



# ANNUAL Report

2021-22

[www.ncf-india.org](http://www.ncf-india.org)





*At the Nature Conservation Foundation, our goal is to contribute to the knowledge and conservation of India's unique wildlife heritage with innovative research and imaginative solutions.*

## Vision

A world in which nature and society flourish together

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## Mission

Exploring, understanding and conserving the natural world through research and responsible engagement with society





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# Our Work

The Nature Conservation Foundation (NCF) was established in 1996 as a public charitable trust and is now a leading non-profit conservation and research organisation in India. At NCF, our goal is to contribute to the knowledge and conservation of India's unique wildlife heritage with innovative research and imaginative solutions.

We work in a range of wildlife habitats—from coral reefs and tropical rainforests to the high mountains of the Himalaya. Here, we strive to understand the survival needs of endangered species such as snow leopards and elephants, as well as equally fascinating but lesser-known wildlife such as corals and rare plants.

Our research also addresses human resource-use and its impacts on wild species and ecosystems. Using this knowledge of wildlife ecology and human society, we design conservation strategies that are locally appropriate. These are implemented in collaboration with local communities who depend the most on natural resources, and the governments that manage them. While promoting wildlife conservation, our programmes also strive to safeguard livelihood and development options for local communities.

NCF presently carries out most of its work under five major programmes: High Altitudes | Oceans & Coasts | Eastern Himalaya | Education & Public Engagement | Western Ghats. Other research projects and conservation initiatives are also led by our dedicated staff. In our work, we are supported by reputed Honorary Associates, Adjunct Faculty, Distinguished Wildlife Biologist, and our Research Advisory Board, besides numerous supporters to whom we are grateful.



# High Altitudes



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Together with the Snow Leopard Trust, we work in India's high altitude regions of the Himalayas to conserve the diversity of life and landscapes, with the snow leopard as the flagship, in a scientifically robust and socially responsible manner. We combine research, community involvement, conservation outreach, and policy-level recommendations.

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## *Snow Leopard Friendly Pashmina*

The Ladakh Pashmina vision document released in February 2021 guided what is now the Sustainable Ladakh Pashmina project. The key partners included Nature Conservation Foundation, the All Changthang Pashmina Growers Cooperative Marketing Society (ACPGCMS), the Looms of Ladakh Women's Cooperative (LLWC), the Ladakh Autonomous Hill Development Council (LAHDC), the Sheep Husbandry Department and local youth groups and entrepreneurs in the pashmina supply-chain.

The focus was on working directly with herding communities to help them adopt contextually-relevant practices that are sustainable and wildlife-friendly. Part of the effort was also to work with a small cohort of local youth and provide them exposure and support to play a proactive role in their respective communities.

Support was extended to ACPGCMS and the LLWC to ensure stability to herders by offering a fair price for their produce and to increase the participation by women of Changthang in downstream processing of local pashmina, further supplementing household incomes.



## Community-based conservation

### Predator-proofing vulnerable corals

Predator-proof corrals are secure enclosures used by herders to protect livestock from attacks by predators. Often such incidents are characterised by surplus killing of livestock that can wipe out a large part of a herder's flock in a single attack. These incidents are also linked to retaliatory killing of wild carnivores.

In 2021–2022, we built 22 corrals in total in several villages across Spiti and Kinnaur in Himachal Pradesh. Similarly, we built 24 corrals with several partner communities in eastern Ladakh. These structures collectively protect over 8,500 livestock. We also built 30 lamb cribs with three partner communities in Ladakh. Lamb cribs are insulated structures that not only protect newborn livestock from predators, but by keeping them warm, also safeguard against hypothermia.

### Livestock security programme

Our community-led livestock security programme allows herding communities to seek financial relief in cases of livestock depredation by wild carnivores. The programme is set up and run by the community, while we ensure financial assistance along with help in monitoring its running.

In 2021–22, herders reported 14 cases of livestock depredation from the villages of Gya, Kyungyam, Miru, and Hemya in Ladakh for which the compensation payout was INR 30,000. We also initiated two new programmes in Sumdo and Rupshoo in Changthang that collectively insure 35 large-bodied livestock. Similarly, in Himachal Pradesh, the communities of Chichim, Kibber, Kee, and Sagnam reported 51 cases of livestock depredation for which a total payout of INR 305,500 was made through the year.





### **Grazing-free reserves**

Grazing-free reserves are community-held pastures set aside by local villagers as refuges for wild herbivores. With the setting up of a grazing-free reserve, a local guard is hired from the community to ensure that these pastures are left free from grazing, and other extractive activities are limited in these areas. Meetings with the community partners were held and we continued to work with them in maintaining four village reserves in Ladakh and five in Spiti, together covering an area of over 510 sq. km.

### **Community conservation champions**

We are actively working to extend the reach of our conservation efforts to newer areas of Himachal Pradesh and Ladakh. We initiated efforts to develop a network of community conservation champions who can act as an extension to our small, but effective frontline teams. Community conservation champions include locals from these regions with an interest in wildlife and an inclination to mobilise their communities to protect wildlife.

In late-2021, a meeting with champions in Kinnaur was held to discuss the progress of conservation work in the landscape. A Spiti-wide workshop and one workshop each in villages of Darcha and Goshal in Lahaul were also held to discuss coping strategies in case of depredation and procedures to be followed to claim forest department compensation. We believe that community conservation champions will play an important role in extending our conservation efforts in these remote areas.



### Community hotline system

In addition to the champions network, we also set up a central communication channel through a helpline to disseminate information and help the champions respond to situations of negative interactions between people and wildlife. This channel is being actively used to report incidences of predation and other emergencies.

### Shangdong to Stupa

Shangdongs are traditional wolf traps in Ladakh which are stone structures constructed by herders as a preemptive measure to safe-guard livestock from wolves. Partner communities neutralised shangdongs around their village in Himya, Ladakh, and built a stupa, a religious structure in Buddhism, as a commitment to cause no harm to wildlife while acknowledging that these structures are a part of their heritage, and a reminder of past struggles.





## Conservation outreach

### Living and learning with snow leopards

As the effects of COVID-19 limited our interaction with children, we tried to keep up with their curiosity with as minimal in-person interaction as possible. In Himachal Pradesh, we trained six local volunteers in conducting nature-related activities using a resource toolkit developed for their aid which provided them with all the resources and information needed to conduct a successful session with children. Taking due precautions, the volunteers conducted activities like birdwatching, storytelling sessions, and exploring miniature worlds using a paper microscope. These volunteers were able to visit six villages and engage 84 children across Spiti.

In Ladakh, we conducted education activities both offline and online, following COVID-19 protective measures, in the schools. We held powerpoint presentations about local biodiversity in Ladakh in four schools with 148 students across Chumathang and Leh. We hope to conduct in-person activities starting next year.



## Himkatha

Himkatha is a trans-Himalayan community newsletter with a focus on sharing stories of human-nature relationships. The high-Himalayan and trans-Himalayan landscape of Himachal Pradesh is home to over two lakh people and a diversity of unique plants, animals and birds. The local communities have been the custodians of these natural landscapes through their traditional knowledge and practices. Most of this knowledge, however, remains implicit and localised. Through Himkatha, we are sharing the stories of local traditions that have been crucial to conserving this rich natural heritage.

In 2021–22, we released an autumn issue covering the festivals, culture and nature in the high altitudes and a spring issue on agricultural practices in the high altitudes. Both issues had a section for children to share their stories, art and learn more about nature.

We have printed and distributed 2000 copies of each issue of the newsletter in over 50 villages and schools of Himachal Pradesh. We also have a website ([www.himkatha.org](http://www.himkatha.org)) to reach out to a wider urban audience.



## The predicament of a

By Tenzin Thinley

Winters in Spiti valley are filled with celebrations of a fruitful year and prayers for a bountiful year ahead. A lot of time is spent within the villages as travel is difficult especially when heavy snowfall causes road blocks. Year 2018 was also not much different. In the month of November as we were readying ourselves for the coming winter months in Kibber, I received an urgent message from a colleague in Mysore in Karnataka. The message said, "A herder has lost many livestock in Chango, possibly by a wild animal" the message said. These were the details along with a WhatsApp video that was I received. Understanding that the matter could be serious and the weather was still permitting travel, I decided to leave immediately for Chango which is in Kinna. I requested Tenzin Thuktan, my colleague, to join me. Chango is about 110 km away from Kibber.





## Women in Conservation

### Shen

Shen is a conservation-led, handicrafts enterprise run by the local women of Spiti valley, established in 2013. This initiative strives to improve women's attitudes towards wildlife, and increase their involvement in our conservation efforts. We engaged 105 women participants from eight villages as part of this effort.

Handicraft production for 2021-22 saw 85 women in participation. Out of this, 14 women participated in the Dastkar exhibition in Delhi at the end of 2021. Some of our products were also available at a new online retail outlet ([www.pashoopakshee.com/shop](http://www.pashoopakshee.com/shop)). In addition, a conservation bonus was paid to the participants who participated in conservation-friendly activities.

We also encouraged women to take part in our annual surveys. Four women participated in the population assessment of dogs. Women have been showing interest in photography, and to help them develop their skill, we trained eight women in photography and visual storytelling. This encouraged women to share aspects of their life through photostories which will be published in our newsletter Himkatha next year.



## Population estimation of snow leopards

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We continued our long-term monitoring of snow leopards in the Upper Spiti Landscape. This is the 11<sup>th</sup> year of the surveys which make them one of the longest ongoing studies on this elusive cat anywhere in the world. These surveys are conducted in partnership with the Himachal Pradesh Forest Department.

We have also, in partnership with the Jammu and Kashmir Forest Department, begun work on population estimation of snow leopards in the newly formed J&K Union Territory. We have covered three landscapes so far, namely Gurez-Tulail, Thajawas-Zojila and Warwan. The highlight of the systematic effort was the first photo capture of a snow leopard from J&K.





## Monitoring wild ungulates

Wild ungulates are key determinants of snow leopard populations, even in multiple-use landscapes that are accessed by pastoral communities. Additionally, wild ungulates play critical roles in keeping ecosystems healthy by influencing vegetation structure, plant species composition, and nutrient cycling. Ungulate monitoring is an annual priority for our programme, for which we use the scientifically robust double-observer method. In addition to conducting the monitoring, we train a few motivated individuals across each site in these methods to ensure local capacity for future surveys.

### Ladakh

This year would have been the ninth year of our long-term monitoring programme of Tibetan Argali in the Tsaba landscape. Similarly it would have been the ninth year of surveying the Puyul valley in Gya-Miru for blue sheep. In Chushul, it would have been the fourth year of surveys for Tibetan argali and in Himya it would have been the fifth year for blue sheep. However, due to logistical constraints we were not able to conduct our long-term ungulate monitoring in Ladakh. We hope to resume it next year.

### Himachal Pradesh

We continued the long-term ungulate surveys in Himachal Pradesh across three sites, Kibber-Langza (ibex and blue sheep), Tabo (blue sheep), Lossar (ibex) for the 11<sup>th</sup> year. Our analysis is teaching us that while wild ungulate populations are largely stable across these landscapes, the underlying population dynamics are different. In Kibber, we believe interactions with sympatric livestock is resulting in a cyclic population of blue sheep, whereas in Tabo, lesser livestock numbers are perhaps limiting their impact on blue sheep.



## Conservation of high-altitude ecosystems

### Disease Surveillance and Management

The research projects on disease surveillance and management are now complete. One paper on parasite transmission between blue sheep and livestock in Kibber has been published already. Another paper on parasite transmission between Asiatic ibex and migratory livestock in Pin is currently in review.

### Participatory monitoring of wildlife and livestock management

We worked with 50 herders in the Korzok landscape in a participatory framework to not only generate questions of interest to them but also devised methods to take data. Over a period of a few months, they decided to document the presence of wildlife species in their pastures. They also took data on the factors resulting in losses for their livestock.

### Effects of climate change in Spiti Valley

Anthropogenic pressure is one of the biggest drivers of changing climatic conditions. With an increase in this pressure and under the continued scenario of rapid climate change, high altitude Himalayan landscapes have become extremely susceptible to rapid ecological alteration. Continued evidence of faster glacial melt due to change in temperature, encroachment of vegetation in previously non-vegetated areas, and a rapid shift in the plant community is a worrying trend for this ecosystem. It is extremely important to understand how the productivity of the landscape, plant community structure changes, and invasion by non-native plants will alter ecosystem functioning.





Nature Conservation Foundation is collaborating with Mayank Kohli (University of Minnesota, Twin Cities) and Dr. Mahesh Sankaran (NCBS, Bangalore) to understand the effects of altered temperature, rainfall and grazing pressure. We continued our collaborative effort to work on nutrient network research in Spiti as a part of a global ecological research cooperative. Due to the COVID-19 related lockdown, we could not continue with our ecological monitoring of vegetation due to climate change. But we continued data collection in the long-term vegetation plots. We have gained more insights about climate change and the changes in disease transmission scenarios in Spiti Valley.

### **Pasture Dynamics in Changthang**

The Changthang region in eastern Ladakh is spread over c. 17,000 km<sup>2</sup> and is home to the Changpa community who rear livestock as their primary vocation. We have been working with communities in these areas through the Snow Leopard Friendly Pashmina project. One of the areas of interest has been to understand the pasture dynamics over the years.

We initiated an effort to gain some understanding through a preliminary study, in which we identified 40 pastures in different parts of Changthang. We identified large and small pastures and delineated them with the help of staff from the Sheep Husbandry Department and NCF's field personnel. Using remote sensing to assess productivity through Normalised Difference Vegetation Index (NDVI), we found that overall productivity in most of the pastures is very low. Analysis of NDVI values for the years 2013–18 did not suggest an overall change in pasture productivity in Changthang—



i.e. productivity has remained similar across these years. Studies across multiple pastures showed that year-wise trends in different pastures vary significantly. There are pastures which showed comparatively higher productivity than others. It was difficult to list down clear reasons to explain these differences as sufficient conclusive literature is still absent. This work may need to be backed with ground surveys and manipulation experiments to understand vegetation dynamics in pastures in greater detail.

Along with this we conducted a training programme on geospatial data analysis and mapping in the Sheep Husbandry Department. This will potentially help our partners map and analyse pasture dynamics with better efficiency in the future.

### **Birds of snow leopard landscapes**

The high mountains of the Indian Himalaya are home to the charismatic snow leopard, an umbrella species for the conservation of these unique landscapes. These landscapes are also home to a rich diversity of other fauna that co-occur with snow leopards. Birds are one such taxa. We have been monitoring birds in different landscapes in and around the Kibber plateau for over two decades now. We continued the effort this year, particularly to see differences in bird communities in different land-uses such as agricultural landscapes, grazing-free reserves, and pastures.





### Factors affecting carnivore community structure

Environmental filtering and species interaction are the major factors that affect species assembly on landscape and local scales, however, our understanding of their relative role on different scales is limited. We are using multi-scale hierarchical occupancy models to assess the relative role of environmental factors and species interaction on landscape and local scales. We have camera trap data of carnivore occurrence from seven sites of Himachal Pradesh, including Lingti Valley, Kibber and surrounding areas. In 2019, we added three more sites—Baspā, Kullu and Bharmour—to our camera trap surveys.

We used data from 72 cameras deployed at three sites. These camera trap locations were selected based on animal signs like scrapes and scent marks. The survey resulted in 1624 photographic captures of 12 carnivore species including:

Black bear (*Ursus thibetanus*),  
 Brown bear (*Ursus arctos*),  
 Common leopard (*Panthera pardus*),  
 Snow leopard (*Panthera uncia*),  
 Leopard cat (*Prionailurus bengalensis*),  
 Red fox (*Vulpes vulpes*),  
 Mountain weasel (*Mustela altaica*),  
 Stone marten (*Martes foina*),  
 Yellow-throated marten (*Martes flavigula*),  
 Himalayan weasel (*Mustela altaica*),  
 Masked palm civet (*Paguma larvata*) and  
 Jackal (*Canis aureus*).



We used an occupancy-based approach to assess carnivore community structuring at the local scale. Specifically, we investigated the relative importance of negative (competition) and positive (facilitative) interactions in structuring carnivore communities. We quantified interactions between carnivore pairs, as well as carnivores and their prey. Our results show that in the high mountain ecosystems, carnivore-carnivore interactions are predominantly positive, suggesting a very limited role of competition in structuring these communities. Additionally, we found a strong spatio-temporal association between prey and predators. Taken together, our study strengthens the earlier evidence that these mountain ecosystems are largely bottom-up controlled systems and conservation measures need to continue to focus on prey base and health of prey species.



## Snow leopard wildlife trade

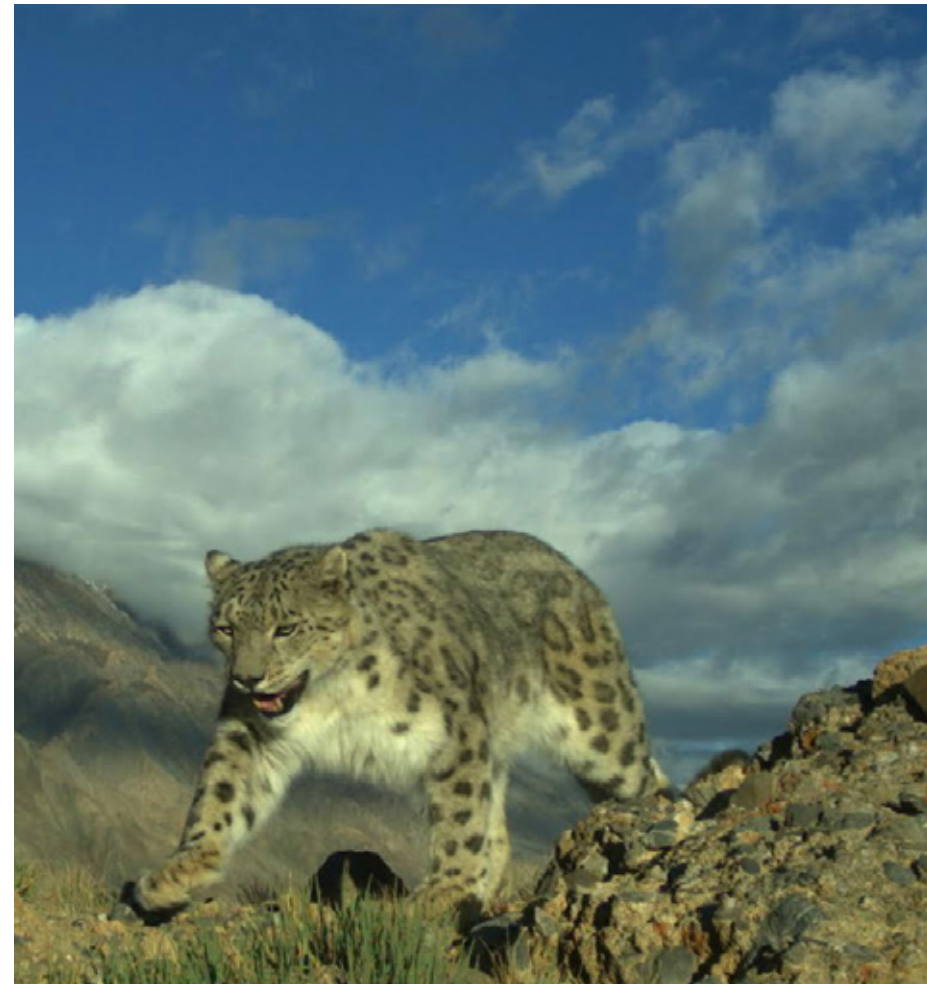
### Illegal wildlife trade and hunting

Wildlife crimes against snow leopards are reported to be opportunistic and driven by supply rather than demand. The trade of snow leopards is therefore likely to be riding on the trade of species co-inhabiting the landscape locally, and the global illegal trade of other species as well. Recent studies have shown that poaching and illegal wildlife trade have increased and become a substantial threat to snow leopard populations. In response, all range countries of the snow leopard committed to combat illegal wildlife trade at the third steering committee meeting of the Global Snow Leopard & Ecosystem Protection programme (GSLEP).

NCF, in partnership with GSLEP and Snow Leopard Trust, initiated work to better understand illegal wildlife trade with respect to snow leopards. Under this we monitor, record and understand wildlife trade in the high altitude regions of Himachal Pradesh with respect to all species. We are developing ways to use information generated through this effort to feed the international GSLEP snow leopard wildlife trade database. Through our local conservation champions network, we are reaching out to larger spatial scope to gather information.

Additionally, we have created an online portal for partners and the larger public to submit incidents, request for information, and interact with existing data. We continue to maintain the database, enhance technologies and improve models to inform conservation, policy and enforcement.

A meeting between the GSLEP Illegal Wildlife Trade (IWT) partners was organised on January 21, 2022. The main aim of the meeting was to review work done on the database, and exchange ideas on improving data collation. Another key point discussed was to ensure the data is regularly shared with relevant stakeholders. A total of 19 partners from eight snow leopard range countries attended the meeting. The data is being uploaded on <https://iwt.globalsnowleopard.org/>





## Field tales



by Chemi Lhamo

Spiti has a rich oral tradition; we have songs, hymns, and odes for every aspect of life and about every element of nature, but the literature produced within the landscape is limited. In the olden times, language learning and literacy were accessible only to a handful of aristocratic groups. The bulk of the population who were farmers and nomads didn't have the means for literacy or scope for any formal education—resulting in generations of people who didn't know how to read or write and whose stories remain untold.

We started HimKatha with an innocuous idea to document stories about human-nature relations in the high Himalayas. In the process, we started understanding so much about the communities and their relation to nature. The initial response of many locals who read the newsletter was that of resonance—the joy of finding your own stories in a piece of literature!

In a place like Spiti where literature is scarce, publishing a community newsletter meant more than documenting stories. It meant finding representation and discovering crucial information about one's history and identity. Many of our contributors are farmers who have not written more than three sentences in their lifetime but hold humongous knowledge about the landscape and natural environment they are living in. Many of them wanted to share their stories but weren't the most comfortable with writing—so we pressed the nerve they are most familiar with and hence, oral storytelling took the most organic form!

Currently, the newsletter is published in two languages—Hindi and English and is read fondly by children and adults alike. Most of them seek it not only for nature-related stories but also to “learn language” and read more about their homeland—a crucial aspect missing in current pedagogy.

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# Oceans & Coasts



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We work in India's oceanic islands and coasts with a broad mandate to understand how these enigmatic ecosystems work, how society interacts with them, and how regional and global influences affect this relationship.

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## Climate change and ecosystem research

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### Climate change impacts on long-term reef dynamics

Climate change is causing irreversible changes to the ecosystems of the world. Few ecosystems are as vulnerable to the impacts of climate change as tropical coral reefs. Understanding the nature of this impact is critical to managing the resilience of these systems. Since 1998, NCF's Oceans and Coasts programme has been monitoring the reefs of Lakshadweep to track impacts to the benthic ecosystem and fish communities. This is an ongoing programme that forms the backbone of our work in Lakshadweep. It has helped unpack trends in reef and fish responses that more focused research can then explore in more detail. What emerges from the first quarter century of this monitoring is that reef responses are not uniform and that local factors such as depth and exposure regime play a disproportionate role in driving patterns of recovery. This spatial patterning provides an opportunity for resilience management—allowing us to suggest spatial planning strategies to deal with the worst effects of climate change.



### **The reef buttress: evaluating the accretion potential of Lakshadweep's coral reefs**

The Lakshadweep archipelago is India's only chain of coral atolls. In a climate change era, these islands are characterised by their precarity, perched just a few metres above a rising sea, its reefs in a state of arrested recovery, and with dense human populations. The ability of these islands to remain habitable over the next few decades rests almost entirely on the integrity of its shallow outer reefs, which form a protective buttress around the island and lagoon. Over the last few years, we have been evaluating the buffer capacity of Lakshadweep's outer reefs, by quantifying the dynamic relationship between cement-forming coral and coralline algae, and a host of bioerosional factors including parrotfish and sea urchins. Following up on our earlier observations, we conducted detailed studies on the sea urchin, *Echinostrephus molaris*, a small burrowing species that is responsible for the bulk of urchin erosion in Lakshadweep. Our results indicate that the numbers of these urchins are most likely linked to land-based nutrients linked to human population gradients. Although fish like triggerfish and wrasses are able to prey on the urchin, they are apparently unable to keep their populations in check. These results provide clear paths forward for securing reef resilience—managing urban pollution on these islands may be critical in reducing urchin-based erosion to help bolster Lakshadweep's reef accretion potential.





### **Freshwater flux in oceanic atolls**

Freshwater is one of the key pillars of habitability on isolated, low-lying atolls like Lakshadweep. Without natural springs or large catchments, the islands are almost entirely dependent on the limited groundwater stocks that collect in a thin subsurface lens. With climate change, these stores are being threatened by frequent storms that could render freshwater unusable because of saline incursion. As Lakshadweep urbanises rapidly and human densities peak, daily consumption needs also increase. To add to this, Lakshadweep has among the densest plantations of coconut, a mainstay of Lakshadweep's economy. Coconuts are also water-hungry, and the demand of coconut palms adds to human requirements. Our ongoing study is building a comprehensive freshwater budget for Lakshadweep islands, mapping how households use freshwater and how much is lost to evapotranspiration by coconut palms. With detailed household interviews, we have measured freshwater use across two of Lakshadweep's islands. And in studies currently underway, we are using soil moisture sensors to evaluate diurnal and seasonal changes in groundwater. Together, this will allow us to evaluate the vulnerability of Lakshadweep's communities to freshwater loss.



### **Long-term monitoring of seagrasses in the Andaman archipelago**

Seagrasses are marine flowering plants found in shallow sandy bottoms in both temperate and tropical seas. Although highly restricted in their aerial extent, they are disproportionately important to the coasts, contributing in a range of regulatory and provisioning services. While the bulk of our knowledge of seagrasses comes from temperate meadows, how tropical species respond to environmental stressors and climate change remains less explored.

The long-term seagrass monitoring project aims to track seagrass community dynamics in the much vulnerable and neglected nearshore habitats. Since the conception of this project in 2019, we have set up monitoring stations across several intertidal seagrass beds in the Andaman Islands (Mayabunder, Middle Andamans and Port Blair, South Andamans). These meadows are especially characteristic for their multi-species seagrass assemblage which we hope will give us insights into how intertidal meadows are structured, and how climate change impacts these productive seascapes.





## Species interactions and community ecology

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### **Greener on the other side: monitoring the effects of green turtles on seagrasses in the lagoons of the Lakshadweep archipelago**

Shallow lagoons of Lakshadweep were once filled with lush seagrass meadows. Seagrass meadows are complex ecosystems that provide food and act as nurseries for many reef and pelagic fishes. In 2005, we started observing a large aggregation of green sea turtles in the seagrass meadows and after two decades of massive grazing, they pushed the seagrass meadows to a state of functional extinction. The green turtles are now distributed in low densities and the seagrass meadows are almost absent in most of the islands. In a small experimental intervention, we are establishing exclosures in the meadows of Kalpeni and Kavaratti to protect remnant patches of seagrasses from further herbivory. The idea is that these patches will serve as sources for later recovery when turtle numbers reduce. These ‘insurance’ sites ensure that the dominant structural species of the original meadow do not go locally extinct, and are available for recolonisation when possible. Finding a balance between seagrass and green turtle conservation is complex, and we will need active and passive means to ensure that both ecosystems and species are maintained in healthy states. In nine months we have seen a significant recovery of seagrass density and a visible recovery of ecosystem functions of seagrasses. The fish density inside the exclosure is three times higher than outside.





### Intertidal seagrass species assemblages in the Andaman archipelago

Between the tides is a place of extremes. Seagrasses that occur in these nearshore systems have to navigate through the environmental stressors of the intertide while also competing with each other for a comfortable spot. We found that the principal challenge for seagrass here is desiccation. Species employ a variety of strategies linked to reducing water loss to resist/recover from desiccation. A few species (like *Halodule uninervis* and *Cymodocea rotundata*) grew relatively smaller leaves in exposed areas than when they were found in submerged conditions. This made them more tolerant to drying. While species like *Thalassia hemprichii*, though less tolerant, are much better competitors. Flowering and fruiting time for species is also linked to differential drying and changes at small spatial scales. Our work is revealing the mosaic of tolerance and competitive ability that underlies the complex mechanisms of this dynamic intertidal system.



## Fisheries and Policy Research

### **Documenting genetic and policy mismatches in industrial fisheries along the west coast of India**

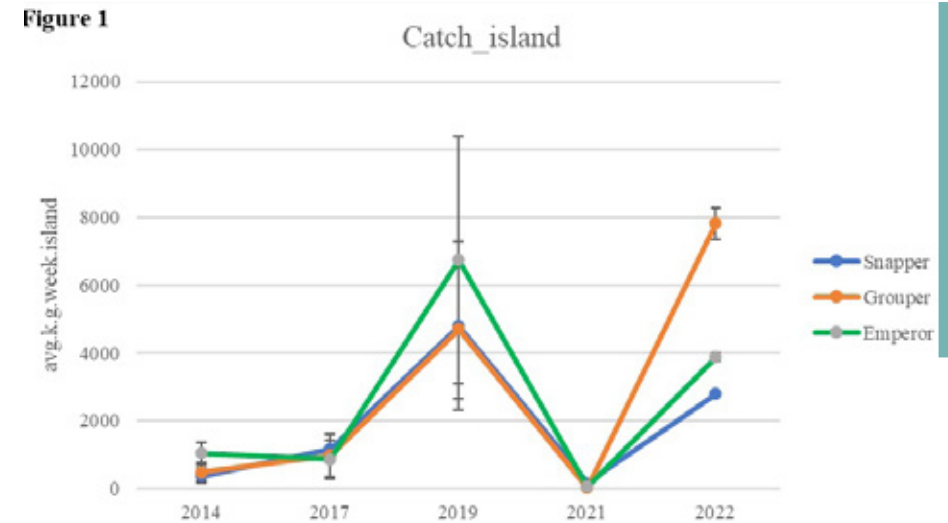
To analyse how much fisheries policy is guided by fish biology and ecology we conducted a detailed textual analysis of official fishing policy documents of the last 75 years. Our exploration has shown that Indian marine fisheries policy engages with fish biology mainly to identify production possibilities. Use of biology in fisheries regulations is ad-hoc, reactive and it seldom has any biological basis, making it a classic case of “selective use of science”. Worryingly, Indian fisheries policy finds it difficult to re-examine the narrative of ever-increasing production. As a response to overcapacity, policy promotes spatial fixes like fishing in international waters and aquaculture while continuing to incentivise coastal fisheries.

To identify geographical boundaries of genetically distinct populations of nine commercially important fish species along the west coast of India, we used genomic tools. Our results show that there is species wise differentiation between population boundaries of analysed fish species. Species like scoliodons and Japanese threadfin bream show a very strong population structure along the west coast of India, whereas mackerel and groupers show admixed populations. Our results suggest a need for a more nuanced and ecological approach to manage coastal fisheries. It also highlights the need for collaboration and coordination between neighbouring provinces when it comes to incentivisation and regulations of different kinds of fisheries. This is the first attempt in India to make fisheries management recommendations based on ecology of target fish.

### Booming commercial fisheries in the Lakshadweep archipelago

Pole-and-line fishing was the start of Lakshadweep's commercial fishing in the 1960s. While reef fishing continued to provide local sustenance, this pelagic fishery quickly established itself as a key component of the economy. Around 2011, ice-hold boats with large storage capacities started to visit Lakshadweep, offering fishermen immediate payment for reef fish. The local fishery has undergone a significant change as a result of these collector vessels, also known as mother boats, with fishermen beginning to fish in the reef on a commercial basis. Reef fishes are essential to the restoration of coral reefs following large-scale bleaching events. Many economically significant reef fish are long-lived and replace themselves at a much slower rate than pelagic tuna.

Collection boats were not able to go to Lakshadweep during COVID-19. This abrupt change might have an impact on the entire fisheries industry. The fishing industry then returns to normal in 2022. The catch has clearly increased suddenly. These reef fishing trends show how reliant Lakshadweep's commercial fisheries are on market demand, not just for the local market but primarily for the export market.







## Outreach and community engagement

Since 2019, the NCF outreach team has been working on a long-term communication process to challenge climate blindness in the Lakshadweep. Given the recent pandemic-related disturbances, we concluded that the most impactful way to conduct future outreach would be by combining an on-ground physical approach with an online geography-agnostic approach.

### Physical Outreach

In 2022, the team held meetings with civil society organisations, government officials and community leaders to tap into local knowledge and explore further outreach collaborations. We also partnered with the DST during the Vigyan Sarvatra Pujyate Science Week celebrations to introduce NCF's outreach work to ~150 school students.

### Online Outreach

A large part of our outreach programme has now been shifted to WhatsApp and Instagram through the launch of the online awareness campaign, Melem Keezhem (Above & Below), which circulates creative infographics containing useful information about island life within a broader narrative of understanding and combating climate change.



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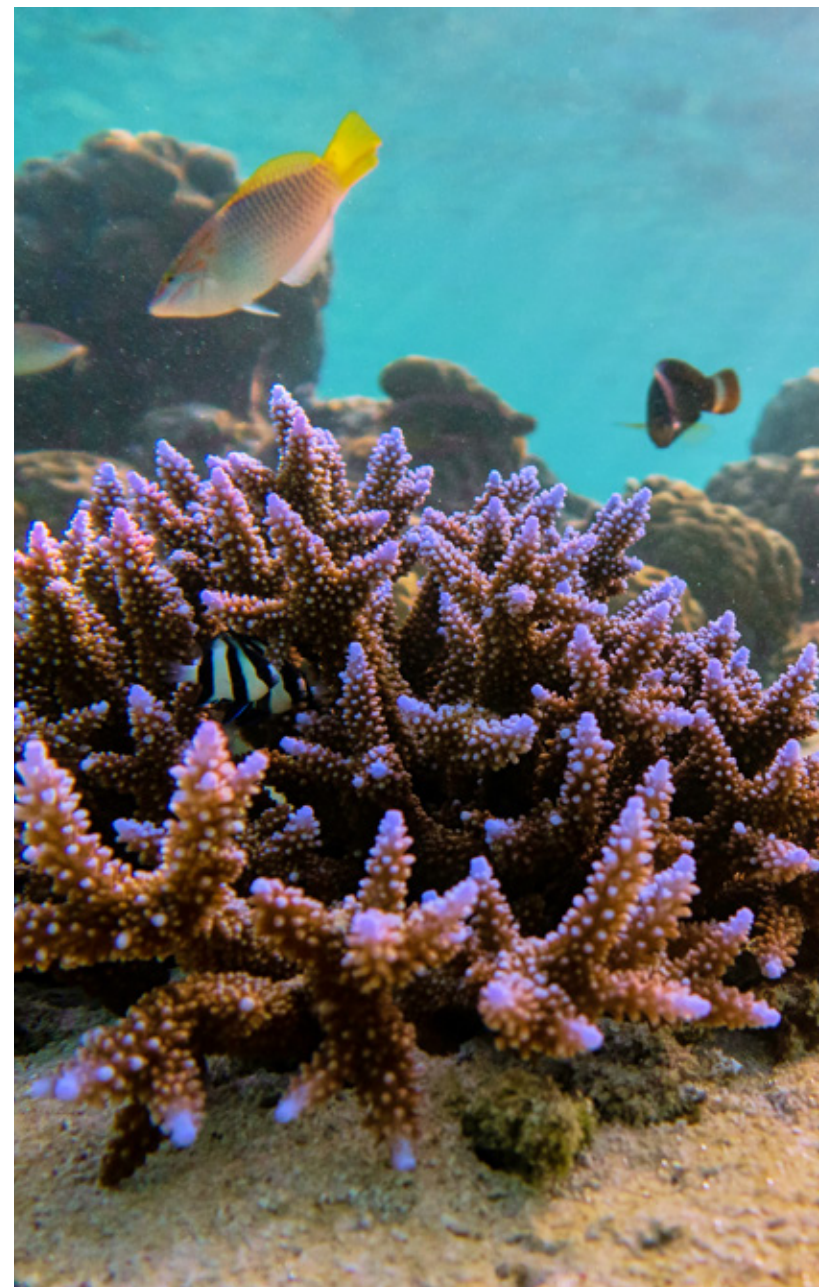
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Ministry of Environment, Forests and Climate Change









# Eastern Himalaya



Our current research is primarily focussed on various aspects of hornbill biology, frugivory and seed dispersal and tree phenology in the tropical forests of Arunachal Pradesh. Our conservation work is currently focussed on protection of hornbills and their nesting habitats in multiple sites through community engagement, restoration of degraded habitats, and nature education for local school children.



### *Saving hornbill homes with communities*

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The Hornbill Nest Adoption Program (HNAP) completes 10 years of dedicated community-based hornbill conservation in the forests outside the Pakke Tiger Reserve in Arunachal Pradesh.

Officially launched in 2012, the Hornbill Nest Adoption Program started as a three-way partnership between the Forest Department, 'Ghora-Aabhe Society', and Nature Conservation Foundation. The idea was to create a synergy between the management, scientific community and local partners to protect hornbills and their habitat in this landscape.

A decade later, 11 local Nyishi members continue to roam the forests looking out for hornbills, guarding over their nest trees and spreading the message of conservation in their villages.

In 2021, the nest protectors monitored 29 hornbill nests in the Reserved Forest, out of which 20 nests were occupied by breeding hornbills. The team confirmed successful fledging in 18 of these 20 nests. Two nests were abandoned mid-season for unknown reasons. The nesting success in 2021 was 90%.

From 2012-2021, fledging of 173 hornbill chicks of three hornbill species—Great Hornbill, Wreathed Hornbill and Oriental Pied Hornbill, have been successfully recorded by the nest protectors.



## Nature Education Programme

We began a formal Nature Education Program in 2017 and set up nature clubs (called Pakke Nature Clubs) in seven local schools (five government and two private) in villages around the Pakke Tiger Reserve (PTR), Arunachal Pradesh. The main highlight of this programme is the annual nature camp inside PTR. Every year, we conduct three-day and one-day camps in November-December for the students of these seven schools registered with us. This is done in partnership with Arunachal Pradesh Forest Department. Besides this we also conduct year-round activities with the students.

### Wildlife week celebration

In October 2021, we conducted a few on ground events during Wildlife Week which included an introduction to birding in two schools in Seijosa and Nature Information Centre (NIC) visit for one school in Tippi range of PTR. Besides this, we were also part of the India for Tigers event at one school in Seijosa organized by MOEFCC and the State Forest Department of Assam and Arunachal Pradesh.







### **Annual Nature Camps, Seijosa Range and Work expansion in Tippi Range of Pakke TR**

In November 2021, we conducted five one-day camps with five schools. These camps were conducted at Seijosa range of PTR in collaboration with the Forest Department. In January 2022, we also expanded the Nature Education Program to four new schools in the Tippi range of PTR.

These camps are based on different modules. The students were taken for nature trails where they participated in various activities and games to learn about the forests of Pakke and connect to it. They made leaf museums, visited hidden places in the forest, played games like the scavenger hunt to collect treasures of the forest, learnt about the hornbills of Pakke and made art. There were also sharing sessions in between to reflect upon their learning throughout the day. Besides these, we also conducted a two day teacher's orientation workshop by Dr. Pranav Trivedi for the teachers to understand the importance of nature education and this programme.

## Counting hornbills and other wildlife outside Pakke Tiger Reserve

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During the non-breeding season, the nest protectors walk on pre-identified trails in the Reserved Forest (RF) to record hornbill and other wildlife sightings using the line transect method. The trails are spatially distributed along the Papum RF in forests adjoining the villages where the nest protectors reside.

From September 2021-January 2022, the nest protectors completed 163 transects across 10 different trails in the (RF), with an effort of 216 km. Oriental Pied hornbill (OPH), a highly adaptable hornbill species, was detected the highest with 103 detections. Out of this, 63 were direct sightings of this hornbill species.

There were 33 detections for the Wreathed hornbill and 17 detections for the Great hornbill.

Transects are not carried out during the breeding season after which the nest protectors start visiting hornbill nests that they monitor in the RF.







### *Long-term monitoring of hornbill roost sites*

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The nest protectors monitored 19 hornbill roosting sites near villages along the Pakke river on the southern boundary of the Pakke Tiger Reserve from April 2021 to March 2022. However, only 10 of these roost sites were used in the last year by hornbills for roosting.

There were three sites being used by Wreathed Hornbills for roosting. At the roost site at Darlong village, hornbills were sighted on 83% of the total monitored days and at Malu Pahar, hornbills were sighted at 72% of the total monitored days.

The highest count of Wreathed Hornbill was 83 individuals recorded at the roost site in Darlong in November, 2021.

Similarly, there were five sites being used by Oriental Pied Hornbills (OPH) for roosting, with Dibru 2 and Jolly Top being frequently used by OPH for roosting with an average of 10 individuals seen at both these sites.

The highest count of Oriental Pied Hornbill sighted on one day was 27 individuals at Jolly Top.



### *Long-term hornbill nest monitoring*

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In 2021, nest monitoring inside Pakke Tiger Reserve started a bit late from mid-April, after our research permit was renewed. In Nameri Tiger Reserve, nest monitoring was stalled from May onwards, owing to restrictions by the Forest Department amidst the rising COVID-19 cases.

In Nameri, there were eight nests active in the 2021 breeding season, two of which were new nests located by the team last year. We could not determine the nesting duration or success for the nests in Nameri in 2021.

In Pakke Tiger Reserve, while we could not record the female entry dates, the team recorded 22 active nests when the team started monitoring from April 2021. Two new Wreathed Hornbill nests were also located by the team in Pakke TR. A total of 13 nests were successful, one was unsuccessful and the outcome could not be determined in eight nests due to problems of accessibility. At the end of the breeding season, the nesting success for the total nests where outcome was determined in Pakke Tiger Reserve was 93%.





## Long-term monitoring of tree phenology

We are monitoring 722 trees of 53 species (mechanically-dispersed, bird-dispersed and mammal-dispersed) twice a month for the tree phenology study in Pakke Tiger Reserve. Different phenophases (leaf flush, leaf fall; flower buds, flowers; unripe and ripe fruits) are recorded.

Our main objectives are to:

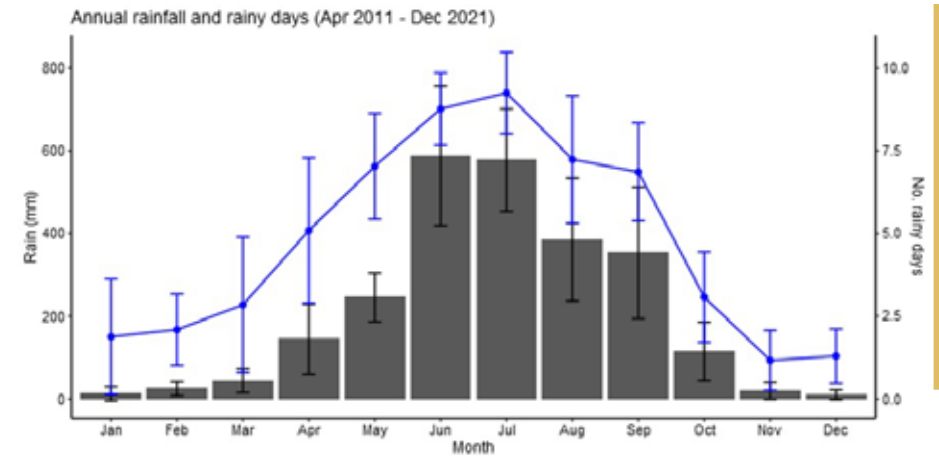
1. Document the seasonal and annual variation in leaf flush, flowering and fruiting of tree species at a community-level and also in terms of seed dispersal modes (bird, mammal, mechanically-dispersed),
2. The effect of climate variables on long-term tree phenological patterns,
3. The effect of fruit availability patterns on timing/initiation of breeding and nesting success of hornbills and
4. Examine individual species phenologies in terms of periodicity, consistency, synchrony and examine individual variation within species.

We set up a weather station in 2011 for weather monitoring.

**Weather station data:** The parameters recorded and downloaded from the weather station are temperature, rainfall, solar irradiance, pressure and wind speed. Readings for these variables are recorded every hour. With the weather data, our main objectives are to:

1. Maintain a climatic record and describe the patterns in the weather data for the variables measured and
2. Examine the effect of climate variables on leafing, flowering and fruiting patterns.

The data from April 2011 to December 2021 has been summarised broadly for all parameters for which the weather monitoring was done. Data on rainfall, temperature, solar radiation, pressure and humidity was collected/recorded for the entire period, although there were gaps in the data for some months in some years due to battery loss and other malfunction in the weather station. Parameters related to wind—such as wind speed, gust speed and wind direction were only collected in the initial years from 2011 to 2014. The figure shows the average monthly rainfall and number of rainy days (2011-2021) over the months.







## Securing hornbill conservation at new sites

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### West Bengal

In northern West Bengal, our work on four species of hornbills—Great Hornbill, Wreathed Hornbill, Oriental Pied Hornbill and the Rufous-necked Hornbill is conducted in collaboration with Nature Mates Nature Club, an NGO based in Kolkata.

We work on various aspects of hornbill ecology in this landscape mainly in two sites—Buxa Tiger Reserve and Mahananda Wildlife Sanctuary and its fringe areas. From February 2022, the team also started interacting with residents of 10 villages from both Buxa and fringes of Mahananda WLS. Through these community surveys, we hope to understand the history, culture and association of people with hornbills and the resource use and dependency of households on natural resources. We are also trying to assess people's awareness and perception towards hornbills and wildlife.

### Buxa Tiger Reserve

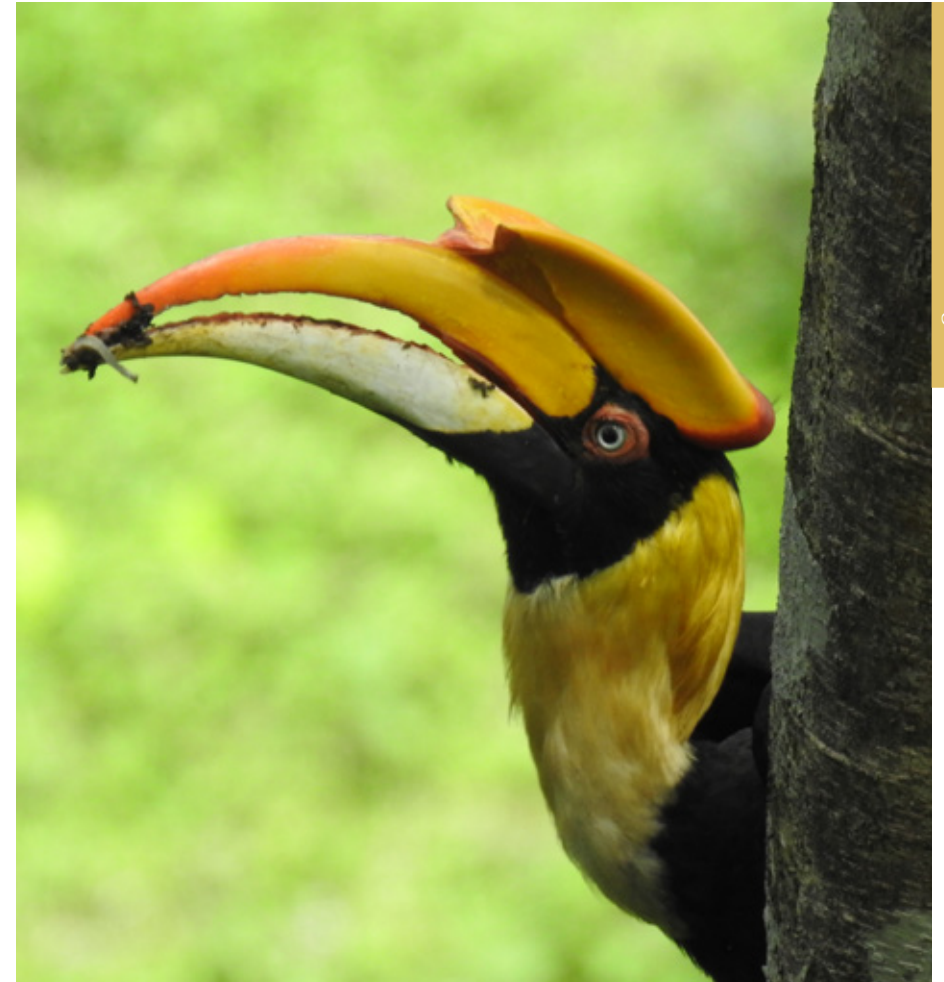
In Buxa Tiger Reserve, for the annual hornbill breeding season in 2021, 16 out of 26 known nests were occupied by hornbills. Among the 16 nests, breeding success was confirmed in 10 nests with a fledging success of 90%.

From April 2021 to March 2022, two hornbill roost sites were monitored: Pukhri lake for Great Hornbills and 20-22 mile stretch of Bala River bed for Wreathed Hornbills. The hornbill numbers in Pukri lake varied from 1-11 individuals. The number of Wreathed Hornbills observed in the Bala River bed roosting varied from 1-144 individuals.

We have also started a tree phenology study in Buxa Tiger Reserve from January 2021. The fruiting, flowering and leafing patterns of 740+ individuals (62 tree species) are recorded between the 21<sup>st</sup> and 25<sup>th</sup> of every month and we have summarised our first one year's data. The percentage of trees in unripe fruit for all species peaked in April (159 individuals) with a smaller peak again in December (113 individuals), while the percentage of trees in ripe fruit peaked in February (121 individuals).

### **Mahananda Wildlife Sanctuary and its fringes**

In December 2021, we have also initiated a similar study in Mahananda Wildlife Sanctuary and the forests surrounding the sanctuary. Our study at this site is also aimed to increase our understanding of hornbill population in this region, breeding biology and tree phenology of some important tree species that includes hornbill food plants found in the upper Mahananda belt.







## Restoration project

It has been seven years since we began rainforest restoration in the Pakke Tiger Reserve (PTR) landscape of Arunachal Pradesh and surrounding areas of Assam of the Eastern Himalayas. This year, we raised 7905 seedlings and saplings of 74 native tree species in our rainforest nursery. We continue raising saplings and making efforts to grow and add new species to the lot. We planted 3584 saplings in three sites inside PTR in June 2021. We provided 500 saplings to a neighbouring tea estate in Assam for planting in a fallow area inside the estate and a few along the boundaries. We monitor the survival of the planted saplings in all the plots and the growth rate of saplings is measured in a few plots for a selected set of species along with clearing weeds around them at regular intervals. The sapling survival ranged from 59-98 % in these plots in Nov 2021.

We distributed 996 saplings to the local villagers for planting in their farmlands or backyards, and for various planting events by the Forest Department as well as local Government bodies and NGOs in this landscape.

We also conducted a three-day workshop on 'Tropical forest restoration in Eastern Himalaya—Concepts and Practice' in October 2021 in collaboration with Green Hub, Assam. The broader aim was to lay the groundwork for science-based forest restoration in the north-eastern region. The workshop was attended by 21 participants from the north-east states, who were either already engaged in restoration at their respective villages on a small scale or some who wanted to take it up.





## Trees of Arunachal Pradesh: A field guide

North-east India is one of the rich biodiverse areas in India, but floristically, it is still less explored and documented. The location is at the interface of Himalayan and Indo-Burma biogeographical realms. Interactions among factors like wide elevation gradient with variable climatic condition and topography make it the most plant-diverse area in India. However, apart from a few regional floras and plant monographs, there is no comprehensive pictorial field guide for identification of common trees from this part of India. With our field guide of trees, we hope that nature and plant enthusiasts as well as visitors can learn, identify and engage with the trees around the low elevation forests of Arunachal Pradesh. Many tree species covered in the book also occur in low-elevation forests of Assam and other parts of North-east India, while some also occur in other parts of mainland India. We published this book in January 2022.

This 591-page photographic field guide to the Trees of Arunachal Pradesh features more than 1500 photos of 241 species of trees, shrubs, and a few climbers. 'Keys' provided in the book help the reader navigate through pages and to the species identity. These 'keys' are based on easily observable characters such as leaves, flowers, and fruits. These keys help with the comparison of species that are similar looking, thus helping to get past the lookalikes and identify the plant of interest quickly.

The species pages which form the bulk of the book gives an account of the species' ecology and utility, along with images of the plant parts and its global conservation status. There is an exhaustive index of vernacular names used in several different local languages that can also guide you to find the correct species of interest. There is also a scientific name index with the authority.



Image credit: Nature inFocus

**THE BOOK:** *Trees of Arunachal Pradesh: A Field Guide*

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**Design:** Kadambari Misra; Janhavi Rajan

**Plant Illustrations:** Meena Subramaniam

**Glossary/Key illustrations:** Janhavi Rajan; Saniya Chaplod

**Funding:** The Serenity Trust



### *Neglected mutualists of the Eastern Himalaya: defining the vital roles of medium-bodied and large mammals (carnivores and ungulates) in seed dispersal*

Seed dispersal is critical for tropical forest persistence. Most tropical trees are animal dispersed, therefore defaunation of fruit-eating animals can have cascading effects on tree diversity and abundance. In this project, we are examining the seed dispersal effectiveness of different mammal species in the Pakke Tiger Reserve. Our initial study was conducted from September 2021 to December 2021. We have studied 13 mammal dispersed plant species. We have carried out 222 hours of fruit tree watches. During diurnal fruit tree watches, among mammals, Malayan giant squirrels were the most common visitor and spent the most time on our focal trees. We also found that tree squirrels were preying on seeds. We carried out camera trapping for 860 nights with an average of 74 nights per plant species. We found that porcupines were the most common visitors in the camera traps.

We walked 36.2 km to search for regurgitated seed piles and droppings. During these walks, we located 29 old and fresh ungulate regurgitation piles, six civet scats, one elephant dung pile with seeds and several other animal droppings. We found 13 sambar deer and 16 barking deer regurgitated piles. Barking deer regurgitated piles had 492 seeds of five species, and sambar deer regurgitated piles had 1147 seeds of five species. The six civet scats contained 332 seeds of one tree species *Vitex quinata*.

We monitored nine regurgitation piles for a range of 18-58 days. These piles contained 870 seeds of five tree species. We monitored 826 seeds of *Choerospondias axillaris*, 30 seeds of *Canarium resiniferum*, 19 seeds of *Spondias pinnata*, seven seeds of *Pyrenaria baringtonifolia* and one seed of *Terminalia bellirica*. Of these monitored seeds, only one germinated within the observation period, 8.6% seeds were damaged and 9.1% seeds were removed. Eighty-two percent of seeds remain intact and need to be monitored for a longer period. We have set up around 130 seeds of five tree species (*Terminalia bellerica*, *Spondias pinnata*, *Turpinia pomifera*, *Canarium resiniferum*, *Vitex quinata*) for germination experiments. This project is underway and more plant species will be studied in the future.







## Conserving the Chinese pangolin

In North-east India's largest and most forested state, Arunachal Pradesh, there are ad-hoc reports of the Chinese pangolin (*Manis pentadactyla*) from some Protected Areas and community-owned forests. The Chinese pangolin is a medium-sized mammal covered in overlapping keratin scales and primarily feeds on ants and termites. Pangolin is also known by different names amongst Arunachal's different tribes, such as Sipit (Adi), Sipi (Apatani), Syichik (Nyishi), Hosik (Galo), and Akusoro (Idu Mishmi). It is believed that habitat destruction, in addition to the connection with the illegal wildlife trade, has caused a sharp 80% decline in pangolin populations throughout the countries where the species is found.

In order to protect the species, it is vital to conduct rigorous scientific research and combine it with in-situ conservation involving the region's many ethnic communities. Therefore as a first step, we sought to fill this knowledge gap by investigating the distribution and occurrence of pangolins, local perceptions of the species and relations with, and hunting pressure on the Chinese pangolin in the Siang basin through local knowledge-based interviews and camera trap surveys.

Our initial study was conducted in the East Siang District from October 2021 to February 2022. The Siang Basin is home to the native Adi, Galo, Idu Mishmi, and Mishing people. We conducted interviews in 42 villages, participatory mapping of where pangolins are found, exploration of the socio-cultural-religious values and beliefs related to the species in the Adi community, and an assessment of the intensity of hunting in the Siang basin. Based on research results and the relationships developed during field surveys, we aim to develop evidence-based and community-led conservation of the Chinese pangolin in Arunachal Pradesh.



## COVID-19 Relief Campaign

To assist medical centres in handling ongoing COVID-19 cases and also to prepare for future surges, NCF started a COVID-19 Relief Campaign to equip 54 local medical centers—the Primary Health-care Centres (PHCs), Community Health-care Centres (CHCs) and Sub-centres (SCs) within reach of most remote villages, across Arunachal Pradesh, Assam and Nagaland. In the initial weeks of the campaign, we worked closely with the medical staff at these health centers to compile a list of requirements. We provided 20 oxygen concentrators donated by Swasth Digital Health Foundation to 10 sites in Assam, Arunachal Pradesh and Nagaland. Our team members and friends helped with the coordination. We started an online fundraising campaign on the Give India platform to crowd-source funds for the COVID-19 relief campaign. The campaign was launched on July 21, 2021 and continued until October 2021. Overall, the campaign raised approximately nine lakhs through the Give India platform and direct donations. Some of the direct donors also included artists who supported the campaign by initiating separate art fundraisers or by helping to amplify the campaign in their network. The funds were used to purchase and deliver medical supplies for COVID-19 treatment in Seijosa, Bhalukpong, Yazali, Pistana, Deed, Daporijo, Dibang Valley of Arunachal Pradesh and Nagaland's and some sites in Nagaland's remote Kiphire district. The supplies included hand sanitizers, digital blood pressure machines, vitamin supplements and medicines that are used to treat COVID positive patients. The funds were also used to provide ration supplies to 40 families in Buxa Tiger Reserve, West Bengal. These families were affected by the pandemic due to loss of income generating opportunities people here are largely dependent on tourism which was stopped. A stretcher was purchased for the villages in the higher regions of Buxa. These villages do not have access to a motorable road and patients are carried in bamboo stretchers for about 3-4 km to reach the road. The stretcher had been requested by the local people from these villages. In addition, we received in-kind support—medical equipment and COVID protective gear for 53 sites across Arunachal Pradesh, Assam and Nagaland. These items were donated by Kantar India and facilitated by Bhumi and Rotary e-connect.







## *Dibang Programme: supporting biocultural diversity through local leadership*

The Dibang Programme was launched in December 2020 by a group of Idu Mishmi people of the Dibang Valley of Arunachal Pradesh with support from NCF. Research over the past decade has highlighted that the Idu Mishmi nature-culture interlinkages have been vital in maintaining high-levels of biodiversity in Dibang Valley, including a newly registered population of tigers. Recent years have seen escalating threats to Dibang's nature and culture. This locally-led, rights-based programme seeks to strengthen Idu cultural and traditional institutions for the continued existence of Dibang's biocultural diversity. It is composed of four interrelated initiatives, each intertwining nature, culture, land, and ancestral knowledge.

### **Community-led socio-ecological research and conservation**

The programme integrates rigorous scientific methods ethically and equitably within local institutions to co-create knowledge. Socio-ecological data, generated and owned by local people, are used to co-develop locally-relevant biocultural conservation and livelihood programs. Key outcomes are the declaration of Eastern Arunachal's first Community Conserved Area (CCA), Elopa-Etugu Community Eco-cultural Preserve (EECEP), managed entirely by the customary Idu owners of the land, and Gram Sabha (village council) resolutions to ban outsider hunting and commercial extraction of forest resources.

### **Hoolock gibbon research and conservation**

The Eastern hoolock gibbon is endemic to the tropical forests north of Brahmaputra. Gibbon songs are an omnipresent background as life unfolds



in the Dibang Valley. To the Idu, it is an ancestral kin, the killing of which brings the most serious misfortune. Expanding agriculture and large-scale infrastructure development is destroying the forests that gibbons depend on. This ethno-primatological project is conducting a long-term study on gibbon ecology, behaviour and demography by combining scientific tools with traditional knowledge. Information generated will inform strategies to secure gibbon lives and habitats.

### Shaman fellowship

Idu shamans are key cultural figures central to the Idu identity. They are repositories of ancestral knowledge, maintaining moral human-human and human-nature relations. Sadly, Idu shamans are no longer self-initiating. This Idu-led pilot programme financially and logistically supports younger Idus who shadow older shamans for two years to learn shamanic knowledge and wisdom.

### Ancestral storytelling

Idu ancestral stories contain traditional knowledge, detailing moral and reciprocal relations people ought to have with each other, and with the animal and the spirit world. Sadly, a majority of younger Idus no longer know these stories. This initiative combines traditional oral storytelling with locally developed art and visual aids, and Western scientific knowledge, wherever appropriate, to create a holistic Idu indigenous curriculum. Stories and other learning material are narrated orally in modern schools—where Idu youth currently spend most of their time.



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### Siang team

Odan Ratan and Chiging Pilia

### Donors for the Hornbill Nest Adoption Programme

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## Donors for the COVID-19 Relief project

Aakar Patel, Abha Chandra, Abhirup Khara, Aditya Arun Soman, Aditya Banerjee, Aditya Singh, Ajay Mahajan, Akshay Rajagopalan, Andrew Larochelle, Anju Agadi, Ankith Keshava, Anupam Sarkar, Anuroop Krishnan, Aparajita Datta, Aparajita De, Aparna Krishnan, Arpita Bhattacharjee, Ashish Chaurasia, Ashwin Arikere, Ashwin Ramaswamy, Avni Gupta, Babitha George, Baskar Kesavalu, Bijoy Venugopal, Chaitali Pednekar, Chandra Sekhar Bandi, Chandini Chhabra and Gerry Martin (Liana Forest School), Charudutt Mishra, Chiging Pilia, Damon Smith, David Clarence, Deepak Krishna S S, Deepika, Devathi Parashuram, Divya Padmanabhan, Diya Kapur, Dollar Ganguly, Geetan Batra, Girish, Harsha Jayaramaiah, Himanshu Chittkara, Hridik Pudukollu, Imna, Jaishree Ram Mohan, Jay Mazoomdaar, Jenis, Karthik Venkatesh, Keerthi, Kevin Gill, Koustubh Sharma, Krishan Chopra, Lansothung Lotha, Lathashree KS, Mallika Chandra, Matthias Fiechter, Megha Rai, Minom Pertin, Mohith Shenoy, Mousumi Ghosh, Mrinank Arun, Mukund Dalal, Namita Rao, Nandini Gupta, Nandita Pande, Nayana, Neela Parikh, Neha Kulkarni, Ng Bee Choo, Nikhita Venkatesh, Nima Manjrekar, Nivedita Chopra, Noopur Borawake, Pallavi M Chilleriga, Prachi Dalal, Priti Bangal, Priyash Chaplod, Rachelle Okmin, Rahul

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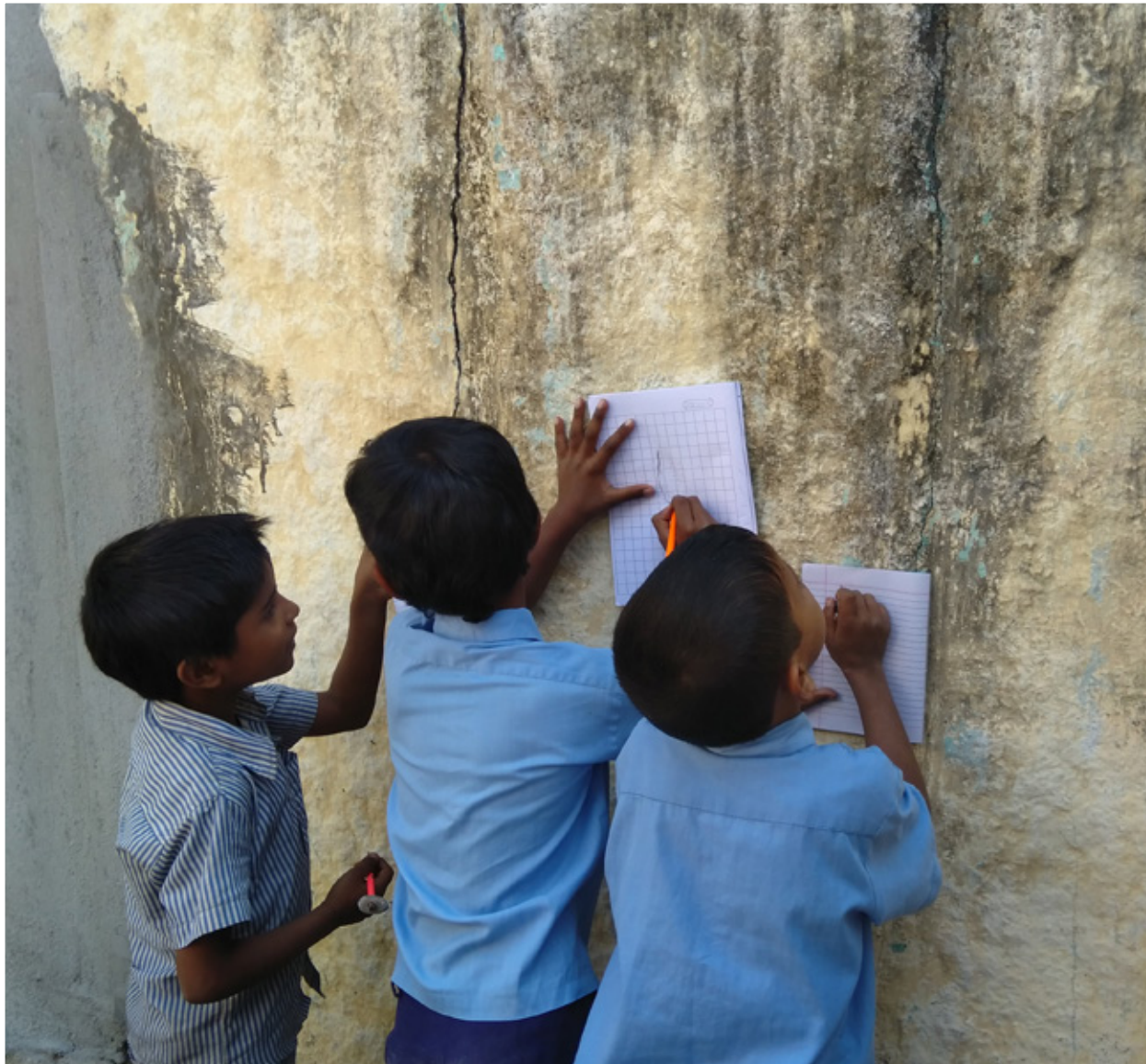
**Artists who donated funds through art sales:** Rohan Chakravarty of Green Humour, Pooja Gupta of Pooja's Laboratory, Abhisheka Krishnagopal, and Adyasha Nayak

**Institutions that supported the COVID-19 relief campaign:** Bhumi, Charities Aid Foundation America, Green Hub India, Kantar India, Ngunu Ziro, Rotary E-connect and Swasth Digital Health Foundation  
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# Education & Public Engagement



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We work to increase awareness about nature and biodiversity among the public, especially children, and to involve the larger citizenry in generating information for better documentation and conservation of nature. We believe that deep connections between people and nature arise primarily through first-hand contact with animals and plants; with some kind of wilderness. At this programme, we want to help make these connections, and once made, help nurture and develop them.

NCF has been working in conservation education and outreach at most of our focal conservation sites across India. We are also increasingly reaching out to an audience at a national scale. This programme also cuts across the various other NCF programmes and strives to add value to NCF's existing efforts in nature and conservation education.

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## *Bird Count India*

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Coordinated at NCF, Bird Count India (BCI) is an informal umbrella of institutions and groups to promote the documentation of birds by birdwatchers and other naturalist groups. Through this project, we carry out sustained engagement with birdwatchers to build capacity and motivate them to help document birds throughout the country. We have been doing this through our website ([birdcount.in](http://birdcount.in)), through in-person workshops across the country, and by encouraging birdwatchers to upload their observations to a common online platform, eBird.

eBirding has been on the rise in India: 11 of the last 12 months recorded an increase in listing year-on-year. Over the past year, we have been focussing on regions with high diversity and low coverage—beginning with the north-eastern Indian hill states. This has been in the form of networking with local birdwatchers and groups, and conducting a series of workshops and field sessions in North-east India.

BCI is involved in multiple partnerships where we engage with other NGOs and local groups in achieving their objectives. We partnered with BNHS in Salim Ali Bird Count





and in monitoring skimmers; with Wetlands International for the Asian Waterbird Census (AWC), and with WWF-India for monitoring vultures. Our support for Bihu Bird Count (BBC) in Assam enabled the creation of a new bird group in Assam—Assam Bird Monitoring Network (ABMN) and they conducted their first conference (Avicon) in Guwahati—over 100 birdwatchers across the state participated.

BCI is working actively to increase diversity in the Indian birding scene—two specific campaigns being to address linguistic and gender diversity. Last year, we worked with eBird, Merlin and Birds of the World team to update the bird names of seven South Asian languages—Hindi, Marathi, Gujarati, Assamese, Bengali, Telugu and the latest one being Odia. We are working towards increasing the number of women eBird editors towards a more gender-balanced data quality team in India.

Last year saw an uptick (1.5 times) in the use of eBird data in scientific publications on Indian birds. Many of these are from independent initiatives, demonstrating the wide-reach of eBird data analysis skills, which we have worked to build over the years.



## SeasonWatch

SeasonWatch is an India-wide citizen science programme that studies the changing seasons by monitoring the phenology of 170 common tree species, inviting volunteers—adults and children alike—from across the country to participate. By March 2022, SeasonWatch had accumulated nearly 5.5 lakh observations on 1.4 lakh trees contributed by 1430 individual contributors and thousands of students from more than 1500 Schools from across the country. In 2021-22, despite the global pandemic, SeasonWatch continued to interact with citizen scientists online over social media, webinars/workshops and WhatsApp, and our engagements led to 532 new contributors joining SeasonWatch. The top five species to be observed in this period were Mango (14000 observations), Jackfruit (10479), Tamarind (4556), Indian Laburnum (3365) and Teak (3030). As in previous years, Kerala contributed more than 85% of the data to SeasonWatch.

In 2021-22, as part of our outreach and engagements, we conducted four online general workshops on tree identification for beginners and eight online workshops covering 41 education districts of Kerala, an online two-day annual meeting with educators, delivered 13 talks and lectures in different institutions, organisations and conferences across India. Our capacity building efforts led to the establishment of a citizen science project for the documentation of mushrooms. Other outreach over WhatsApp and social media reached thousands of new and existing citizen scientists.

In 2021-22, SeasonWatch had the opportunity to engage closely every month from August to December 2021, with a core group of interested and motivated educators in discussing how citizen science can be utilised as a pedagogy tool in classrooms. These series of discussions involved learning plant identification and plant ecology through activities at the primary and middle school level. We started analysing the SeasonWatch data in relation to the environment. The first of these efforts was published as a popular article, followed by a peer-reviewed journal article.



## Early Bird

Early Bird aims to introduce children and young adults to birds and nature, by creating educational material and content, and training teachers and bird educators.

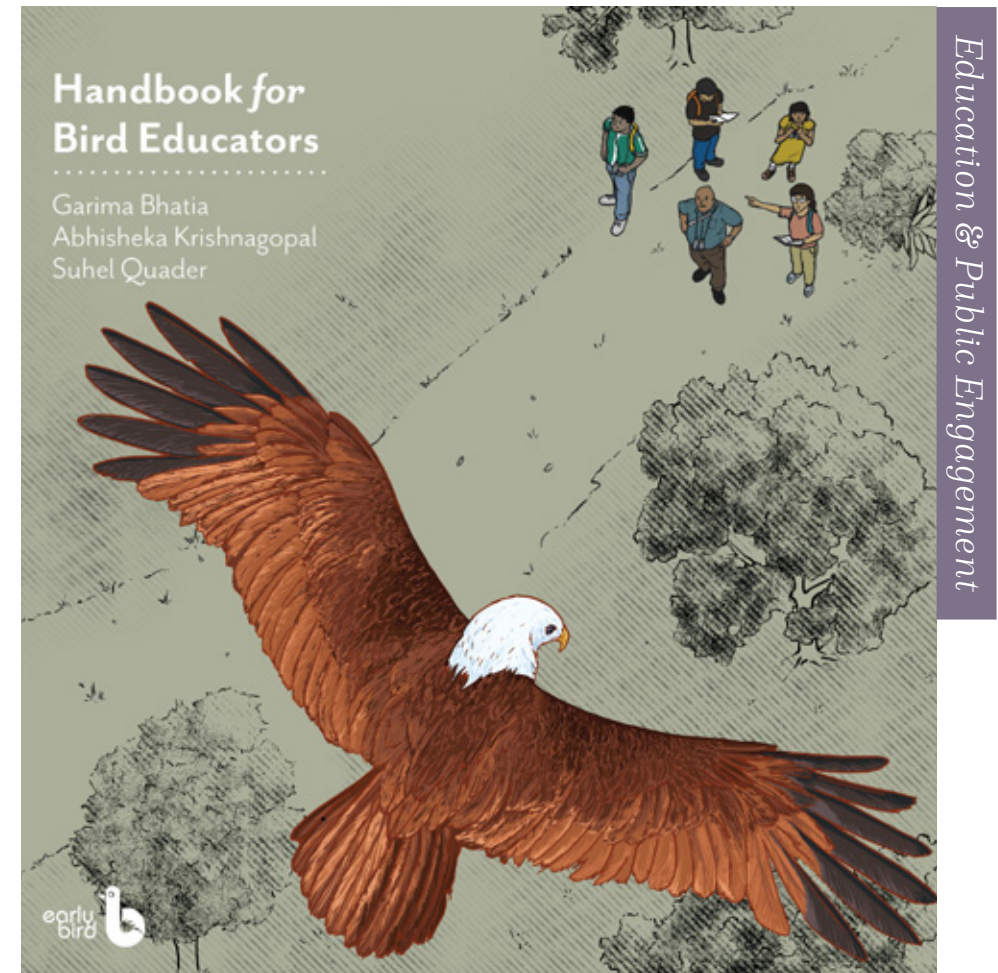
In 2021-2022, a few major initiatives of Early Bird were brought to fruition. Among these was the publication of our '*Handbook for Bird Educators*' which is available as a PDF for free download, a web format for browsing, and in print.

We launched a revamped, user-friendly website in September 2021, with a number of new features like a monthly 'Meet-an-Educator' column, a blog, and dedicated pages for each of the 9 languages in which Early Bird's materials are available.

In 2021 we converted our popular 'How to be a birding buddy' workshop into an online format, and conducted three such workshops for educators. Two of them were in English and the third was in Hindi in collaboration with Udaan Foundation from Mumbai. Around 90 educators attended the sessions, and were later invited to join our Birding Buddies network.

Our Young Birders' Network was kicked off in 2021 with a six-week online workshop conducted during May-June. A new theme was introduced each week—nature journaling, habitat, migration, bird behaviour and citizen science. Participants (10-16 year olds) were engaged using a combination of multimedia, guided interactions, and activities via online sessions. The second workshop expanded the scope by involving five members of our educators network as co-facilitators. A total of 72 children participated in the two workshops.

Early Bird resources developed during this period included two new pocket guides (Birds of Jungle Lodges, and Birds of Odisha), instructional videos on the use of Early Bird Tamil flashcards, and content developed in March 2021 for an exhibit on Birdsong, as part of a collaboration with the Indian Music Experience Museum.







## Nature Communications

Nature Communications started in May 2020 with the aim to build awareness and love for birds and nature in new audiences through mass media interventions. In less than two years, the project's Media Initiative has partnered with India's top newspapers and media houses in six of the major Indian languages, published more than 187 articles (cover stories, features and columns) and built a community of 570+ writers in 20+ Indian languages.

The project is divided into multiple initiatives. Through Nature In Mass Media we liaise with prominent media houses to run a series of articles, both print and digital, in different languages. We work with India's top national dailies including Dainik Bhaskar (Hindi), Amar Ujala (Hindi), The Hindu Tamil, Sambad (Odia), Mint Lounge (English) and NavGujarat Samay. In digital media we work with The Wire (Marathi), NDTV Gadgets (English), NDTV Hindi and more.

Our strategic Digital Partnerships initiative pitches, designs and implements innovative storytelling collaborations with mass digital platforms. We have conducted 20+ webinars by ecologists and nature experts in India's top media, academic and cultural institutes (total viewership: 57,000+) and collaborated on innovative digital storytelling with global platforms like Google and Storyweaver to develop content for audiences worldwide.



## Nature Classrooms

The Nature Classrooms team works with primary school teachers and educators to connect learning to the natural world. We develop age-appropriate, locally-culturally relevant and robust nature learning resources, content and tools that supplement and enrich primary school environmental studies curriculum. We engage in long-term collaborations and capacity building for teachers and educators across India and carry out research projects in the domain of education and nature learning to inform our work.

The team creates nature learning resources that are cost-effective and replicable for various teaching-learning contexts (like flashcards, visual aids, worksheets, puzzles, outdoor games). These resources and training sessions engage with nature through current theoretical understandings, and hands-on and inquiry-based learning. Our workshops for school teachers and nature educators allow participants to design classroom sessions, engagements that encourage students to develop empathy, experience wonder, love and build a connection with their natural environment.

All our trialled and tested open-source learning resources are uploaded on our new website. The Nature Learning Framework and Pedagogy also added to our website that we have designed based on education theory, practice and our own experience as nature educators, wildlife biologists and ecologists is being used and adapted by educators, school teachers and organisations engaged in the field of education.

'Children, Nature, the City', is a research project being carried out in collaboration with Azim Premji University. The one-year project has been looking to understand how 8-12 year old children in Bengaluru relate to, and connect with nature. The study uses multiple methods to provide avenues for participants to express themselves; and alongside, it has allowed us to attend to, and learn from children's complex everyday lives. Information gathered through these activities are simultaneously being coded and analysed. This is being further developed into themes that are emerging and on synthesising the findings which will inform our work at Nature Classrooms.







## Collaborations and Capacity Building

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The Collaborations and Capacity-building project was started with two primary aims:

1. To encourage meaningful collaborations among researchers and students in the field of ornithology and
2. To train budding ornithologists in the scientific study of birds.

In 2021-2022, we collaborated with seven faculty from six institutes across India to offer a 'Basic Course in Ornithology' on the MOOC platform run by the National Programme on Technology Enhanced Learning" (NPTEL). Over 5,000 people enrolled in the course, which was well-received by both nature enthusiasts and academic audiences (students and faculty).

### Long Term Ecological Observatories (LTEO)

The Long-term Ecological Observatories (LTEO) effort is a multi-institutional partnership setting up long term studies on ecological monitoring across the country. NCF is a partner within the bird theme of this programme along



with the Wildlife Institute of India, Dehradun; Indian Institute of Science, Education and Research, Pune; Indian Institute of Science, Education and Research, Tirupati; Indian Institute of Science, Bengaluru; Indian Institute of Forest Management, Bhopal; and Salim Ali Centre for Ornithology, Coimbatore. The goal of the programme is to set up monitoring for nine themes including birds, herpetofauna, arthropods, forests, grasslands, soils, freshwater ecosystems, marine ecosystems and movement ecology in six landscapes across the country.

In 2021-22, the field teams in Gujarat (Gir), Rajasthan (Desert National Park) and Arunachal Pradesh (Eaglenest) conducted the first winter field season of data collection at each of these sites. The teams used a combination of line transects and point counts to establish permanent bird monitoring stations. The teams generated baseline data and protocol at both sites to build on, in the upcoming field seasons.

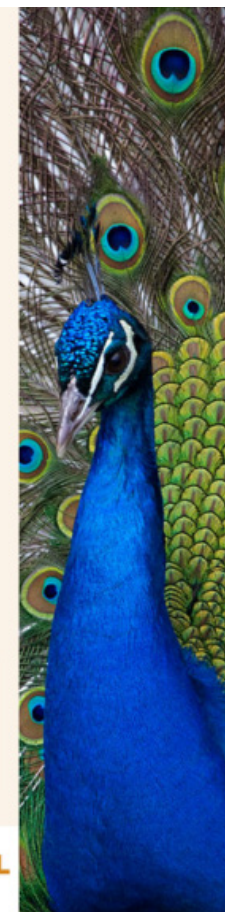
## Basic Course in Ornithology

Suitable for **students pursuing their Bachelors and Masters degree in life sciences** and for **bird enthusiasts** who wish to learn about the formal study of ornithology

<b>Start date</b>	<b>Duration</b>
24 January 2022	12 weeks
<b>Platform</b>	<b>Enrolment Fee</b>
Online, over NPTEL	FREE
<b>Faculty</b>	
Dr. Anand Krishnan	Dr. V.V. Robin
Dr. Manjari Jain	Dr. Suhel Quader
Dr. Mousumi Ghosh	Dr. Umesh Srinivasan
Dr. Rajah Jayapal	

More details and registration on [ornithology.in](https://ornithology.in) or scan the QR code

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## Selected Collaborations

**Birds of the World (BoW)** is an online resource with comprehensive life history information on 10,721 species of the world's birds. Bird Count India partnered with The Cornell Lab of Ornithology to provide free access to Birds of the World for anyone within India. In return, Bird Count India is working with c.50 ornithologists and bird experts to generate detailed accounts on Indian species for BoW. So far, over 30 such species accounts have been completely re-written by and published on BoW.

**Fig Tree Learning Centre (FTLC, Silvepura Village):** We collaborate with the Fig Tree Learning Centre to develop nature-based activities and experiences for students in government schools in the outskirts of Bengaluru city. In 2020–21, the two teams were joint recipients of a small grant from the Bengaluru Sustainability Forum allowing us to develop resources that highlight the biodiversity in a rapidly changing peri-urban area.

**Aripaana Foundation (Bihar):** Aripaana Foundation is a Darbhanga-based organisation, working for the overall development of North Bihar, with a focus on education. As part of Aripaana's environment and sustainability education program in North Bihar, they engage with schools and other voluntary/teacher groups. We collaborate with them for capacity building in the nature education domain and to co-create locally-culturally relevant nature resources for the geographical areas they work in.

**Parikrma Humanity Foundation Schools:** We collaborated with the Parikrma schools to provide consistent engagement for primary school environmental studies (EVS) teachers through workshops, lesson planning support and resource creation.



**Samavesh:** Our collaboration with Samavesh, Madhya Pradesh involved a two-part workshop that introduced local educators to nature learning pedagogy and practice. They also reviewed existing EVS lessons and supplemented them by adding local natural history stories.

**Punarchith:** We worked with facilitators of the Aniketana programme at Punarchith, Chamrajnagar district, Karnataka. Post the nature learning workshop, the facilitators designed and conducted sessions for the student group supplemented by collaboratively developed resources.

**Wipro Sustainability Educators Network:** We conduct intensive nature learning workshops for the Wipro Sustainability fellows and educators from various parts of the country every year. These sessions allow the participants to examine their existing approach and understanding towards nature education as well as design and contextualise activities and resources for their unique learning contexts and geographies.

**Aga Khan Foundation (AKF):** The AKF runs programmes aimed at improving the quality of life of disadvantaged communities across India. We collaborated with the Low Carbon Agriculture Team Heads and the school teachers they work with in Bihar and Uttar Pradesh to conduct online nature learning workshops.

**National Centre for Biological Sciences (NCBS):** Our staff have been helping supervise and mentor NCBS MSc students in their research. Ashwin Viswanathan has been supervising Mohammad Maaz (tree cavity use by birds) and Priti Bangal has been supervising Abhijith A. V. (mixed-species bird flocks) for their dissertations.

**Other Collaborators:** Prof. Jayashree Ramadas, Dr. Radha Gopalan, Jane Sahi, Dr. Ovee Thorat, Dr. Kaustubh Rau, Yuvan Aves





**Team leader**

Suhel Quader

**Programme team**

Aashish Gokhale, Abhisheka Krishnagopal, Ashwin Viswanathan, Devica Ranade, Garima Bhatia, Geetha Ramaswami, Jignasa Patel, Kaushik Sarkar, Karthik Thrikkadeeri, Misha Bansal, Mittal Gala, Muhammed Nizar, Mythreyi Kumaraswamy, Praveen J., Priti Bangal, Roshni Ravi, Rutuja Dhamale, Shweta Taneja, Shonali Chenzira, Subhadra Devi, Suhel Quader, Suhirtha Muhil, Sayee Girdhari, Swaroop Patankar, Swati Sidhu, Vena Kapoor, Nayantara Siruguri.

**Collaborators/partners**

Aga Khan Foundation, Aripaana Foundation, Azim Premji Foundation, Birds of the World, Bombay Natural History Society, Fig Tree Learning Centre, Foundation for Ecological Security, Google Arts and Culture, Keystone Foundation, Mathrubhumi SEED, National Centre for Biological Sciences, Parikrma Humanity Foundation Schools, Punarchith, Quora, Sálím Ali Centre for Ornithology and Natural History, Samavesh, Storyweaver.org (Pratham Books), Udaan Foundation, Wipro Earthian/Sustainability Educators Network.

**Funding**

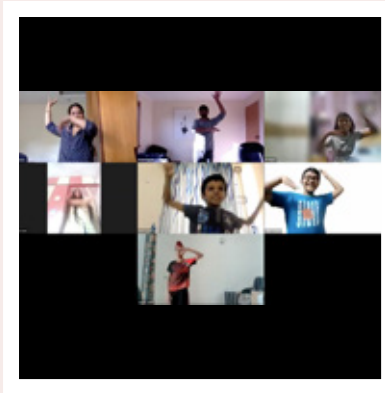
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Team & Support



## Field tales



by Misha Bansal

### Long Distance Caws

How does one adapt when “the field” is no longer accessible? With the pandemic taking over, Early Bird’s outreach took a hit, and the last two years have passed in experimenting with online sessions. Many of these were a part of the Young Birders’ Workshop—a space for 10-16 year olds to expand their interest in birds.

The challenge—how do we make the online sessions as engaging as possible? And how do we create an appreciation for birds remotely—without actually seeing birds together?

We tried a host of ideas, focusing on keeping the sessions as interactive as possible. In the nature journaling session, we could not possibly sit together outdoors and draw nature, so we asked the kids to bring nature home (like a small rock or leaf, twig or flower) and journalled about it together on Zoom. In the habitat session, we created imaginary birds, drawing birds with different beaks and claws as adaptations that help them survive.

Keeping the sessions interactive meant that we would often get stumped by the kind of questions kids threw at us, the most mind-boggling one being “do birds love humans?”

After the workshop, we organised monthly sessions for the participants with experts. Figuring out how

to break down concepts like sound frequency and speciation models for nine year olds was invigorating! I truly understood the meaning of the quote, “if you can’t explain it to a nine year old, you don’t know it.”

Our speakers were creative too! In the birdsong session, Ramit Singal launched a spectrogram generator, and the kids clicked, clapped, whistled and screeched to visualise their sounds in real time. In another session, Esha Munshi talked about her feather library, showing wings of a falcon, owl and kingfisher and even a flamingo’s!

Once we got into the groove, we kept finding new ways to keep the kids on their toes. To break the monotony during long sessions, Shonali Chenzira, my colleague, designed an energiser called eleMENTAL. We allotted an action to each element of life—fire, water, air and earth. Then we would name something in nature and the kids had to do the action of whichever element they thought it was associated with.

Creating online sessions has been a challenging but fulfilling experience. We are now excited to see how these activities will work in person!





# Western Ghats



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In the Western Ghats, our work encompasses wildlife and plant research, ecological restoration, conservation with communities, and outreach and education. In the Anamalai Hills, Tamil Nadu, we carry out ecological restoration of degraded rainforest remnants in a fragmented rainforest landscape dominated by plantations. Here, and in the Hassan-Alur landscape in Karnataka, we also work to foster human-elephant coexistence through collaborative efforts including the innovative use of technology for early warning systems. In the Anamalais and in our recently established field station at Kadamane, Karnataka, we carry out research examining long-term trends and dynamics of tropical forest ecosystems and address key issues of how forests change due to fragmentation, degradation and extractive use. In other parts of Karnataka, we also study the ecology and distribution of mammals, and work to consolidate protected areas and minimise human impacts. Our work is helping the conservation of both existing wildlife reserves and their surrounding landscapes.

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## Restoring degraded rainforests

Ecological restoration of degraded rainforests requires sustained decadal efforts and in the Anamalai Hills, is carried out by NCF through continued partnerships with plantation companies such as Parry Agro Industries Limited and Tata Coffee Limited.

### Rainforest restoration

Over the last year, we continued our on-ground restoration efforts. We revised and renewed our Memorandum of Understanding (MoU) with Tata Coffee Ltd. (division of Tata Global Beverages) for a 10-year period (2021–2031). With this, 17 rainforest fragments were also mapped accurately to support the efforts at their protection and revival as well as wildlife research. We also continue to work with Parry Agro Industries Ltd. under the existing 15-year MoU (2016–2030), for the protection and restoration of 15 rainforest remnants on the Valparai plateau, including a 100 ha. site which is the focus of intensive restoration and monitoring efforts. These MoUs, besides leading to the protection of over 1065 ha. of rainforest fragments and remnants within private lands, also support other activities such as wildlife research, human-wildlife coexistence efforts, and native shade tree use in plantations. Restoration efforts over the last year included plantings in degraded rainforest sites, continued maintenance and monitoring of rainforest plant nursery and restoration sites. In the 2021 planting season (south-west monsoon), we planted 5536 saplings of 136 native species in seven sites. A small number (298) of saplings of 71 species were also distributed to use as alternative native shade trees in plantations. Past and current sites were photo-monitored and a sample of them will be surveyed more intensively in the coming year. The sites included new restoration sites as well as in-filling planting in older restoration sites that had partially recovered in which more mature forest species saplings were planted.



## Restoration and invasive alien species: policy and practice

As part of the National Mission on Biodiversity and human well being, the Biodiversity Collaborative has held a series of consultations and is preparing a comprehensive document to which we have also contributed: Restoring India's Terrestrial Ecosystems: Needs, Challenges, and Policy Recommendations (Summary for Policymakers). This is likely to be published later this and will be a useful policy guide and reference on ecological restoration in India.

At the state level, the Tamil Nadu Government has taken a lead in proposing a Tamil Nadu Policy on Invasive Plants and Ecological Restoration (TN-PIPER). During the consultations, we took the opportunity to contribute to the concepts and content of the policy. The draft went through a public consultation and is expected to be adopted by the TN State Government in 2022.

At a regional level, we collaborated with Green Hub, Tezpur, and our colleagues in the Eastern Himalaya Program to conduct a workshop on ecological restoration in October 2021 at Tezpur, Assam, and Pakke, Arunachal Pradesh. A number of participants from different states in north-eastern India participated in the workshop that we hope will spur some restoration efforts in the region.

## Research on recovery after restoration

Our study on recovery of bird communities through ecological restoration examined recovery of bird species richness, abundance and community composition in 23 actively restored (AR) sites compared to paired naturally regenerating (NR) sites, and 23 undisturbed benchmark (BM) rainforests. We recorded 92 bird species in 460 point-count surveys. We found that active







restoration of degraded fragments benefits rainforest birds and reduces the infiltration of open-country birds, and highlights the importance of considering rainforest and open-country species separately. This study was published in the *Journal of Applied Ecology* (Hariharan & Raman, 2022).

We also concluded a study examining natural regeneration of rainforest seedlings following rainforest restoration. The study showed that improving canopy cover is important and doing so by planting diverse native species and controlling invasive alien species helps rainforest recover in degraded rainforest fragments. Planting non-native monocultures in degraded forests, a prevalent practice in India, could be counterproductive for forest recovery. These findings were published in the journal *Restoration Ecology* (Osuri *et al.*, 2022).

### Ecological Restoration Alliance—India

Over the last year, we worked with our network of restoration practitioners and ecologists to create the Ecological Restoration Alliance India (ERA-India), a collective that aims to foster efforts to support and sustain ecological restoration in India. ERA-India is an informal partnership of individuals, organisations and groups working together to foster knowledge and practice of ecological restoration of natural ecosystems in India. The goals of the alliance are to collate and share knowledge, experience, and case studies of ecological restoration of different natural ecosystems across India. The alliance is headed by an 11 member steering committee—Anita Varghese, Aparna Watve, Arun V., Divya Mudappa, Paul Blanchflower, Pradip Krishen, Rita Banerji, Siddharth Rao, Suprabha Seshan, T. R. Shankar Raman, and Vijay Dhasmana. ERA-India has six institutional partners: Adavi Trust, Auroville Botanicals, The Forest Way, Greenhub, Keystone Foundation and Nature Conservation

Foundation. The website and knowledge platform ([era-india.org](http://era-india.org)) to be launched in 2022 aims to help practitioners find answers to the where, what, and how of ecological restoration. The platform will support a community knowledge-base of resources, information, and guidelines for restoration. ERA-India aims to hold and facilitate events, foster conversations and networking between restoration practitioners, and spur the revival of degraded ecosystems nationwide.

### Survey of Threatened Tree Species

To understand the distribution and assess the conservation status of 11 threatened rainforest trees in the rainforests of the Anamalai Hills, we continued our project supported by Fondation Franklinia. The project focuses on 11 select tree species listed as threatened under the IUCN Red List of Threatened Taxa (IUCN 2019): 3 Critically Endangered (CR), 4 Endangered (EN), and 4 Vulnerable (VU) tree species, in the Anamalai Tiger Reserve (ATR) and Valparai plateau. An additional 969 trees of the 11 threatened species were recorded along over 35 km. of survey trails this year and 161 tree-centred plots were laid for habitat measurements. The total occurrence records of the 11 target threatened species during the surveys done over the last 2 years is 1944 with 620 tree-centred PCQ plots laid for habitat measurements and associated species. The Manamboli range of the Anamalai Tiger Reserve had all 11 species and was identified as a key area for in-situ conservation. The study resulted in new population records of *Phyllanthus anamalayana* (CR, earlier known from a single global location) and *Palaquium ravii* (EN), besides *Dipterocarpus bourdillonii* (CR). We also planted over 3000 seeds of these threatened tree species in our nursery and are germinated over 1500 seedlings and saplings for planting rainforest restoration sites.







## Long-term forest monitoring

Long-term research and monitoring is a critical component of our work in the rainforests of the Anamalai Hills. The following projects focussed on tropical forest phenology, forest dynamics, and bird communities are underway in the landscape of the Anamalai Tiger Reserve (ATR) and the Valparai plateau.

### Tree phenology

We continued monitoring seasonal cycles of leafing, flowering, and fruiting of in the Anamalai hills for the 5th consecutive year. From 2021 January onwards, we rationalised the survey and presently monitor 1089 trees of 59 species with at least 10 individuals, and also added individuals of 10 globally threatened tree species. The protocol was intensified from monthly to fortnightly sampling to study finer-grained temporal patterns. We have also begun synthesising the initial findings from tree phenology monitoring in the Anamalai Hills (data from 2017-20, Figure) for a scientific review paper as part of a collaborative project describing variation in tree phenology across several forest ecosystems in India. These efforts are ultimately likely to generate valuable insights into the response of Western Ghats rainforests to climate change, along with their immediate practical application in helping streamline the seed collection calendar for our rainforest restoration project



## Forest dynamics

We continued to monitor two long-term ecological monitoring (LEMoN) 1 ha. plots, established in collaboration with the National Centre for Biological Sciences. Our team has been monitoring tree survival and growth following LEMoN protocols since 2017. Analysis of data over the last five years indicates changes in the status and dynamics of species density, tree density, aboveground carbon stocks, and mortality and recruitment rates in these two plots. The results indicate substantially higher tree diversity and carbon stocks (c. 85 species, >190 tons C per ha.) in Manamboli compared to the degraded rainforests of the Candura plot (c. 65 species, 72 tons c per ha.), and the lower dynamism of the less-disturbed plot in terms of mortality and recruitment. A decreasing trend of aboveground carbon in the Manamboli plot maybe due to the death of larger trees and is a source of concern. Overall, this research is yielding interesting and new data on tropical rainforest dynamics in terms of tree growth, recruitment of saplings, tree mortality, and carbon dynamics. We are working with other members of the LEMoN on a joint manuscript of the findings across sites.





## Bird monitoring

### Birds in tea estates

In the Anamalai Hills, we studied how different intensities of tea cultivation influence birds by comparing bird communities in conventional monoculture tea plantations and mixed-shade tea plantations, both of which use agrochemicals, with organic tea plantations, a rainforest fragment, and larger patches of rainforests within the protected area of the Anamalai Tiger Reserve. A scientific article based on this work was published in the journal *Current Science* (Raman *et al.* 2021). Our findings indicate that organic tea is better than conventional tea for birds, but mixed-shade tea is even better, although still poorer than forests. Thus, retaining or promoting native shade trees in conventional or organic tea will greatly increase bird diversity and abundance, including of forest-affiliated species, and support landscape-level bird conservation.

### Long-term bird monitoring

We continued our long-term bird monitoring efforts through annual road surveys in March 2022, for the 8th consecutive year. A cumulative total of 940 point count surveys carried out so far recording 191 bird species in the landscape. The intensive monitoring of a 100 hectare rainforest remnant could not be continued since the interruption due to the pandemic but analysis of this data is focusing on seasonal patterns in bird density, distribution related to habitat structure, and inter-annual variation. We completed another study and initiated analysis of data on birds in 18 rainforest fragments, including 14 surveyed between 2000 and 2005 to understand longer-term changes in bird communities in relation to forest fragmentation.



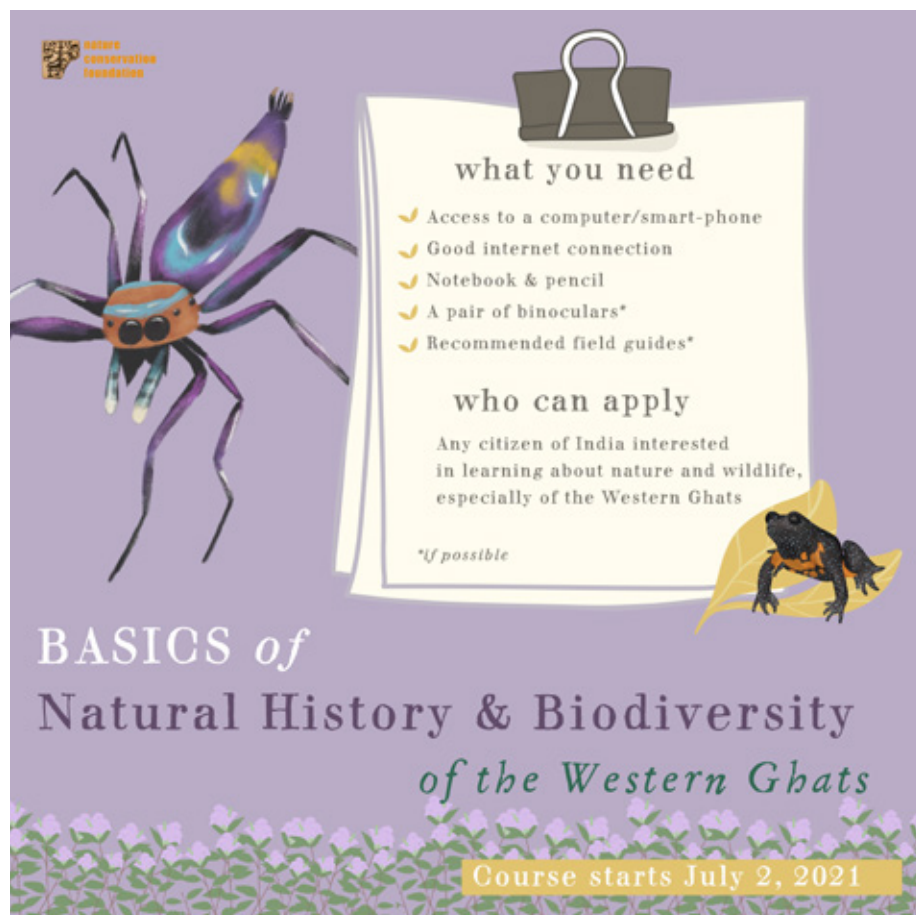
## Conservation education and training

The Anamalai Nature Information Centre (ANIC) at Iyerpadi, near Valparai, continues to receive visitors throughout the year, including students, researchers, tourists, local people, and forest trainees. Over the year, our team in the Anamalais conducted or participated in numerous interactions with local people, tea plantation workers and managers, Tamil Nadu Forest Department officers and field staff, and visiting forest trainees. Our approach has been to have a continuous outreach to different stakeholders on key conservation issues in the landscape including forest fragmentation and ecological restoration, invasive alien species and their management, human-wildlife interactions, and nature awareness and appreciation.

### Nature Guide Training

Our Online Nature Guide Training and Mentorship Course, conceptualised, developed and conducted in collaboration with Harsha Jayaramaiah and Payal Mehta, professional tour leaders and nature guides, continued this year. The course is aimed at local people based in the Western Ghats who intend to pursue Nature Guiding as a profession. We conducted five Online Nature Guide Training Courses between 2021-2022 for individuals based in the Western Ghats and intending to pursue Nature Guiding as a profession or as a skill that will help in their profession. From the 150-200 applications received each time, 12-15 candidates, mostly from rural areas, were selected for each course (total 69, including 21 women). This basic-level course attempted to reach out to rural youth offering a skill development opportunity to encourage a nature-based career in natural landscapes where tourism is fast becoming an industry. We hope the course will create a group of well-informed and sensitive nature guides capable of conducting ethical nature tourism.





### Biodiversity Basics: Western Ghats

We also conducted three rounds of an online course to introduce interested participants to the biodiversity of the Western Ghats. This beginner-level online course was meant for those interested in learning about nature, especially of the Western Ghats. The course provides a broad overview of the natural history and rich biodiversity of the Western Ghats from experts and naturalists from around India. This online course is organised in eight chapters containing 26 Videos (pre-recorded). Each chapter introduces a topic broadly before delving into the Western Ghats. The chapters are aimed to help participants become better naturalists, provide guidance on making good field notes and observations, and on using various apps to record data and contribute to citizen science, besides guidance on the ethics of observing nature as a responsible naturalist.

### Other student projects

At the Anamalai field station, we facilitated two external students—C. Niranjana from National Centre for Biological Sciences, and Ashni Dhawale from National Institute of Advanced Studies, by providing logistical and field support, for their Master's and PhD research. Their work examined the effects of forest fragmentation on butterflies and behavioural adaptations of lion-tailed macaques in human modified habitats.



## *Tropical Ecology and Restoration Field Centre*

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We established a new research, restoration, and training centre at Kadamane in the Western Ghats of Karnataka in partnership with the Kadamane Estates Company. The Tropical Ecology and Restoration Field Centre (TERFC) hosts a number of in-house and collaborative research projects investigating both opportunities and challenges for conserving biodiversity and sustaining human well-being (through ecosystem services such as carbon sequestration) in human-dominated landscapes under a changing climate. The Centre also offers training in natural history, ecological research and monitoring, and conservation, through student projects and workshops and training programmes for researchers and practitioners.

A number of pilot research projects have been initiated to document plants, mammals, birds, amphibians, and invertebrates across different habitats and seasons at the centre. We completed a pilot study examining the role of dead and fallen coarse woody debris (CWD) in rainforest carbon and nutrient cycling, and how these are affected by fuelwood extraction. The results of this study show that the woody litter carbon pool is 50% smaller in forests subject to fuelwood extraction, and this decline is associated with changes in soil nutrients such as phosphorus and potassium which are important for plant growth. Insights from this study are helping shape future work on understanding and addressing fuelwood needs and impacts on the rainforest ecosystem.

We completed mapping and instrumentation of a 1 ha. permanent plot in Kadamane in collaboration with the Long-term Ecosystem Monitoring Network—India (LEMoN; [lemonindia.weebly.com](http://lemonindia.weebly.com)). A total of 1,258 trees belonging to 73 species were recorded within the plot. In January 2022, we





commenced rigorous monitoring of tree populations, growth rates, carbon capture rates, litterfall dynamics and respiration rates from vegetation and soil within this plot. Over the past year, we have also set up two phenology trails at Kadamane, in which 333 trees belonging to 56 rainforest tree species are being monitored following standardised protocols.

### **Student research projects**

TERFC hosted and supported two postgraduate students from Pondicherry University and TERI School of Advanced Studies, and supported them for their dissertation field projects. Rama Narayanan from Pondicherry University compared nocturnal flying insects (e.g., beetles, moths, flies) between rainforest and coffee plantation habitats, and examined their role in pollinating coffee flowers. Vedika Dutta from TERI School of Advanced Studies evaluated frugivorous bird communities and fruiting resources in rainforest and coffee habitats. We also hosted Aniruddha Dhamorikar, an expert entomologist, for a study on insects of the rainforest floor, and how their community is affected by forest fragmentation.

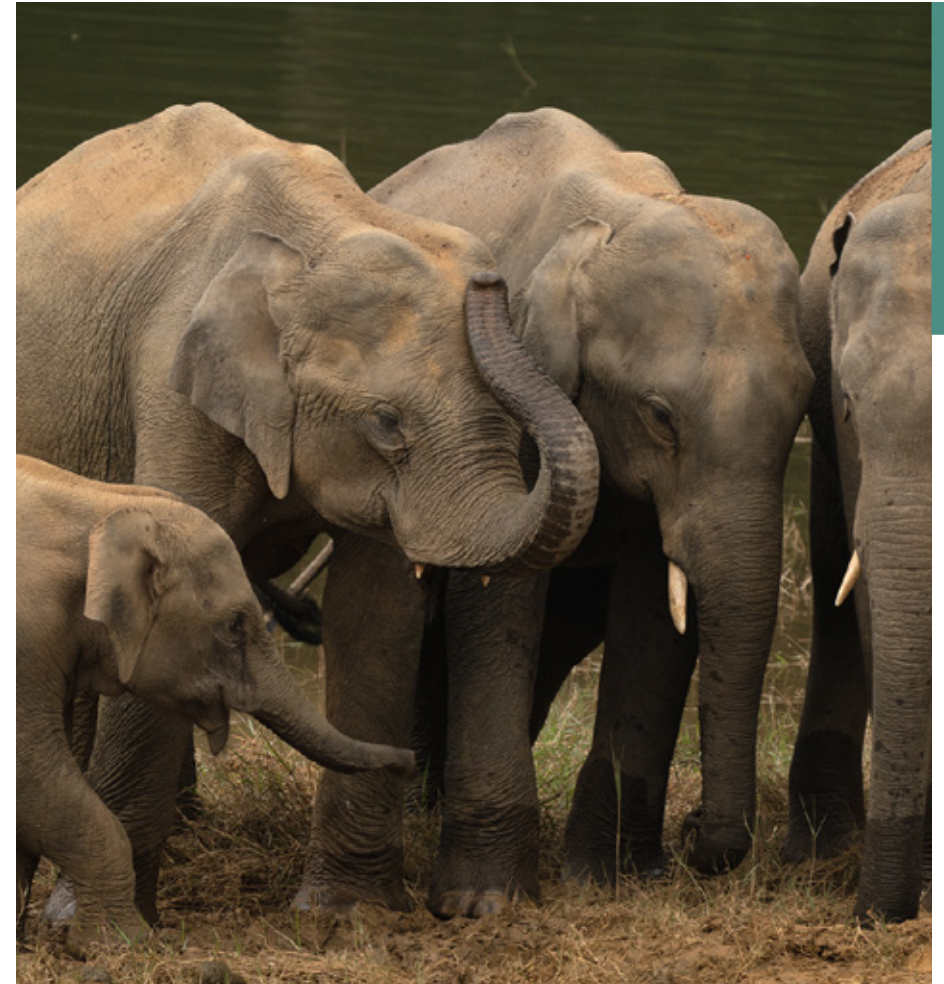


## Human-elephant coexistence in Anamalais and Hassan

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Human-elephant conflict has been one of the critical conservation issues for Asian elephants in Asia. Our long-term research and conservation work in two critical model landscapes of Valparai plateau in Tamil Nadu and Hassan region in Karnataka, enabled us to implement simple, participative, and technological interventions such as SMS and voice call alert systems and GSM-based digital information boards and alert light beacons. These systems have been well regarded by local communities and helped in reducing elephant caused human fatalities/injuries in these two landscapes. Our human-elephant coexistence model has encouraged state forest departments and private corporations to implement similar systems in Tamil Nadu, Karnataka, West Bengal, and Kerala.

In the Anamalai Hills, we continued to monitor elephant movements and conflict incidents and advanced intimation systems in the Valparai region. Elephants spent about 3039 'herd-days', with a peak between October and March. About 4500 subscribers now receive elephant alerts over SMS and call alerts with alert beacons installed in 35 critical locations to avoid any accidental encounters. Around 8 lakh text messages and around 6.2 lakh call alerts were sent out (delivery rate of 70% and 53%, respectively). Local community operations of alert light beacons (95%, 290 or 307 operations) and 690 response calls from people towards SMS and call alert systems indicate active community involvement. Following relaxation of COVID-19 restrictions, we conducted direct interactions with stakeholders through outreach programmes. We held four street plays by professionals covering around 800 estate workers to communicate the importance of elephants as part of the landscape and precautionary steps needed. Tamil Nadu Forest Department has established an Elephant Cell to manage human-elephant conflict. These collective efforts resulted in no human death due to elephants during the past one year.





Alur-Yeslur-Arakalgu-Sakleshpur-Kodlipet-Belur region in Hassan-Kodagu has been frequently used by elephants regularly and interacting with 1,00,000 people, leading to human-elephant conflict over decades. Currently, the region supports 65 elephants and 1,00,000 people with limited area under forest fragments ranging from 150-300 hectares in size. We have expanded monitoring of elephants and conflict occurrence in 220 villages in 2021 to 275 villages in 2022, covering 650 km<sup>2</sup> primarily dominated by coffee-paddy interspersed with Acacia and Eucalyptus plantations and forest fragments. In this particular landscape, human-elephant conflict in the form of loss of life and livelihood of people and pressures on elephants, pose a big challenge for local people, government departments, scientific and conservation organisations to find out locally appropriate conflict mitigation measures in the region. Over the past two years, elephants showed a significant shift in their movements and their areas of use towards the northern part of the study area, covering parts of Sakleshpur and Belur ranges. This shift in the use of anthropogenic and natural forest areas by elephants was due to installation of solar powered fences around coffee estates which resulted in increased incidents of human fatalities and crop damages, particularly in new areas of Sakleshpur and Belur ranges.

Since a majority of human fatal incidents due to elephants occurred with lack of prior knowledge about elephant locations to people, we have expanded early warning systems using SMS-based text and voice call alerts and installation of GSM-based alert beacons and digital information boards beyond 220 monitoring villages. A database of around 5000 mobile phone numbers of local residents who voluntarily shared to receive alerts over phone has been maintained. This database includes information such as the name of the person, place of residence, division, estate etc., covering 80,000 people living in



160 villages in the study region. On a daily basis, elephant presence information is being sent out in the form of text messages and call alerts to peoples' mobile phones in Kannada. Currently, we have installed 14 digital information boards and 12 alert beacons in strategic locations that would signal elephant presence to around 20,000 people who live in 60 villages. During the last one year, we have sent out 7,59,416 text messages and 2,64,933 call alerts (delivery rate of 84% and 42%, respectively) to mobile phones of people who reside within two km. from elephant locations. Number of human fatalities declined from an average of 4-5 persons/year (2010-2017) to an average of two persons/year between 2018-2020 in 220 monitoring villages where early warning systems have been functional. However, between January 2021 and March 2022 eight people lost their lives in direct encounters with elephants with six of the deaths occurring in areas with no facility of early warning systems, indicating the need to expand alert systems in new areas.





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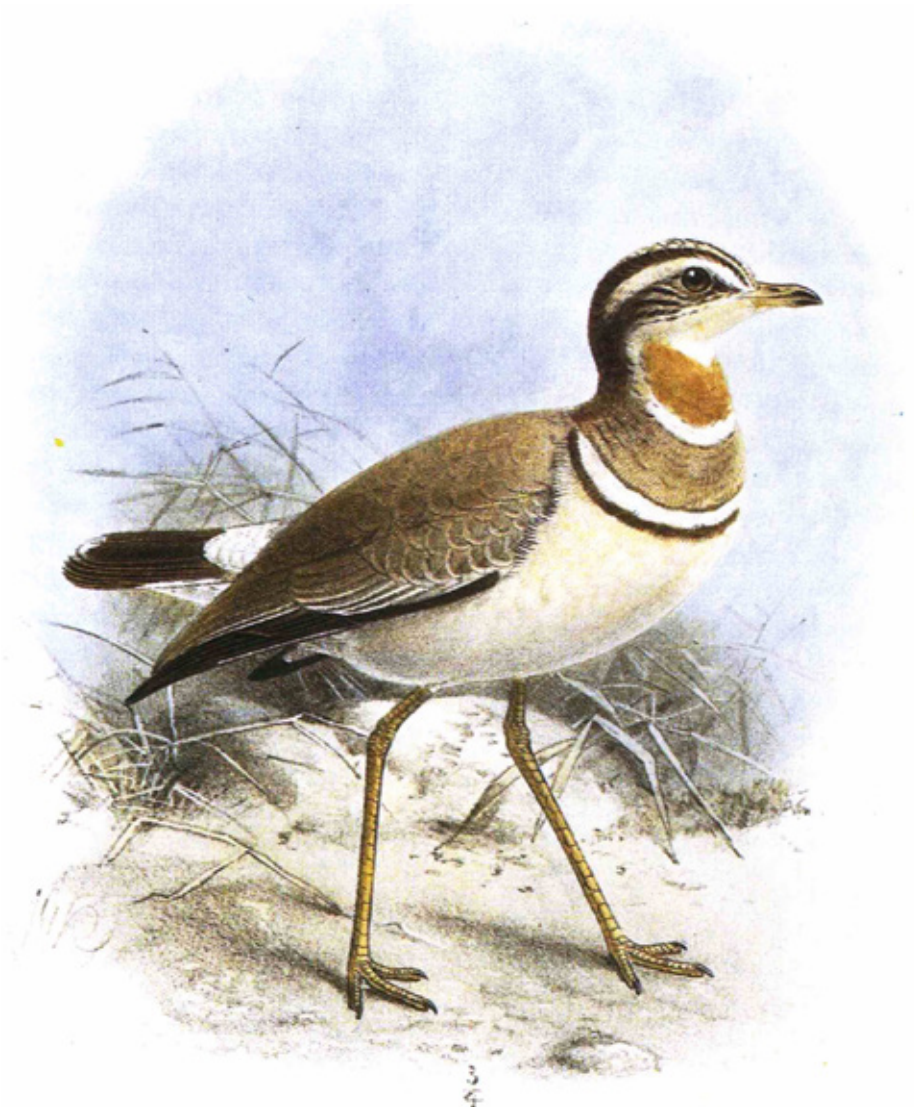
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# Labs, PhD & Conservation Leadership



Two new initiatives at NCF have taken root as new labs. The first, led by Dr Rohit Naniwadekar explores the relationships between fruiting plants and the animals that feed on them, with a study carried out in the tropical forests of Andaman and Nicobar Islands and other parts of India. And the second, led by Dr P. Jeganathan in NCF, focusses on endangered species such as the Jerdon's Courser and the Black-bellied Tern in southern India.

We also have an academic programme at NCF which comprises the doctoral programme, annual courses in conservation leadership and targeted capacity building initiatives. Our doctoral programme fosters the highest standards of academic and applied research in conservation science. Our leadership modules and training strengthen the conceptual and practical skills of conservationists.



## Endangered Birds Lab

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Our programme carries out (i) long-term research on certain threatened birds and conservation of their habitat especially from south India, (ii) nature education and citizen science.

### **Jerdon's Courser Recovery Program**

The Jerdon's Courser is one of the rarest birds in the world and listed as Critically Endangered. It has not been detected since 2008. Habitat modification and destruction are two of the major threats to the species. In this project, we intend to map the extent of the existing potentially suitable habitat of this species across its historical range in southern Andhra Pradesh. A preliminary land-use land-cover map will be produced and, based on that, field surveys will be carried out in this region especially in the scrub jungle area. Based on the availability and extent of the scrub jungle and the proximity to the historical sites of the Jerdon's Courser, intensive surveys will be carried out. Vegetation sampling and monitoring of habitat will be carried out in these historical sites as well as in and near Sri Lankamaleswara Wildlife Sanctuary where the Jerdon's Courser is known to occur at present.



### **Monitoring the endangered Black-bellied Tern and other riverine bird species in Tamil Nadu, India**

The Black-bellied Tern (*Sterna acuticauda*) is categorised as Endangered by the IUCN. The habitat it occurs in is also under severe threat due to various anthropogenic disturbances such as construction of dams and sand mining. They are poorly studied birds, and their population status and threat levels are unknown. We conducted a bird survey in the Kaveri and Kollidam rivers 2021-22. Of the total c. 450 km. stretches of the Kaveri and Kollidam rivers within Tamil Nadu we surveyed c. 300 km. during this period. In total, we have surveyed 527 point locations. From this effort, we recorded Black-bellied Terns only in 12 points. All these locations fell within 50-60 km. of the entire river stretch surveyed. Regular monitoring of Black-bellied Terns in this stretch is underway.

Apart from this, we were also engaged in mapping the threat features of the Kaveri and Kollidam rivers (within about 1 km. from the bank either side) such as sandmining areas, industries, sewage discharge locations, brick kilns, exotic tree plantations, aquaculture. In addition to that we have mapped the eucalyptus plantations along the river (some within the riverbed itself) and did groundtruthing. We found that there are about 40 sq. km. under eucalyptus plantations mixed with other tree species plantations.

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## CEROS (Community Ecology and Restoration) Lab

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Tropical forests are among the most biodiverse and yet the most threatened ecosystems. We strive to understand how human activities like habitat conversion, logging, and hunting affect species (from genes to populations) and communities, work towards restoring modified ecosystems and increase awareness of species and the threats they face among citizens. By working on threatened yet neglected species and sites, we hope to fill vital knowledge gaps that may aid in identifying and prioritising conservation action. We work across all the Biodiversity Hotspots—Himalaya, Western Ghats, Indo-Myanmar and Sundaland on woody plants, amphibians, reptiles, birds and mammals.

### Northern Western Ghats

#### Impacts of forest conversion on biodiversity

The forests of Northern Western Ghats are being converted to agroforestry plantations at an alarming rate. Being climatically drier than forests in southern Western Ghats, the biodiversity is likely to be more vulnerable to forest conversion. We completed field surveys for birds and select frog and reptile species to determine the impacts of forest conversion to cashew, rubber and mango plantations. We found that the bird diversity (taxonomic, functional and phylogenetic) is higher in relatively less-disturbed Reserved Forests than in privately-owned forests and cashew, rubber and mango plantations. We found that generalist species are replacing specialist and endemic species. Certain species that do persist in modified landscapes exhibit altered microhabitat use and lowered body condition. The diversity of several forest specialist species is higher in low-elevation Reserved Forests compared to high-elevation Protected Areas, highlighting the value of the low-elevation forests. We are now following up with a study on woody plants.

We are engaging with landowners of private forests and begin ecological restoration.

Impacts of land-use change on herpetofauna of lateritic plateaus  
Open natural ecosystems, like the lateritic plateaus of Northern Western Ghats, are considered wastelands. However, up to 50% of plant species found on these plateaus could be endemic to the habitat and region. Several new species of plants and animals continue to be discovered from the plateaus. However, most plateau habitats in the lower elevations of Northern Western Ghats are privately-owned or classified as revenue land. They are being converted to other land-uses like paddy or agroforestry plantations. This collaborative study with Biome Conservation Foundation focused on determining the impacts of habitat conversion on herpetofauna. We find that abandoned paddy and orchards negatively affected threatened and endemic white-striped viper gecko and generalist saw-scaled viper. However, the endemic Seshachari's caecilian benefitted from conversion to abandoned paddy. We are analysing the results for amphibians.

## Andaman Islands

### Impacts of logging on birds and seed dispersal in south Andamans

Ninety percent of birds that have gone extinct are island endemics. Our past research on Narcondam Island in the Andaman archipelago has demonstrated that island birds can play an irreplaceable ecological role as seed dispersers shaping plant communities on islands. This project aims at understanding the habitat preferences of birds in south Andamans and determining the impacts of logging on birds and seed dispersal. Our initial results demonstrate that several island endemics exhibit a preference for the

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semi-evergreen and deciduous forests on the islands. Unfortunately, many deciduous forest sites are currently included under Reserved Forests are not protected and experience logging.

#### **Narcondam Hornbill population genetics**

Genetic diversity is an important factor determining the persistence of species. Island endemics often have small founder and extant populations and are therefore likely to have lower genetic diversity, making them vulnerable to extinction. The Narcondam Hornbill is a point endemic hornbill found only on Narcondam island. This collaborative project with CCMB aimed to determine the genetic diversity of Narcondam Hornbill and compare it close relatives and determine potential changes in genetic diversity over time. Our initial results with two mitochondrial markers indicate low haplotype diversity. Additionally, in the extant population, we failed to detect haplotypes present in museum specimens, likely due to past hunting pressures. We now hope to do another study on understanding the impacts of hunting and past climate on hornbill population genetics and phylogeography for multiple hornbill species in the Indian subcontinent.

### **Himalaya**

#### **Lantana invasion in grasslands and forests**

Lantana has been identified as one of the worst invasive plants globally. Its fleshy fruits attract diverse array of frugivores who in turn disperse the seeds and facilitate its spread. This collaborative project between WII and NCF aimed to determine if fruiting intensity and frugivore visitations on fruiting Lantana differed between open and closed forests. We found that Lantana fruiting and frugivore visitation was higher in open grasslands compared to forests, a likely reason for faster invasion of Lantana in open habitats.

### **Drivers of Himalayan river bird diversity**

Unlike forest birds, riverine birds have received relatively limited attention. Eastern Himalaya has the highest diversity of riverine birds in the world. Himalayan rivers are modifying drastically due to hydroelectric projects and other threats like sand and boulder mining, excessive fishing among others. We compared patterns of turnover in riverine birds in Eastern and Western Himalaya and found that the Western Himalayan rivers had relatively poor diversity than Eastern Himalaya. The patterns of turnover were influenced by habitat availability and climate, highlighting the role of environmental filtering in structuring river bird communities. We are now hoping to build on this work and do a more focused study on riverine birds, especially the Critically Endangered White-bellied Heron, in Eastern Himalaya.

## **Thailand**

### **Impact of habitat degradation on endangered hornbills**

Peninsular Thailand has very high site diversity of hornbills with up to nine species of hornbills that occur sympatrically, which is the highest in Asia. The nine species includes the Critically Endangered Helmeted Hornbill which has been persecuted for its casque and the associated illegal wildlife trade. Additionally, forests in South-east Asia face significant threats from habitat degradation. This collaborative project between Thailand Hornbill Project, King Mongkut University and NCF aims to determine temporal and spatial changes in sympatric hornbill populations due to hunting and habitat degradation in Hala Bala and Budo Mountains in southern Thailand. We found more than 90% decline in Helmeted Hornbill populations in 20 years. We found that degraded sites had lower densities of the Rhinoceros and Wreathed Hornbills. The next phase of the project aims to compare plant-frugivore communities between degraded and primary forest patches.

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## *The Himalaya Lab*

The lab aims to conduct, facilitate, and catalyse long-term research and interventions that promote fair and effective forms of conservation across the Himalaya. We strive to create a dynamic balance between the well-being of the natural landscape, and the economic and cultural needs and aspirations of the communities through partnerships with key stakeholders including communities, policymakers, government departments, scientific institutions, and the larger citizenry.

### **State of human-wildlife conflicts in the Lahaul landscape in Himachal Pradesh**

The Lahauli community inhabiting around 200 villages are primarily agro-pastoral. Over the last two decades, Lahaul has witnessed a sharp increase in high-value cash crops such as apple, green peas, cauliflower, and iceberg lettuce. During the same time, the intensity and frequency of crop depredation by animals especially the Himalayan brown bear has reportedly increased. This project, therefore, was designed to understand the gravity of human-wildlife conflict on local agrarian livelihoods. By generating various socio-economic as well as ecological baselines, the project also aimed to decipher the patterns, processes, and drivers of conflict, and understand the attitudes and perceptions of the community towards bears. This information then allowed us to formulate suitable solutions and strategies to mitigate and minimise human-wildlife conflict effectively on ground.

### **Participatory Rural Appraisal exercises with Lahauli communities**

To collect baseline information on intensity and distribution of wildlife-induced losses, historical transformations in agropastoral livelihoods, socio-economic



indicators, and existing mitigation strategies, a total of 93 focus group discussions were carried out in 78 census villages. To understand people's attitudes towards bears, a total of 178 interviews were carried out at a household level in 26 census villages. Records from government departments were accessed to understand the trends in demography, conflicts, agriculture, and animal husbandry practices. Further, to identify individual bears and their feeding preferences in the landscape, 111 samples of bear scat and hair were collected from the landscape.

### **Patterns, processes, drivers and tolerance towards bear conflicts**

Crop damage by bears was restricted to the left bank of Chandrabhaga (Chenab) River, and a tributary, Miyar. These vulnerable villages have good bear habitat typified by patches of mixed conifer forests and rugged canyons that offer shelter as well as food. Most damage was caused to cash crops like green pea, apple and iceberg lettuce. It appears that the intensity of crop losses has risen, coinciding with the proliferation of apple orchards since mid-2000s, especially noticeable in these vulnerable villages. On an individual level, people were ambivalent towards the presence of bears in Lahaul, but did not want them near their village. Factors like age, gender, perceived risk from bears, perceived benefits from wildlife, and livelihood diversity affected their attitudes and tolerance towards bears, and not the actual losses incurred.

### **Stakeholder engagements for awareness and consultations**

Stakeholder awareness and consultation workshops were arranged in five of the conflict affected villages in Lahaul, following which a landscape-level meeting involving representation from various government departments, panchayat samiti,

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zila parishad, and UNDP-India Secure Himalaya was conducted where deliberations were held around our recommendations on conflict interventions and building synergies. Some of our project recommendations are being adopted and implemented by the Himachal Pradesh Forest Department (HPFD) working closely with UNDP in the landscape.

Our key recommendations in these meetings for bear conflict mitigation were: Gradual phasing out and replacing of crops preferred by bears like green pea, iceberg lettuce and apple in the identified vulnerable villages by equally, if not more, remunerative cash crops such as cauliflower, broccoli, and asafoetida that are not consumed by bears. Experimentation with integrated protection of crop damage by bears by use of a combination of barriers and deterrents such as solar-fencing, fox light, early warning systems such as ANIDERS, coupled with a trained and equipped Rapid Response Team that can guard the fields at night during peak season to drive away bears from fields. Offsetting monetary losses incurred by diversifying livelihood options from avenues such as responsible and sustainable wildlife tourism and value-added agricultural products should be tried. Promoting the cultivation of value-added traditional, climate resilient and non-perishable crops such as barley and black peas by creating strong market linkages should be revived. Empowering people with practical information about i) causes of increased conflicts (drivers) ii) effective mitigation measures to prevent and reduce crop damage, iii) existing government schemes for crop protection and policies (such as crop insurance) that can be availed to help offset the losses incurred. And most importantly, implementing these mitigation measures through sustained collaboration and support from concerned government departments (Forest, Agriculture, Horticulture, Tourism) and programmes such as the UNDP-India's SECURE Himalaya Project will ensure long-term sustainability of these efforts.



## Assisting States with Project Snow Leopard and the National Snow Leopard Monitoring Program

The Project Snow Leopard is a flagship scheme of the Ministry of Environment, Forest, and Climate Change (MoEFCC) that was initiated in 2009 with technical assistance from NCF and other agencies. The very first management plan under this scheme was prepared for the Upper Spiti Landscape by a team led by NCF in 2011 and was implemented till 2017. This plan was revised in 2018 but couldn't be implemented until 2021. The Himachal Pradesh Forest Department tasked the Himalaya Lab to help revise this plan and include crucial aspects of climate smarting and effective inter-sectoral convergences in August 2021. The Lab's team with HPFD officials have prepared a draft for better energy security, water conservation, climate resilient farming, disaster mitigation and structures to enable inter-sectoral convergences. This will be reviewed by the HPFD and can greatly improve the quality and implementation of the revised Management Plan.

The Himalaya Lab, along with colleagues from NCF, WWF and WII catalysed the adoption of appropriate snow leopard and prey monitoring protocols under a programme adopted by the MoEFCC called the Snow Leopard Population Assessment in India (SPAI). This is a national range-wide effort being carried out by the snow leopard range states. The Lab is the key knowledge partner for the Union Territory of Jammu and Kashmir to implement this programme. The SPAI uses a two-step process of first covering 50-80% of the state's snow leopard range by occupancy surveys in grids to determine the range and stratify based on habitat quality, followed by camera-trap and/or scat-based genetic sampling for abundance estimates. A consortium of partners that include state-level universities, NGOs and national institutes working with the J&K Department of Wildlife Protection has been set up. Training workshops for the staff of partner agencies were carried out and a pilot survey undertaken in October-November 2021. The full surveys covering over 10,000 km<sup>2</sup> of potential habitat in the Union Territory is proposed to be undertaken through 2022.







## *PhD and Conservation Leadership*

The academic programme at NCF comprises the doctoral programme, annual courses in conservation leadership and targeted capacity building initiatives such as the nature training guide training courses. We currently have eleven doctoral students. In the past year, we held nine online and one in-person course in Conservation Leadership and five nature guide training courses.

### **Conservation Leadership programme**

We have been organising a suite of courses under the Conservation Leadership Programme annually. The target audience for these courses are conservation practitioners working in conservation organisations in the governmental, non-governmental and private sectors. A number of participants also join us from academia, including faculty members. In 2022, we offered a series of nine courses in Conservation Leadership during March-April 2022. We received 171 applications from various parts of the country this year. Given that individual courses could accommodate between 15-25 participants, overall 62 (38 female, 24 male) applicants attended these nine courses. Owing to the ongoing pandemic, which precluded holding these courses in-person, we conducted them online on Zoom. The resource persons used various tools like additional facilitators, discussions in break-out rooms and group/individual assignments to actively interact and engage with the participants and overall, we have received very encouraging feedback.

### **PhD programme**

NCF currently has fourteen PhD scholars, of whom three are in the final stages of writing up their doctoral research. We inducted eight doctoral students to the NCF doctoral programme in January 2022. Of these, three have received NCF institutional

fellowship, one has received a national scholarship and the rest are being supported through NCF programmes. We offer a range of courses in basic and applied ecology, conservation, social sciences, quantitative methods and research ethics as part of our interdisciplinary doctoral course work. These are taught by NCF core faculty in addition to invited subject experts from external organisations. They completed the first term online in March 2022. We are all set to resume in-person classes in the second term in the first week of June. Most of the students are preparing to formally register with MAHE by the year-end.

### **Nature guide training and natural history courses**

NCF conducted five online Nature Guide Training Courses between 2021-2022 for individuals based in the Western Ghats and intending to pursue Nature Guiding as a profession or as a skill that will help in their profession. This course was conceptualised and developed in collaboration with Harsha Jayaramaiah and Payal Mehta, professional tour leaders and nature guides. They mentored the participants through the course. This basic-level course attempted to reach out to rural youth offering a skill development opportunity to encourage a nature-based career in this landscape. The hope is that a course like this would create a group of well-informed and sensitive nature guides who are capable of conducting ethical nature tourism. Five batches went through the online course from March 2021 till March 2022.

We received between 501-150 applications for courses. Applications were received from many parts of the country and a few from outside the country even though the advertisement had clearly stated that the course was focused on the Western Ghats. 12-15 participants were chosen based on their will to pursue a career as nature guides in the geographic location mentioned in their application form. The course design can be described as hybrid—a combination of pre-recorded and live sessions along with continuous mentorship and assessments and discussion of each assignment. All participants who completed the course with over 80% assignment submission, were given a certificate of participation by NCF.

#### **Academic Dean**

Mousumi Ghosh

#### **PhD Students**

Jenis Patel, Mayuresh Gangal, Suhridam Roy, Abhirami C, Bibidishananda Basu, Mayukh Dey, Noopur Borawake, Pooja Pawar, Rohan Menzies, Rintu Mandal, Vijay Karthick, Kirina Melo, Kuru Sunya, Julee Jerang

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## *Tiger population recovery*

Abishek Harihar, Adjunct Faculty

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As part of Panthera's Tigers Forever program, Abishek assists in developing and implementing conservation interventions for initiating and sustaining tiger population recovery at priority sites in India, Nepal, Malaysia, Thailand, and Indonesia. As a critical component of the program, scientifically monitoring populations and assessing the effectiveness of interventions constitute a vital component of evaluating the program's success.

To meet these objectives, he has worked with government and other non-governmental organizations to design and implement multi-year population monitoring protocols in Manas Tiger Reserve (India), Shuklaphanta, Chitwan and Parsa National Park (Nepal), Kenyir-Taman Negara National Park (Malaysia), multiple protected areas in the southern Western Forest Complex and Thap-Lan National Park (Thailand) and Kerinci National Park (Indonesia).

He is also collaborating with scientists from other institutions to promote the conservation of tigers. A genetic tool-based study has been initiated by me and Dr Uma Ramakrishnan at NCBS to evaluate tiger population connectivity in North-Eastern India and to study the conflict between tigers and livestock. With Dr Anand Osuri, Abishek Harihar conducted a course on Monitoring and Evaluation of Conservation Programmes under the Conservation Leadership Program of NCF from March 28-31, 2021. Finally, he serves as a member on Jenis Patel's Doctoral Advisory Committee.



# *Publications, Talks, Workshops*



- » Peer-reviewed publications
- » Books, chapters, guides
- » Datasets
- » General and popular articles
- » Talks, presentations and workshops

## Peer-reviewed Publications

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Bhatia, G. and Krishnagopal, A. (2021). Handbook for Educators: Beyond 'watching' birds. Invited talk at the (online) celebration of Bangalore Bird Day. 2 Oct 2021

Bhatia, G., Krishnagopal, A. and Quader, S. (2021). Handbook for Bird Educators organised by Suzhal Arivom. 5 June 2021

[https://www.youtube.com/watch?v=oKu\\_EYd-6Mg](https://www.youtube.com/watch?v=oKu_EYd-6Mg)

Biniwale, S. (2021). Eavesdropping on Bird Calls. Online webinar by Early Bird. 21 Oct 2021

Bird Count India (2021). Best Practices in eBird for Ladakh eBirders. 24 Oct 2021

Bird Count India (2021). Analysing eBird data using MS Excel. 25 July 2021

Bird Count India (2021). Analysing eBird data using R. 7 Aug 2021

Bird Count India (2021). Best Practices in eBird for J&K eBirders. 14 Nov 2021

Bird Count India (2021). Beyond Birdwatching (for IISER Behrampur students). 1 July 2021

Bird Count India (2021). Bird Identification (for Dibang birders). 22 July 2021

Bird Count India (2021). Breeding and behaviour codes. 26 June 2021

Bird Count India (2021). Counting Birds. 28 Nov 2021

Bird Count India (2021). Introduction to birding and Bird Identification. 26 Sept 2021

Bird Count India (2021). Introduction to birds in different habitats and their adaptations. 31 Oct 2021

Bird Count India (2021). NPTEL - Big Data in Biodiversity. 8 July 2021

Bird Count India (2021). Patch Monitoring. 18 July 2021

Bird Count India (2021). Using eBird for Global Bird Weekend & Bharatpur Birding Week. 27 Sept 2021

Bird Count India (2021). Using eBird for Vulture Count Survey. 12 Sept 2021

Bird Count India (2021). Using eBird for Vulture Count Survey. 4 Sept 2021

Bird Count India (2022). Beyond Birding and How to use eBird App. 30 Jan 2022

Bird Count India (2022). Beyond Birding and How to use eBird App. 3 Feb 2022

Bird Count India (2022). Beyond Birding and Using eBird App. 13 Feb 2022

Bird Count India (2022). Beyond Birding and Using eBird App. 14 Feb 2022

Bird Count India (2022). Beyond Birding and Using eBird App. 16 Feb 2022

Bird Count India (2022). Everyone can be a citizen scientist! (in association with Centre for Wildlife Studies). 20 Jan 2022

Bird Count India (2022). GBBC: Resources for GBBC Trainers. 5 Feb 2022

Bird Count India (2022). GBBC: Resources for Trainers. 11 Feb 2022

Bird Count India (2022). How can birdwatching contribute to science and conservation? (in person at Kolkata). 19 Feb 2022

Bird Count India (2022). How to use the eBird app and platform for a multi-person survey/bird race (for Gujarat birders). 21 Jan 2022

Bird Count India (2022). Key learnings from citizen science and how you can participate (for IVSA Hassan). 14 Jan 2022

Bird Count India (2022). Monitoring our Waterbirds: Citizen Science Initiatives. 6 Feb 2022

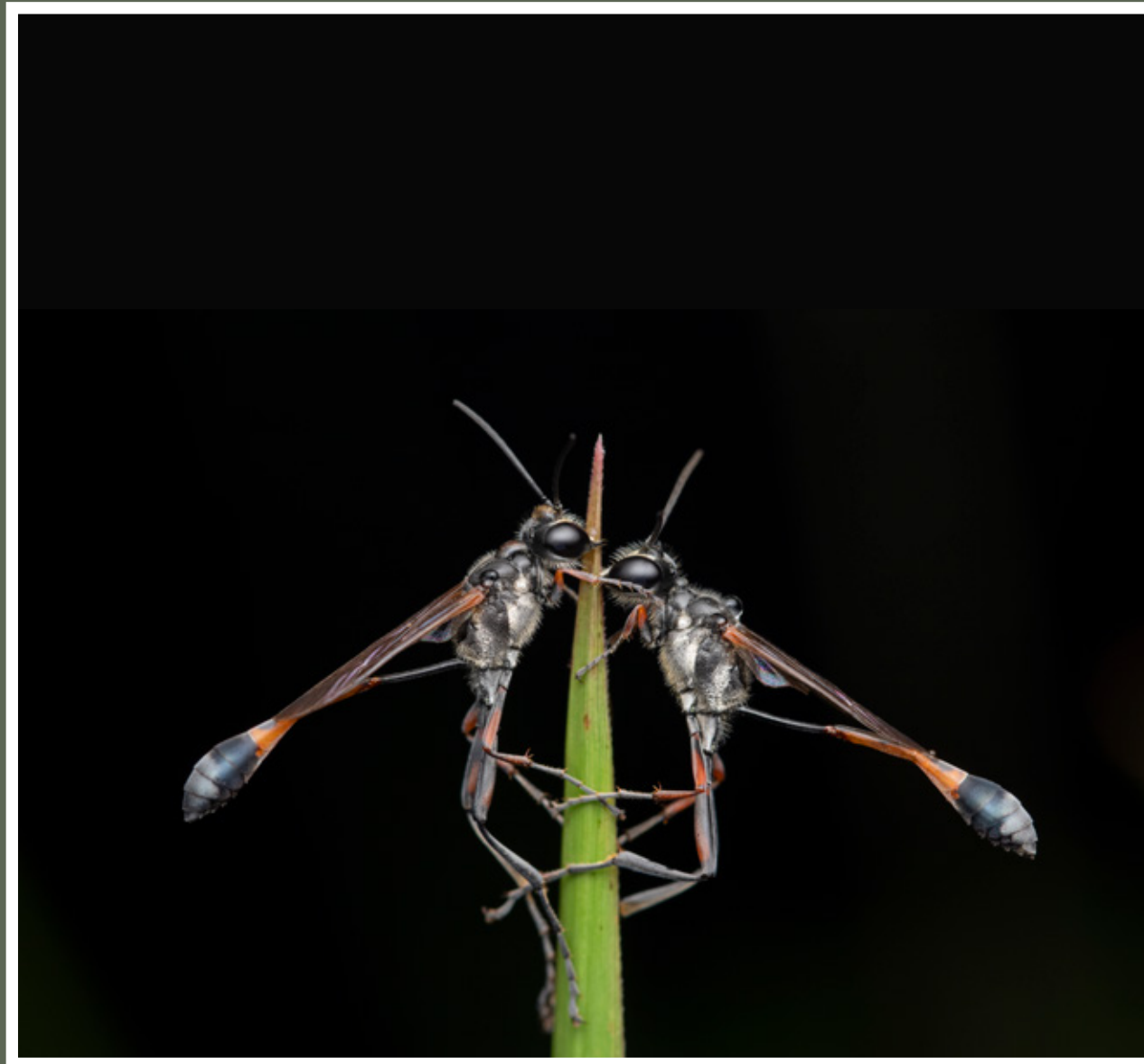
- Bird Count India (2022). The Yellow Wagtail Conundrum (in association with Sri Lanka birders). 8 Feb 2022
- Borawake, N. (2021). Online talks on forest restoration for biodiversity conservation for Women's Christian College, Chennai, Tamil Nadu. 9 September 2021
- Borawake, N. (2021). Online talks on forest restoration for biodiversity conservation for Symbiosis Institute of Health Sciences, Pune, Maharashtra. 27 August 2021
- CEROS Lab (2021). Constant gardeners: on why we need to save hornbills. 5th Goa Bird Festival. 17 December 2021
- CEROS Lab (2021). Constant gardeners: on why we need to save hornbills. University of Science & Technology, Meghalaya. 22 May 2021
- Citizen scientists of SeasonWatch (2021). What motivates a citizen scientist? Online plenary compilation talk for Cit Sci India 2021
- Datta, A. (2021). Frugivory and Seed Dispersal by Hornbills – Are They Truly Farmers of the Forest? Speaker in Symposium on the theme: Pollinators and Seed Dispersers: The Natural Gardeners, in celebration of the current International Year of Fruits and Vegetables, 32nd Mid-Year Meeting of the Indian Academy of Science. 2 July, 2021
- Datta, A. (2021). Patterns in hornbill breeding and fruiting phenology: insights from long-term monitoring. Symposium on Bird Monitoring – 26, 27 March 2021  
<https://www.birdmonitoring.in/invited-talks/>; <https://www.youtube.com/watch?v=5YfAY7g8srU>
- Datta, A. (2021). Twenty years of understanding hornbills: Hope and resilience in the Indian Eastern Himalaya. June 14, 2021. Invited talk for the Hampshire Bird Club, Massachusetts, USA
- Early Bird Team (2021). How to be a birding buddy. (Workshop for educators - online format). 5-6 June 2021
- Early Bird Team (2021). How to be a birding buddy. (Workshop for educators - online format). 19 & 25 Sept 2021
- Early Bird Team (2021). How to be a birding buddy. (Workshop for educators - online format) in Hindi in collaboration with Udaan Foundation from Mumbai. 5 - 25 Oct 2021
- Early Bird Team (2021). Young Birders' Workshop #1. A 6-week online Workshop for children. May-June 2021
- Early Bird Team (2021). Young Birders' Workshop #2. A 5-week online Workshop for children. Nov-Dec 2021
- Gala, M. (2021). Improving the quality of big citizen science data: Learnings from eBird. Conference presentation: CitSci India.
- Girdhari, S. (2021). Being 'social' for citizen science. Online talk at Cit Sci 2021. 13 Sept 2021
- Girdhari, S. (2021). Introduction to SeasonWatch. Multiple online and offline venues - Nisargaayan Pune, EcoNE, Phansad Bird Count, Sanjay Gandhi National park, JJ Hospital, RRBCEA Pune, VJBU Pune, BNHS. July 2021 - March 2022
- Jeganathan, P. (2021). Importance of Nature Journaling for nature enthusiasts. Webinar organised by Iragugal Mr. Owl's Classroom for kids and parents. 16 June 2021
- Kapoor, V. Working effectively with People and Teams as part of the Conservation Leadership Courses by NCF
- Khanyari, M. (2022). Predicting Parasite Dynamics in Mixed-Use Trans-Himalayan Pastures to Underpin Management of Cross-Transmission Between Livestock and Bharal. Talk given to Stanford University Ecology cluster.
- Khanyari, M. (2022). Towards improved understanding and management of parasite transmission in the rangelands of Asia. Talk given to University of Bristol Biosciences Department
- Nature Classrooms Team (2021). International Snow Leopard Network: Workshops conducted on Nature Learning for participants working in Snow Leopard Landscapes
- Nature Classrooms Team. Communities in Practise—Nature Learning: Facilitating an open platform for educators that involve conversations, training on topics, tools on nature learning and education
- Nizar, M. (2021). How SeasonWatch popularised citizen science in Kerala. 13 Sept 2021
- Patankar, S. (2021) The use of eBird data for conservation in India. Conference presentation: CitSci India.

- Peeyush Sekhsaria and Ashwin Viswanathan. (2021). Bird collisions with buildings in India: A synthesis of current knowledge. Conference presentation: CitSci India
- Pradhan, K. (2021). Online talk on hornbill conservation in north Bengal and Arunachal Pradesh for Symbiosis International university, Pune. 29 August 2021
- Pradhan, K. (2021). Talk on communities and conservation in the Eastern Himalaya during the online certificate course on 'Climate, Community and Conservation' organized by Department of Environmental Studies, Indraprastha College for Women. 16 September 2021
- Quader, S. (2021). How to be a Weaverbird. Online webinar by Early Bird. 2 Aug 2021.
- Ramaswami, G. (2021). SeasonWatch—an India-wide citizen science programme. Online talk at the Lessons from international phenology networks Symposium organised by the African Phenology Network. 13 Sept 2021
- Ramaswami, G. (2021). Tracking climate change through trees. Multiple online venues - Regional Natural History Museum Bhubaneswar, Citizen Science Initiative IISER Berhampur, Ashoka University, Parikrma Festival of Science, IIT Bombay CITARA. Apr 2021 - Mar 2022
- Rodrigues, K. M. (2021). Nature Camps: Helping Children Become Citizen Scientists.
- Rodrigues, K. M. (2021). The joy and tears of digitizing historical bird data. Conference presentation: CitSci India.
- Sarkar, K. (2021). Capacity building for bird monitoring in Thanamir, Nagaland. Conference presentation: CitSci India
- SeasonWatch (2021). Basics of Tree ID. Online workshop for SCCS-Bng 2021. 29 Sept 2021
- SeasonWatch (2022). Treasure of Trees. One-day online workshop. 26 Mar 2022
- SeasonWatch. A beginner's guide to tree-watching. One-day online workshop.
- Suhirtha Muhil . (2021). Introduction to SeasonWatch. Multiple online and offline venues - G18 Coimbatore, Jayendra Saraswathi School, TNAU. Nov 2021 - Mar 2022
- Suryawanshi K.R. (2022). Science of Ecology and Human Dimensions of Conserving Snow Leopards (*Panthera uncia*) in High Asia. Departmental Talk at the Leibniz Institute for Zoo and Wildlife Research – IZW, Berlin.
- Suryawanshi K.R. (2022). The past, present and future of Pashmina in India. Invited to talk at the workshop on The past and future of Fashion, at the Wissenschaftskolleg Zu Berlin, Institute of Advanced Studies
- Suryawanshi, K. (2021). Can we save the snow leopard? Colloquium at the Wissenschaftskolleg Zu Berlin
- Suryawanshi, K. (2021). Is my cashmere scarf strangling the snow leopard? Colloquium at the Wissenschaftskolleg Zu Berlin
- Suryawanshi, K.R. (2021). Lessons from the teenage years of a 20-year bird monitoring program in the India Trans-Himalaya. Symposium of Bird Monitoring in India
- Suryawanshi, K.R. (2022). Lessons the bharal (*Pseudois nayaur*) taught us about the Indian Trans-Himalaya. Azadi ka Amrit Mahotsav: Commemoration of 75 years of India's Independence, Talk series organized by the Central Zoo Authority
- Viswanathan, A. and Menon, T. (2021). Citizen science as a tool to understand bird migration. Conference presentation: CitSci India.
- Viswanathan, A. (2021). Shorebird abundance trajectories in the CAF: Insights from citizen science. International Wader Study Group conference.
- Western Ghats (2021). Given a talk "Saving lives over phones: use of technology in the mitigation of human-elephant conflict. Project Elephant Division, Ministry of Environment and Forests and Climate Change, Government of India. 9 August 2021
- Western Ghats (2021). Interacted with college students of The Hindu College, New Delhi to share the information on status of human-elephant conflict in India and the role of technology in saving lives of people, learnings from two critical landscapes of south India. 12 August 2021
- Western Ghats (2021). Interactions with students of Indraprastha college, New Delhi to convey interactions between people and elephants in critical landscapes: experiences from model landscapes for promoting human-elephant coexistence. 14 September 2021
- Western Ghats (2021). Mobile technology for human-elephant coexistence for Ranger Trainees of Tamil Nadu Forest Academy, Coimbatore. 16 September 2021





# Financials



- » Form 10B
- » Balance Sheet
- » Income and expenditure account
- » Receipts and payment account

# Form No. 10B

## FORM NO. 10B [See rule 17B]

Audit report under section 12A(b) of the Income-tax Act, 1961, in the case of charitable or religious trusts or institutions

Acknowledgement Number -539487520260922



We have examined the balance sheet of NATURE CONSERVATION FOUNDATION AAATN1542Q [name of the trust or institution] as at 31st March 2022 and the Profit and loss account for the year ended on that date which are in agreement with the books of account maintained by the said Trust or institution. We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of the audit. In our opinion, proper books of account have been kept by the head office and the branches of the abovenamed Trust visited by us so far as appears from our examination of the books, and proper Returns adequate for the purposes of audit have been received from branches not visited by us, subject to the comments given below:

In our opinion and to the best of our information, and according to information given to us, the said accounts give a true and fair view:-

(i) in the case of the balance sheet, of the state of affairs of the above named Trust as at 31st March 2022 and

(ii) in the case of the profit and loss account, of the profit or loss of its accounting year ending on 31st March 2022

The prescribed particulars are annexed hereto.

Name Narayanamoorthy Vaidyanathan

Membership Number 022573

Firm Registration Number 003178S

Date of Audit Report 25-Aug-2022

Place 49.37.171.223

Date 26-Sep-2022

### ANNEXURE

#### STATEMENT OF PARTICULARS

#### I. APPLICATION OF INCOME FOR CHARITABLE OR RELIGIOUS PURPOSES

1. Amount of income of the previous year applied to charitable or religious purposes in India during that year	₹ 83,193
2. Whether the Trust has exercised the option under clause (2) of the Explanation to section 11(1) ? If so, the details of the amount of income deemed to have been applied to charitable or religious purposes in India during the previous year.	No. -
3. Amount of income accumulated or set apart for application to charitable or religious purposes, to the extent it does not exceed 15 per cent of the income derived from property held under trust wholly for such purposes.	₹ 0
4. Amount of income eligible for exemption under section 11(1)(c) (Give details)	No



## Form No. 10B

No.	Details	Amount
	No Records Added	
	Amount of income, in addition to the amount referred to in item 3 above, accumulated or set apart for specified purposes under section 11(2)	₹ 0
	Whether the amount of income mentioned in item 5 above has been invested or deposited in the manner laid down in section 11(2)(b) ? If so, the details thereof	Not Applicable, -
	Whether any part of the income in respect of which an option was exercised under clause (2) of the Explanation to section 11(1) in any earlier year is deemed to be income of the previous year under section 11(1B) ? If so, the details thereof	No, -,-
	Whether, during the previous year, any part of income accumulated or set apart for specified purposes under section 11(2) in any earlier year-	
	(a) has been applied for purposes other than charitable or religious purposes or has ceased to be accumulated or set apart for application thereto, or	No, -,-
	(b) has ceased to remain invested in any security referred to in section 11(2)(b)(i) or deposited in any account referred to in section 11(2)(b)(ii) or section 11(2)(b)(iii), or	No, -,-
	(c) has not been utilised for purposes for which it was accumulated or set apart during the period for which it was to be accumulated or set apart, or in the year immediately following the expiry thereof? If so, the details thereof	No, -,-

## II. APPLICATION OR USE OF INCOME OR PROPERTY FOR THE BENEFIT OF PERSONS REFERRED TO IN SECTION 13(3)

Whether any part of the income or property of the Trust was lent, or continues to be lent, in the previous year to any person referred to in section 13(3) (hereinafter referred to in this Annexure as such person)? If so, give details of the amount, rate of interest charged and the nature of security, if any				
No.	Amount	Rate of interest charged (%)	Nature of security, if any.	Remarks
		No Records Added		
Whether any land, building or other property of the Trust was made, or continued to be made, available for the use of any such person during the previous year? If so, give details of the property and the amount of rent or compensation charged, if any				

## Form No. 10B

Sl. No.	Details of property	Amount of rent or compensation charged
	No Records Added	

3.	Whether any payment was made to any such person during the previous year by way of salary, allowance or otherwise? If so, give details	Yes
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Sl. No.	Detail	Amount
1	T.R.SHANKAR RAMAN-Senior Scientist & Trustee	₹ 21,60,564
2	ROHAN ARTHUR- Senior Scientist & Trustee	₹ 21,60,564
3	APARAJITA DATTA -Senior Scientist(Trustee's wife)	₹ 21,60,564
4	DIVYA MUDAPPA -Senior Scientist(Trustee's Wife)	₹ 21,60,564

4.	Whether the services of the Trust were made available to any such person during the previous year? If so, give details thereof together with remuneration or compensation received, if any	No
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Sl. No.	Name of the Person	Amount of Remuneration/ Compensation	Remarks
		No Records Added	

5.	Whether any share, security or other property was purchased by or on behalf of the Trust during the previous year from any such person? If so, give details thereof together with the consideration paid	No
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Sl. No.	Name of the Person	Amount of Consideration paid	Remarks
		No Records Added	

6.	Whether any share, security or other property was sold by or on behalf of the Trust during the previous year to any such person? If so, give details thereof together with the consideration received	No
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Sl. No.	Name of the Person	Amount of Consideration received	Remarks
		No Records Added	

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Balance Sheet as at 31<sup>st</sup> March, 2022

NATURE CONSERVATION FOUNDATION #1311, "Amrutha", 12th Main Vijayanagar 1st Stage Mysuru-570017, India				CONSOLIDATED IT			
Balance Sheet as at 31st March, 2022				Figures in INR			
Sources of Funds	Schedule No	31.03.2022	31.03.2021	31.03.2022	31.03.2021	31.03.2021	31.03.2021
Corpus Fund	22			7,70,17,586		19,94,47,072	7,32,58,146
<b>Corpus Grants/Corpus Donations</b>							
Opening Balance		25,04,25,165				19,94,47,072	
Add: Grants received	4	5,29,11,537				2,32,54,675	
Grants Under Foreign Contribution Regulation Act	7	27,04,913				96,77,228	
Corpus Donation Received	5	8,02,32,278				10,88,44,406	
Local Grants Received	6	11,23,833				5,35,215	
F C R A Donations	8	62,69,277				73,90,954	
Donation received - AUs 35	9	6,53,237				7,56,572	
Bank Interest Received		39,43,20,240				34,99,06,122	
<b>Sub-total</b>		11,85,56,661				9,87,60,405	
Less: Grants utilized - Project Expenses	14	5,76,610				7,20,552	
Less: Grants Returned	18			27,51,88,969			25,04,25,165
Closing Balance				16,61,654			15,97,885
Field Advance	23			(3,33,354)			1,24,948
Current Liabilities	13						
<b>Total</b>				<b>35,35,44,815</b>			<b>32,54,06,144</b>
Application of Funds	Schedule No	31.03.2022	31.03.2021	31.03.2022	31.03.2021	31.03.2021	31.03.2021
Fixed Assets	21			2,94,04,627			2,36,22,509
Other Advances	25			41,63,760			48,54,416
Income and Expenditure Account Deficit Balance B/F						5,61,19,930	
Less: Surplus/(Deficit) for the year						(76,46,146)	
Balance C/F				7,25,57,862			6,37,66,076
Field Advance	23			1,11,58,538			4,56,092
Current Assets:							
Fixed Deposits and Investments	19					19,93,11,468	
Cash & Cash Equivalents	20			20,81,94,948		3,29,03,000	
Income Tax Refund Receivable	3			2,77,81,456		1,85,518	
Grant Receivable				1,49,113		3,07,065	
				1,34,510			23,27,07,051
<b>Total</b>				<b>35,35,44,815</b>			<b>32,54,06,144</b>

As per our attached report under Section 10B of the Income

Tax Act, 1961

For Rao &amp; Nathan

Chartered Accountants

Firm Registration #0031785

Narayana Narayana

Partner

Membership No. 622573

Office: Mysuru

Date: 26th September, 2022

For Nature Conservation Foundation

T.R. Shankar Ramaswamy

Trustee





## Income and expenditure account for the year ended 31<sup>st</sup> March, 2022

NATURE CONSERVATION FOUNDATION #1311, "Amritha", 12th Main Vijayanagar 1st Stage Mysuru-570017, India		CONSOLIDATED IT	
Income and Expenditure Account for the Year Ended 31st March, 2022		Figures in INR	
Income	Schedule No.	31.03.2022	31.03.2021
Interest Received on Savings Bank Account	9	4,57,085	5,74,652
Interest Received on Fixed Deposit	9	1,571	1,865
Interest on Gratuity Fund	9	1,94,581	1,80,055
Sub Total		6,53,237	7,56,572
Less: Transferred to Respective Grants		6,53,237	7,56,572
Interest on Income Tax Refund	9	7,125	4,415
Donation Received	7	76,068	88,311
Surplus on sale of Fixed Assets		-	1,336
<b>Total</b>		<b>83,193</b>	<b>94,062</b>
<b>Expenditure</b>	<b>Schedule No.</b>	<b>31.03.2022</b>	<b>31.03.2021</b>
Administration Expenses	15	35,26,926	27,32,994
Depreciation	21	53,48,052	50,07,214
<b>Surplus/ (Deficit) Carried to Balance Sheet</b>		<b>(87,91,786)</b>	<b>(76,46,146)</b>
<b>Total</b>		<b>83,193</b>	<b>94,062</b>

As per our attached report under Section 10B of the Income Tax Act, 1961

**For Rau & Nathan**

Chartered Accountants

Firm Registration #003178S

*Narayanamoorthy Vaidyanathan*  
Partner

Membership No. 022573

Place : Mysuru

Date : 29th September, 2022



For Nature Conservation Foundation

*T.R. Shankar Raman*

T R Shankar Raman

Trustee



## Receipts and payments account for the year ended 31<sup>st</sup> March, 2022

NATURE CONSERVATION FOUNDATION		CONSOLIDATED IT	
#1311, "Amritha", 12th Main Vijayanagar 1st Stage Mysuru-570017, India		Figures in INR	
Receipts & Payments Account for the year ended 31st March, 2022		Schedule No.	Amount
Receipts			
<b>Opening Balances:</b>			
Fixed Deposits & Investments	1	19,93,11,467	
Cash & Cash Equivalents	2	3,29,03,000	23,22,14,468
<b>Grants &amp; Donations Received:</b>			
Grants Under Foreign Contribution Regulation Act	4	5,29,11,537	
Local Grants Received	5	8,00,97,768	
F C R A Donations	6	11,23,833	
Corpus Donations	7	27,04,913	
Donation towards Field Assistants' Fund	22	52,360	
General Donations	7	76,068	
Donations Received under Section 35	8	62,69,277	14,32,35,756
Grant receivable in FY 2020-21			3,07,065
Income Tax Refund Received - FY 2019-20	3		89,125
Bank Interest & Interest on Income Tax Refund	9		6,60,362
Surplus on Redemption of Investments	10		37,47,081
Field Advance	11		2,55,60,678
Other Advances Recovered	12		58,62,487
Current Liabilities	13		11,95,76,135
<b>Total</b>			<b>53,12,53,156</b>
Payments		Schedule No.	Amount
Project Expenses	14		11,85,56,661
Administration Expenses	15		35,26,926
Field Advance	16		3,61,99,355
Current Liabilities	13		12,00,24,477
Other Advances Paid	12A		51,71,831
Capital Expenditure	17		1,11,30,171
Other Payments	18		6,14,610
TDS for the FY 2021-22	3		52,720
<b>Closing Balances:</b>			
Fixed Deposit and Investments	19	20,81,94,948	
Cash & Cash Equivalents	20	2,77,81,456	23,59,76,405
<b>Total</b>			<b>53,12,53,156</b>

As per our attached report under Section 10B of the Income Tax Act, 1961

For Rau & Nathan

Chartered Accountants

Firm Registration #003178S

*Narayanamoorthy Vaidyanathan*  
Partner

Membership No-022573

Place: Mysuru

Date: 29th September, 2022

For Nature Conservation Foundation

*T.R. Shankar Raman*

T R Shankar Raman  
Trustee







**Admin Director**

Smita Prabhakar

**Accounts and Admin Team**

Vinay Hegde

Haridas Bhat

M Shivakumar

Sunil V.

Suma P.

Shivani Jain

Sagar V.

Saraswati

## Trustees

NCF is administered by a board of three trustees. The Board of Trustees works in close interaction with Executive Board and Advisory Panel constituted by invitation, and comprises professionals of international repute in science and conservation.

### **Dr. Rohan Arthur**

Trustee & Senior Scientist

### **Dr. Charudutt Mishra**

Trustee & Senior Scientist

### **Dr. T. R. Shankar Raman**

Trustee & Senior Scientist

## Research Advisory Board (RAB)

### **Dr. Ajith Kumar**

Formerly National Centre for Biological Sciences

### **Dr. Mewa Singh**

Mysore University

### **Dr. Uma Ramakrishnan**

National Centre for Biological Sciences, Tata Institute of Fundamental Research

### **Dr. Bivash Pandav**

Bombay Natural History Society

### **Dr. Rohini Balakrishnan**

Centre for Ecological Sciences, Indian Institute of Science

### **Dr. Nitin Rai**

Independent Researcher, formerly Ashoka Trust for Research in Ecology and the Environment

*We would like to thank our previous RAB members*

*Dr. Shomita Mukherjee, Dr. Harini Nagendra,*

*Dr. Sindhu Radhakrishna, Dr. Mahesh Sankaran, and Dr. Ghazala Shahabuddin*

## Adjunct Faculty

### **Dr. Teresa Alcoverro**

Blanes Centre for Advanced Studies (CEAB), Spain

### **Dr. Abishek Harihar**

Panthera, USA and India

### **Dr. Kavita Isvaran**

Indian Institute of Science, India

### **Dr. Jagdish Krishnaswamy**

Ashoka Trust for Research in Ecology and the Environment, India

### **Dr. Nuria Marbà**

Mediterranean Institute for Advanced Studies (IMEDEA), Spain

### **Dr. Steve Redpath**

University of Aberdeen, UK

### **Dr. Anindya Sinha**

National Institute of Advanced Studies, India

### **Dr. Suri Venkatachalam**

Connexios Life Sciences, India

## Honorary Associates

Dr. A.J.T. Johnsingh (Distinguished Wildlife Biologist)

Riyaz Ahmad

Sangeeta Isvaran

Prashanth N. S.

Tanya Seshadri

Pranav Trivedi

Kalyan Varma

## Institutional Support

Rohini Nilekani Philanthropies

Arvind Datar

T. R. Rajagopalan

Excel Metal Engineering Pvt. Ltd.

AMM Murugappa Chettiar Research Centre

Ranjeet Ranade

Rainmatter Foundation

Cholamandalam Investment & Finance Co. Ltd.

Smitha Prabhakar







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