

Chapter 24: Elephant in the City

Rabindra K. Singh informs us about interactions with humans and elephants in different States and ways to mitigate negative Human-Elephant interactions. The author narrates a thrilling incident where a wild elephant herd (Ashoka dal) came into Ambikapur City, Chattisgarh.

Chapter 25: Survival: The Existential Threat facing the Great Indian Bustard

Sumit Dookia tells us about the conservation challenges of the Great Indian Bustard (GIB). We are informed about the status, ecology, distribution and threats to the GIB. He catches our attention by describing his efforts in engaging local youth of Rajasthan in conservation efforts.

Chapter 26: Four Conservancies Silently Protecting Wildlife in Rajasthan

This chapter presents a narrative about privately-owned lands contributing to

conservation. The experiences are well written and give the reader hope that not every conservation activity requires the involvement of government and that people and private organizations can also bring a change.

Chapter 27: Conservation champions

Ananda Banerjee tells us about popular/ unpopular contributors from different states of India. Notable people who made conservation their personal mission to support the cause of wildlife conservation are listed.

Chapter 28: NGOs in Wildlife Conservation

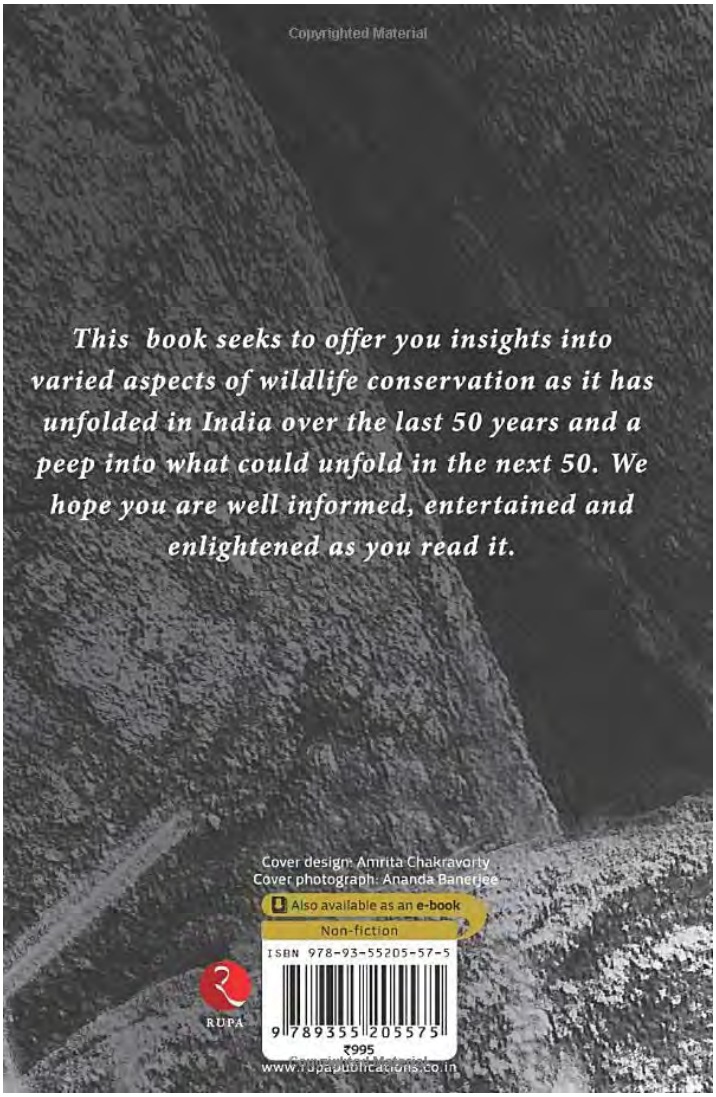
Written by the editor of the book, Manoj Kumar Misra, this chapter gives us a list of non-governmental organizations working for animals in India. This chapter can be resourceful for students, animal welfare advocates, environmental social workers, and fresh law graduates.

Chapter 29: WPA in Climate Altered India

Niveta Khandekar paints a picture of dystopian reality by giving the reader some perspective on plants getting affected by threats like invasives, anthropogenic activities, and climate change.

Chapter 30: Looking into the crystal ball: WLPA of 2072

Neha Sinha probes about future WPA of 2072 and enlightens us about what needs to be changed. The author gives us an optimistic image of wildlife conservation after 50 more years from 2022 and gives us the opportunity to reflect about key issues such as 'ease of doing business', linear projects conflicting with our dream to conserve biodiversity.



Acknowledgement: We appreciate the opportunity given to us to read the book and reflect on our interpretations at the Ram Hattikudur Advanced Training in Conservation course at Zoo Outreach Organisation. It helped us to learn our wildlife history and reflect on the challenges to be faced as budding conservationists.

Reviewed by Swaathi Na, Lakshmi Ravinder Nair, Tandrali Baruah, Melito Pinto, Rajib Saha, Akansha Mishra, Pooja, Ramdas Patil, Aishwarya S. Kumar, P. Kritika & Soham Parnaik, RHATC 2022–23, Zoo Outreach Organisation, 43/2 Varadarajulu Nagar, 5th Street West, Ganapathy, Coimbatore, Tamil Nadu 641006, India.

ZOO'S PRINT

Communicating science for conservation

ZOO'S PRINT Publication Guidelines

We welcome articles from the conservation community of all SAARC countries, including Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka and other tropical countries if relevant to SAARC countries' problems and potential.

Type — Articles of semi-scientific or technical nature. News, notes, announcements of interest to conservation community and personal opinion pieces.

Feature articles — articles of a conjectural nature — opinions, theoretical, subjective.

Case reports: case studies or notes, short factual reports and descriptions.

News and announcements — short items of news or announcements of interest to zoo and wildlife community

Cartoons, puzzles, crossword and stories

Subject matter: Captive breeding, (wild) animal husbandry and management, wildlife management, field notes, conservation biology, population dynamics, population genetics, conservation education and interpretation, wild animal welfare, conservation of flora, natural history and history of zoos. Articles on rare breeds of domestic animals are also considered.

Source: Zoos, breeding facilities, holding facilities, rescue centres, research institutes, wildlife departments, wildlife protected areas, bioparks, conservation centres, botanic gardens, museums, universities, etc. Individuals interested in conservation with information and opinions to share can submit articles ZOOS' PRINT magazine.

Manuscript requirements
Articles should be typed into a Word document with no more than 800 words of text and 10 key References (Tables, Images with copyright information, and Videos are encouraged) and **emailed to zp@zooreach.org.** Include the names of one or two potential reviewers when submitting a publication.

Articles which should contain citations should follow this guideline: a bibliography organized alphabetically and containing all details referred in the following style: surname, initial(s), year, title of the article, name of journal, volume, number, pages.

Editorial details
Articles will be edited without consultation unless previously requested by the authors in writing. Authors should inform editors if the article has been published or submitted elsewhere for publication.

Publication Information

ZOO'S PRINT, ISSN 0973-2543
Published at: Coimbatore

Owner: Zoo Outreach Organisation, 3A2 Varadharajulu Nagar, FCI Road, Ganapathy, Coimbatore, Tamil Nadu 641006, India.

Editor: Sanjay Molur
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ZOO'S PRINT magazine is informal and newsy as opposed to a scientific publication. ZOO'S PRINT magazine sometimes includes semi-scientific and technical articles which are reviewed only for factual errors, not peer-reviewed.

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