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Ideal Nature Club Presents

"AANGAN BOOKLET"

YEAR 2023-2024

VOL 1

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- **It is our rich, albeit declining, biodiversity that provides us with potential solutions to our sustainability challenges**

International Day of Biodiversity was celebrated on May 22. It gave us an opportunity to appreciate the wonder of biodiversity and renew our commitment to nurture and protect all the many forms of life with which we share our planet. We are a nation so defined by the richness of life around us that the words 'diversity' and 'India' have become synonymous. Our ethnic, cultural, and linguistic diversity has been greatly influenced by the unique features of our land, climate and geography, as well as the forces of migration and evolution. These forces have enriched our land with a multitude of species of plants, animals, and other organisms.

We, the human species, are an integral and influential component of biodiversity. Our own bodies host living microbiomes of tiny organisms without which we cannot survive. Our cultures shape the biodiversity around us, and biodiversity shapes our cultures and our future here on Earth.

- **Ukraine destroys Russian warship in Black Sea**

Ukraine claims to have destroyed a Russian warship from the Black Sea Fleet in a special operation off Russian-occupied Crimea. Ukrainian intelligence said that the small warship sank after it received direct hits to the hull.

The official account of Ukraine's defense ministry on X(formerly Twitter) has shared a video on Thursday, purportedly showing the sinking of the Russian warship. The ministry informed that a special unit of Ukraine's defense destroyed the missile corvette "Novelists" of the Russian Black Sea Fleet.

"Ship wreck of the day! Warriors of the special unit "Group 13" of the @DI_Ukraine destroyed the missile corvette "Novelists" of the Russian Black Sea Fleet. As a result of a number of direct hits to the hull, the corvette was damaged, rolled to the stern, and sank. The value of the ship is approximately $60–70 million. Nice job, warriors!," posted Ukraine's defense ministry.

The main directorate of intelligence of Ukraine's defense ministry gave details about the successful operation, on its official website.

"The operation was made possible with the support of the Ministry of Digital Transformation of Ukraine and the United24 platform. The enemy ship was patrolling the Black Sea near Lake Donuzlav near the occupied Crimea. As a result of a number of direct hits to the hull, the Russian ship suffered damage incompatible with further movement - the "Novelists" rolled to the stern and sank," message on the official website read.

Notably, Russia and Ukraine have been exchanging hostilities since 2022 when the former invaded into the country. In the ongoing war, both sides have lost thousands of lives. Russia claims to have annexed parts of Ukraine. Amid the

ongoing war, Ukraine has been receiving financial aid and arms & ammunition from friendly countries like the US.

- **Snowfall disrupts normal life in HP and J&K, cold intensifies in parts of north India**

Snowfall disrupted normal life in Himachal Pradesh and Jammu and Kashmir on Wednesday, while rainfall in parts of North India intensified the winter chill in the region. The IMD has predicted above-normal rainfall in February across the country. (HT Photo/Deepak Sansta)

The tribal areas and other high reaches in Himachal Pradesh experienced the first heavy snowfall of the year, resulting in the closure of 134 roads, including four national highways. (ANI)

The local MeT office has issued an orange warning for heavy snow and rains at isolated places in five districts—Shimla, Kullu, Chamba, Kinnaur, and Lahaul and Spiti—on January 31 and February 1. (ANI)

Delhi experienced a bone-chilling cold on Wednesday as parts of the city received light rainfall, bringing down the maximum temperature to 18.6 degrees Celsius, four notches below the season's average, and a low of 7.3 degrees Celsius, a notch below the normal, according to the IMD. (Bloomberg)

A dense fog enveloped the national capital in the morning, leading to diversions of at least three flights at the Delhi airport and causing delays in several train services. (PTI)

In Jammu and Kashmir, numerous areas in the higher reaches, including those along the Zojila axis on the Srinagar-Leh highway, experienced fresh snowfall, while the plains were lashed by rains. (HT Photo/Deepak Sansta)

The tourist resorts of Gulmarg, Sonamarg and Pahalgam received fresh light to moderate snowfall overnight, officials said. (HT Photo/Waseem Andrabi)

The local MeT office issued an avalanche warning for six districts in Jammu and Kashmir: Poonch, Baramulla, Bandipora, Kupwara, Doda, and Ganderbal. (HT Photo/Waseem Andrabi)

Tourists enjoy snow covered Drang area of Tangmarg, about 50kms from Srinagar on Wednesday.(HT Photo/Waseem Andrabi)

- **India involved in election interference in Canada, says intelligence report**

Cyclone Mocha is predicted to make a disastrous landfall in Bangladesh and western Myanmar with wind speeds reaching up to 175 kmph. Scientists on Friday said that cyclonic storms in the Bay of Bengal and the Arabian Sea are becoming more intense and lasting longer due to climate change. The researchers attribute the increase in the global mean temperature to the changes in the cyclogenesis, particularly over the Indian Ocean. According to a study titled 'Changing status of tropical cyclones over the North Indian Ocean', the Arabian Sea saw a significant increase in the intensity, frequency, and duration of cyclonic storms and very severe cyclonic storms during the period of 1982 to 2019.
The study found a 52-per cent increase in the frequency of cyclonic storms in the Arabian Sea during the recent epoch (2001–2019) while there was an 8 per cent decrease in the Bay of Bengal.
"Cyclones nowadays can retain their energy for quite a long number of days. One example of this trend was Cyclone Amphan, which continued to travel over land as a strong cyclone and resulted in massive devastation. As long as oceans are warm and winds are favourable, cyclones will retain their intensity for a longer period," said Roxy Mathew Koll, a climate scientist at the Indian Institute of Tropical Meteorology and a lead author of Intergovernmental Panel on Climate Change (IPCC) reports.

camp in Bangladesh
Cyclone Mocha, which rapidly intensified into a very severe cyclonic storm, is predicted to make a disastrous landfall in Bangladesh and western Myanmar with wind speeds reaching up to 175 kmph. The World Meteorological Organization

has warned of violent winds, floods, and possible landslides in Bangladesh, and inundations of low-lying areas in Myanmar.

According to the Ministry of Earth Sciences' report titled 'Assessment of Climate Change over the Indian Region', climate model simulations project a rise in tropical cyclone intensity (medium confidence) and precipitation intensity (medium-to-high confidence) in the North Indian Ocean basin.

The report compared pre-1950 and post-1950 periods and found the number of severe cyclonic storms rose from 94 to 140 (a 49 per cent increase) in the Bay of Bengal region and from 29 to 44 (a 52 per cent increase) in the Arabian Sea region annually.

Despite three consecutive years of La Nina conditions, 58 per cent of the ocean surface experienced at least one marine heat wave in 2022. In contrast, only 25 per cent of the ocean surface experienced a marine cold spell, the WMO said.

Global mean sea level is at a record high, having risen by 4.62 mm per year from 2013 to 2022, double the rate between 1993 and 2022.

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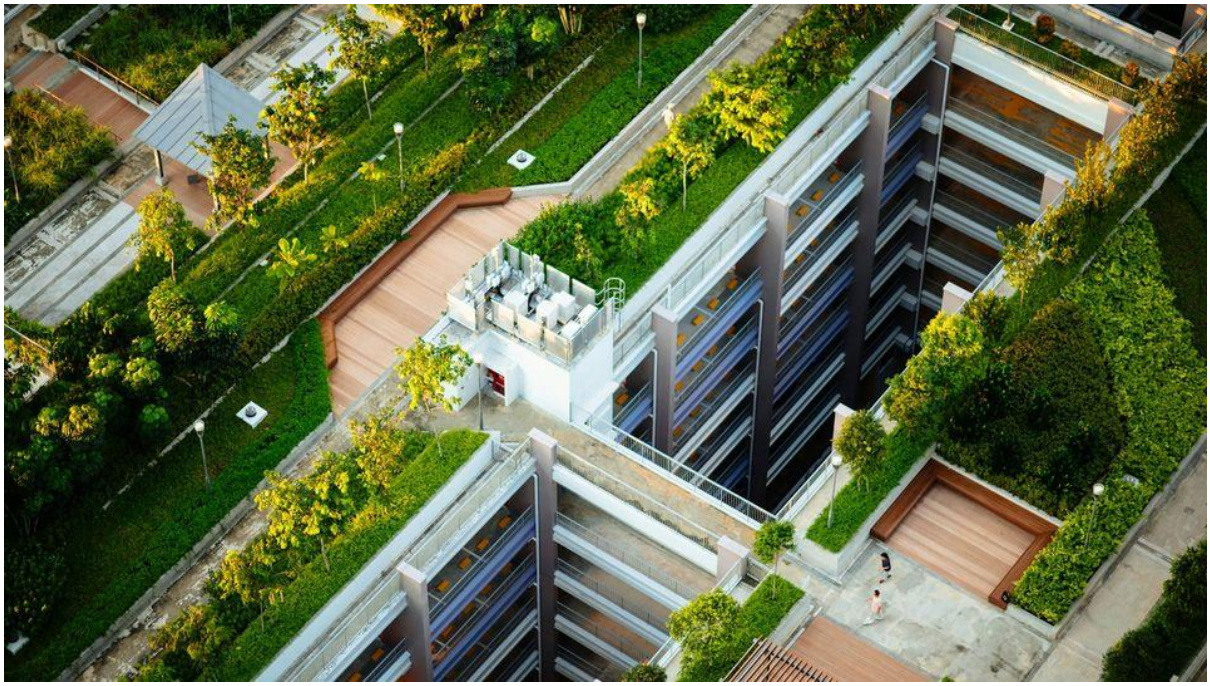
- **Green roofs have become increasingly popular thanks to their benefits related to climate adaptation, mitigation, and urban biodiversity management.**



These vegetated surfaces on the rooftops of buildings absorb excess storm water, reduce energy use by insulating buildings, and cool neighborhoods, tempering urban heat islands, while also creating urban habitats for plants, pollinators, and wildlife.
But, in the U.S., green roofs are typically planted with non-native plants in sterile soils, and their effectiveness declines over time.

A Dartmouth-led research team set out to determine if managing green roof soil microbes could boost healthy urban soil development, a methodology that could be applied to support climate resilience in cities.

The team created an experimental green roof in Chicago to test how enhancing soil with native prairie microbes would change the soil microbial community over time.

They were particularly interested in tracking the presence of beneficial mycorrhizal fungi.

Mycorrhizal fungi are well-known to live in roots and support plants in a symbiotic underground relationship, delivering nutrients and water to them in exchange for plant sugars.

Mycorrhizal fungi could be particularly helpful to plants in green roofs that have to endure high temperatures, intense sun, and periodic flooding.

The researchers added soil rich with native mycorrhizal fungi obtained from a local restored prairie, referred to as "inoculum," to the experimental green roof's soil.

They planted inoculated and untreated soil with native prairie plants and green roof succulents.

Over two years, the team tracked changes in the mycorrhizal fungal community of the green roof.

They also compared the green roof fungal species identified to those present in the inoculum and in the air.

Their findings demonstrate that active management of green roof mycorrhizal fungi accelerates soil development faster than if mycorrhizal fungal communities are left to passively reestablish on their own.

Green roofs treated with mycorrhizal fungi foster a more diverse soil community that is more likely to support long-term green roof sustainability, according to the results published in New Phytologist.

"In this urban rooftop setting, we saw more diversity in the fungal communities of the inoculated soil," said lead author Paul Metzler, soil ecology lab manager in the Department of Environmental Studies at Dartmouth.

"The long-term and consistent effects of the inoculum were quite surprising, as it's not necessarily something you would expect when working with such small microorganisms."

Using a molecular technique called "DNA metabarcoding," which enables the identification of multiple organisms in one sample, the researchers could identify fungi present in the green roof soils as well as potential sources of these fungi.

Many fungi came from the inoculum while other species got there through some other vector such as wind.

The co-authors state that their study was different than most of its kind, as few studies track mycorrhizal community shifts over time post-inoculation and even fewer attempt to track the sources of species pools.

The team also had a number of species in their green roof that likely arrived via unmeasured vectors such birds, insects, or even rats.

Still, the most diverse fungal communities were those that had been treated with the inoculum, illustrating how mycorrhizal fungi could be used to improve soil health in green roofs.

The results suggest that active management of soil microbial communities is effective and worth the effort and resources in cities.

"Green roofs have a shelf life and they're not always the self-sustaining ecosystems that we think they are," says senior author Bala Chaudhary, an associate professor of environmental studies at Dartmouth.

"They can be beneficial to urban areas but tend to lose their efficacy over time."

While green roofs are marketed as "set it and forget it," the co-authors explain that ecological thought should be incorporated into their design, construction, and maintenance to maximize the benefits and role that green roofs play in the climate resilience of urban areas.

"Our cities could be a window into the future," says Chaudhary. "They are experiencing the impacts of climate change -- warming temperatures and increased drought and flooding -- in an intensified way, which make them a great microcosm to study some of these impacts below ground."

- **Plant biologists report that a species of tree fern found only in Panama reanimates its own dead leaf fronds, converting them into root structures that feed the mother plant. The fern, *Cyathea rojasiana*, reconfigures these "zombie leaves," reversing the flow of water to draw nutrients back into the plant.**

This weird phenomenon occurs only after the leaves die and droop to the ground, said University of Illinois Urbana-Champaign plant biology professor James

Dalling, who made the discovery with his team while studying a different plant in a Panamanian forest reserve.
Dalling noticed that the fronds were strongly embedded in the soil and had sprouted a network of rootlets.

Laboratory tests revealed that the zombie leaves were drawing nitrogen out of the soil.

Even after they are converted into roots, the wilted fronds look like decayed plant matter, which is probably why generations of plant biologists failed to notice that they were performing a life-sustaining task, Dalling said.

"This is a truly novel repurposing of tissue. And it's distinct from what we know other ferns do," he said.

Other plants, including some ferns, send out leaves or shoots that touch the ground and sprout roots to sustain a new plant, he said.

But reconfiguring dead tissue to feed the original plant has never been reported.

The new findings are detailed in the journal Ecology.

C. rojasiana belongs to an ancient lineage of tree ferns dating back to the Jurassic period, Dalling said.

The zombie leaves are most likely an adaptation to the nutrient-poor volcanic soils.

"Panama is a land bridge between North and South America that coalesced 7 million years ago out of an archipelago of islands, and those islands are the result of volcanic activity in the past," he said.

"In one site we discovered, a layer of volcanic ash several meters deep looks like sand that you would dig up on a sandy beach. The plants that grow there are distinct from those that we find elsewhere in that forest reserve."

The patchiness of the vegetation means soil nutrients also are unevenly distributed.

"And so the tree ferns seem to be putting out tentacles to sample the surrounding soils," Dalling said.

"They're able to sample a greater range of nutrient environments for the same amount of investment of rootlets than if they just sent out a single rooting structure all around the fern. I think it's all about the economics of how they use resources in a patchy environment."

The tree ferns also grow very slowly.

"They're probably putting on one or two leaves a year, and so they're adding on the order of a few centimeters of height a year," Dalling said.

This means each frond is a major investment of resources that the plant repurposes after the leaf dies.

The slow growth also means that the tree fern is short enough that when its fronds die, they droop all the way to the ground.

The trees reach a maximum height of about two meters, Dalling said.

The finding is "another example of the extraordinary diversity of plant adaptations that exist in resource-poor environments," he said.

Dalling also is a research associate at the Smithsonian Tropical Research Institute in Panama.

- **What does an asparagus have in common with a vanilla orchid? Not much, if you are just looking at the two plants' appearances. However, when you look inside -- their leaves are more similar than you would think -- as revealed by the composition of their cell walls.**

By studying plant cell walls -- which are to plants what skeletons are to humans -- we can reveal the composition of how leaves and stems of plants are actually constructed. This is exactly what a team of University of Copenhagen researchers has done, in a large comprehensive study. In doing so, they have created something truly novel: a large "reference catalogue" of plant cell wall compositions from 287 species, broadly representing the entire plant kingdom.

"Flowering plants have succeeded in adapting to the most unwelcoming and harshest environments in the world, in part due to the construction of their cell walls. They provide the plants with both mechanical structure and ensure the internal transport of water. Plant cell walls are composed of many different carbohydrates, that each have a unique structure and function -- you can think of them like toy building blocks." says botanist Louise Isager Ahl from the Natural History Museum of Denmark, and continues:

"Although humans rely heavily on plants and their carbohydrates for food, building materials, clothing and medicine, our knowledge of their fine structure is still quite limited. We know that carbohydrates are some of the most complex chemical structures in nature, but how they are assembled, how they work and how they have evolved over the past several million years is still largely unknown."

By analysing leaf and stem tissues from 287 different plant species, the researchers investigated the connection between the ultra-complex plant carbohydrates and their evolutionary history, growth forms and habitats. The species included in the study represent the most important evolutionary branches of the plant tree of life, from algae to vascular plants.

Genetic heritage more influential than environment

The researchers' hypothesis was that growth form and habitat would also affect plant cell wall structure. They expected, for example, to find similarities in the cell wall composition between species that were genetically distant but living in the same environment. This turned out not to be the case:

"As an example, in a typical Danish beech forest, you will find beech trees, anemones, various grasses, and other plants. Since they share the same habitat, it would be easy to think that their construction is also similar. However, our analyses show that the carbohydrate compositions of their cell walls are vastly different. And when we compare carbohydrate compositions with the plants' family history, habitat and growth form, we can see that it is primarily their family history that determines their individual structures," explains Louise Isager Ahl.

"The carbohydrate composition of a plant is thereby more closely related to where it is placed in a family tree than to its habitat and growth form. Here, heritage plays a more important role than environment," adds Professor Peter Ulvskov from the Department of Plant and Environmental Sciences.

Conversely, this also means that species that morphologically resemble each other or live in the same type of habitat can be constructed in very different ways. One good example of this relates to a pair of succulents studied by the scientists.

"Among others, we examined two succulent species, the jade plant (Crassula ovata) and jade necklace (Peperomia rotundifolia), both are common living room

plants where the leaves resemble one another. However, they belong to two different families, and when we look at their carbohydrates, it turns out that the two plants are built very differently too," says Louise Isager Ahl.

Targeted plant breeding

The scientists hope that others will make use of their large dataset, which is freely available, together with their recently published article in the journal Plant, Cell & Environment.The catalogue of cell wall compositions could, for example, be used as a starting point for targeted breeding of crop plants.

"Even though the cell walls of plants are an important component in our food, animal feed, textiles and other materials, we have yet to target our breeding of cultivated plants to improve their cell wall properties. For example, cell walls determine to a large extent the digestibility of plant material. Targeted breeding of cell walls could increase both the quality and sustainability of animal feed. Now there is a catalogue to start from," says Peter Ulvskov.

Furthermore, the researchers believe that the dataset is ideal when it comes to research into climate-resilient plants.

"Our data can be used as an encyclopedia orreference database for researchers when they, for example, want to plan a study on a plant group they have not previously worked on. For example if you want to study how plant species in the rain forest, desert or on the heath react to environmental influences such as drought, high CO2 levels or floods -- the dataset can be used as a benchmark," says Louise Isager Ahl.

This type of knowledge is important because climatic changes will probably change plant habitats:

"All of the climatic and environmental changes that we are now facing are challenging the planet's plants, and thus humans as well. Because we are deeply dependent on how plants function. If we are going to develop more resilient plants, it is important that we understand the mechanisms by which they survive or succumb. Here, understanding their building blocks, in the form of cell walls and carbohydrates plays a key role," concludes Peter Ulvskov.

- **A collaborative team of researchers from the University of Massachusetts Amherst and the Wildlife Conservation Society (WCS), which runs the world's largest field conservation program, has conducted first-of-its kind research into how global climate change affects African elephants. The work, published recently in *PLOS Sustainability and***

***Transformation*,shows that older elephants will have markedly decreased chances of survival, which will not only drastically reduce the species' overall ability to weather the changing climate but will send ripple effects throughout the surrounding landscape. The team has also modeled possible mitigation scenarios, which WCS is already implementing.**

Africa's Greater Virunga Landscape (GVL) is a 15,700-square-kilometer area of savannas, mountains and lakes in Uganda, Rwanda and the Democratic Republic of Congo.

It is home to the largest land animals in Africa, with seven national parks, three tropical high-forest reserves and three wildlife reserves, three of which are world heritage sites, covering 88% of the area.

It is also home to a population of African elephants whose numbers have dropped so precipitously over the past century that they are now listed as critically endangered by the International Union for Conservation's Red List.

Elephants play a key role in modifying and sustaining their landscapes by dispersing the seeds of the plants they feed upon, felling trees and enriching soil fertility with their dung.

They also play an important role in many African cultures.

To date, few studies have focused on the dynamics of the environment, climate change, elephant demography and how the changing habitat influences elephants over long periods.

To get a clearer picture of what the elephants' future might look like and what we can do to best ensure their survival, lead author Simon Nampindo, who completed

this research as part of his Ph.D. in environmental conservation for UMass Amherst and who is now country director for WCS Uganda, and Timothy Randhir, professor of environmental conservation at UMass Amherst, built a systems dynamic model.

"This model," says Nampindo, "can look at all the different environmental and population dynamics within a system. For the first time, we're able to get a comprehensive vision of what the future might look like for African elephants in the face of climate change."

Nampindo and Randhir built their model using data on the numbers of elephants, historical changes in the landscape and different future climate-change scenarios representing 1.6 º, 2.8º and 4.3º Celsius of warming over the next 80 years.

Finally, they charted the effect each of the climate scenarios would have on five elephant age brackets: under 10 years old, 11 -- 30, 31 -- 40, 41 -- 50, and more than 50 years old, because, as Randhir puts it "any impact on one age class has a community effect throughout the entire population."

"We found that the older elephants will be massively affected by warming under every scenario," says Nampindo.

"Elephants are matriarchal -- their leaders are the older cows, and the herds depend on their wisdom, long memories and ability to outsmart prey, and if they are lost to changing climate, it will wreak havoc on the surviving, younger herds, as well as change the genetic profiles and structures of the herd. There will also be ripple effects through the GVL's landscape."

"But," says Randhir, "this model not only tells us what the threats are, we can also use it to tell us which policy possibilities will be most effective in helping African elephants to survive."

In the case of a species like the elephant, which migrates widely across national boundaries, it is especially important to also understand how differing policies could affect future herds so that management agencies can coordinate their responses.

In particular, Nampindo and Randhir find that a coordinated GVL management strategy at the national, regional and local levels is needed to address poaching threats.

Well-funded anti-poaching efforts are essential, but they also point to the importance of community-led programs and education in the front-line towns and villages where human-elephant interaction is common.

The GVL landscape must also be managed appropriately to reduce the impact of habitat fragmentation, fire and invasive species.

"These results are very important to WCS," says Nampindo. "If we can do a good job at protecting elephants, our efforts will reverberate to other species, such as lions and mountain gorillas."

"More broadly," says Randhir, "the most exciting thing about this systems dynamic modeling is that it can be adapted to any migratory species that move across political boundaries, from fish to birds to lions."

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