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Title of the Abstract:
Landscape and plant community drives leaf foraging of leafcutter bees

ABSTRACTS

Leafcutter bees are pollinators of globally-leading crops. Their reproduction requires both flower and leaf resources. However, we know very little on their nesting ecology. This is critical for their survival and management.

To address this, we surveyed plant communities in the home gardens with diverse plants of four major tropical plantation systems in the Western Ghats biodiversity hotspot – tea, coffee, rubber, and cardamom – to test the hypotheses that a) the cutting of leaf discs from plants by leafcutter bees (hereafter leaf-foraging) will vary significantly across landscape with the different management practices and b) local plant community traits (plant clade, family, nativity and leaf width) within home gardens will drive leaf-foraging of bees.

In all the four plantations, home gardens completely surrounded by the corresponding plantation crops were selected as the study sites. All plants within each home garden were recorded. We used urn-shaped cut marks on leaves left by bees as proxies of leafcutter bees' leaf-foraging activities, following Kambli et al. (2017). The plants with at least 10 cut marks are recorded as foraged and others as non-foraged.

The proportion of leaf-foraging plants differed across landscapes; the tea and cardamom landscapes had a higher proportion of foraged plants, while rubber had the lowest. Among local plant community traits, the proportion of ornamental roses and Fabaceae in homesteads emerged as critical drivers. Bees preferred native plants over exotics for leaf foraging.

Leafcutter bees could be affected by the landscape type in tropics. Our research highlights the relevance of resource rich heterogenous habitats in supporting the resource requirements of leafcutter bees in monoculture systems. This study also highlights the need to diversify the resource plants in management and conservation to include non-floral plants. Including the preferred leaf-foraging resources, particularly rosid clade and Fabaceae family can support populations of leafcutter bees.

Keywords: Conservation, Landscape, Leafcutter bee, Leaf foraging, Non-floral resources, Plantation

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Title of the Abstract:
An integrative phylogenetic framework to reconstruct the pantropical biogeography of Ebenaceae

ABSTRACTS

Integrative phylogenetic frameworks that combine fossil records with molecular and morphological information provide powerful tools for mapping biodiversity patterns across deep time. This study investigates the tectonic and climatic drivers that influenced the origin, diversification, and global distribution of the pantropical plant family Ebenaceae by integrating fossil pollen evidence with molecular and pollen morphological datasets of their extant relatives. Our results suggest that Ebenaceae originated in western Gondwana ~108 Ma. The progressive separation of Africa and South America led to vicariant divergence within the family, resulting in the emergence of subfamily Lissocarpoideae in South America (~53.6 Ma) and subfamily Ebenoideae in the lowland tropical rainforests of Africa (~102 Ma). Subsequent dispersal of Ebenoideae from Africa occurred through several geological corridors shaped by tectonic movements and climatic transitions. Dispersal into Eurasia likely occurred along a South Turkey-Balkan-Italy lineament during the Campanian, followed by expansion through boreotropical regions and adaptation to fluctuating climates of the early Paleogene in East Asia before reaching India and Southeast Asia. A second pathway into India may have occurred via the Kohistan-Ladakh Island Arc during the Maastrichtian-Paleocene, with subsequent adaptation to increasing temperature-driven seasonality in the Indian Paleocene. Movement towards Sahul region likely occurred through southern Gondwanan remnants during the early Paleogene, while the Sunda-Australia collision in the Oligocene and uplift of New Guinea during the Miocene facilitated dispersal across Wallace's Line. Additional dispersal into Southeast Asia likely occurred along the northern Tethyan belt following the Afro/Arabia-Asia collision during the Miocene. Overall, this integrative approach highlights how deep-time dispersal corridors and ecological adaptability shape tropical biodiversity and provides a framework for identifying historically resilient regions and potential climate refugia relevant to contemporary biodiversity monitoring and conservation planning.

Keywords: evolutionary history, fossil pollen, Gondwanan vicariance, paleoclimate, refugia

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Title of the Abstract:
Advancing Mangrove Science in India: Monitoring Strategies for Climate Resilience and Coastal Sustainability

ABSTRACTS

Coastal habitats are increasingly squeezed between intensifying human development and the sea level rise. This spatial squeeze results in constraining ecologically critical habitats to withstand rapid change and lowers their resilience. Inadequate understanding of how these coastal ecosystems are responding to such drivers is a major gap that limits our ability for overall risk assessment, management and adaptation planning.

This gap can be addressed through establishing long-term monitoring sites to measure variables that govern nutrient cycling, carbon storage, and habitat connectivity within dynamic coastal environments. A systematic approach to sampling and monitoring, with careful consideration of spatial and temporal scales, is necessary to elucidate the ecological dynamics driving these changes and their implications for coastal sustainability.

Through multi-institutional collaboration we established a network of 64 long-term monitoring sites spread across Andaman Islands, Coringa Wildlife Sanctuary (Andhra Pradesh), Sundarbans Biosphere Reserve (West Bengal) and Bhitarkanika National Park (Odisha). Coastal geomorphology, sediment accumulation, vegetation structure, carbon dynamics, and tidal regimes and salinity changes are being monitored at these sites through scientifically robust protocols to determine coastal ecosystem's response to the sea level rise,

Preliminary data on elevation change trends and vegetation characteristics from selected locations will be presented. This will be supplemented by some opportunities and challenges faced during establishing this network in India. It will also explore the evolving paradigms of mangrove and coastal research with the current network as example of extended collaboration between various institutions and state forest departments.

Long-term ecological monitoring of mangrove ecosystems is indispensable for understanding their role in climate change mitigation and adaptation, assessing ecosystem health and resilience, and guiding evidence-based management decisions. By integrating monitoring efforts into conservation and restoration strategies, we can enhance the capacity of mangroves to mitigate climate change impacts and contribute to sustainable development in coastal regions.

Keywords: Climate change, collaborations, mangrove, Sea level rise, long-term monitoring

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Title of the Abstract:
Mitigating the snakebite crisis in India: a narrative review of efforts by the Madras Crocodile Bank Trust

ABSTRACTS

Snakebite is a deadly yet severely neglected public health crisis. Each year, venomous snakebites kill up to 140,000 people per year and leave another 400,000 permanently disabled. About half of the world's snakebite deaths occur in India, and an unknown number of snakes are killed out of fear and retaliation. This work highlights the multifaceted efforts of the Madras Crocodile Bank Trust (MCBT), a leading grassroots organization tackling SBE through education, advocacy, research, and venom production. MCBT's initiatives revolve mostly around education and outreach. These include the creation of educational films and posters in regional languages, which are distributed directly to communities. MCBT coordinates a network of so-called "snake rescuers" who remove snakes from houses and relocate them away from human dwellings, while delivering important snakebite prevention and first aid information to communities. MCBT coordinates training programs for rescuers and clinicians, sharing herpetological, first aid, and technical snake handling knowledge through a train-the-trainers model. Besides education, MCBT collaborates with state and national governments, including India's first National Action Plan for Snakebite Envenoming (NAPSE). The organization also supports the Irula Snake Catchers' Industrial Cooperative Society (ISCICS), India's largest venom supplier, through technical and administrative support. Through this work, MCBT works to address sustainability and quality control challenges within the current venom extraction model. By detailing MCBT's activities, key insights, and future directions, this article aims to shed light on the ongoing challenges of snakebite envenoming in India and the concrete steps being taken toward more effective, sustainable solutions.

Keywords: Snakebite, Outreach, Conservation, Snake-Rescue, Policy

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Title of the Abstract:
Genomic Signatures of Cold Adaptation in a Himalayan Drosophilid

ABSTRACTS

Drosophila nepalensis is a cold-adapted drosophilid endemic to the Himalayan region. Its ability to survive in harsh, cold conditions establishes it as a key drosophilid and a valuable model organism for studying the evolutionary responses to a warming world. Here, we report the first de novo genome assembly of *D. nepalensis*, based on a hybrid sequencing strategy that combines Illumina short reads and Oxford Nanopore long reads. Illumina sequencing generated 49.88 million 150 bp paired-end reads (~14.96 Gbp), while Nanopore sequencing produced 1.35 million long reads totalling ~0.76 Gbp. The assembled genome spanned ~178 Mb with an N50 of 83.6 kb and 98% BUSCO completeness, comparable to other well-annotated *Drosophila* genomes. Annotation identified 10,560 protein-coding genes, including transcription factor–rich and stress-related domains such as Zinc fingers, WD40 repeats, and ankyrin motifs. Comparative orthology analysis across six *Drosophila* species identified 14168 orthologous clusters, of which 9173 were shared among all the species compared, representing the conserved *Drosophila* core genome. *D. nepalensis* showed 83 unique orthogroups and 50 singletons, suggesting some lineage-specific gene expansions associated with cold adaptation and endemicity. Gene family evolution analysis revealed highest expansions in the cold-tolerant Himalayan drosophilid, *D. nepalensis*, a speculative resultant of differential adaptive pressures. This high-quality genome assembly and annotation establish a foundational resource for investigating the molecular basis of cold adaptation, evolutionary history, and climate-driven range shifts in D. nepalensis and related Himalayan drosophilids.

Keywords: Cold-tolerant, comparative genomics, *Drosophila nepalensis*, genome

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Title of the Abstract:
Identifying dengue hotspots in urban Bengaluru

ABSTRACTS

Dengue is an *Aedes* mosquito-borne disease caused by the dengue virus. Given its zoonotic origin and amplification of the sylvatic cycle causing disease in humans, dengue ecology and mosquito control warrant a One-Health approach. Seasonal climate variability and intra-urban heterogeneity are reshaping mosquito-borne disease transmission dynamics in rapidly urbanizing cities. Dengue and other mosquito-borne febrile illnesses have placed significant health and economic burdens in low-resource settings. Bengaluru contributes the highest number of dengue cases in southern India, yet availability of fine-scale data restricts identification of disease transmission zones. Understanding how seasonal climate patterns interact with intra-urban ecological and socio-demographic variability is therefore essential for a science-based approach in identifying transmission hotspots- and designing targeted, location-specific vector control.

We used two complementary approaches to identify high-risk zones using four years (2016-2019) of ward-level dengue case data across seasonal quarters: (i) space-time scan statistics and (ii) spatial autocorrelation methods (Global Moran's I, Local Indicators of Spatial Association, and Getis-Ord Gi*). Despite inter-annual variability, dengue activity remained both temporally structured and spatially concentrated within a small subset of wards in the central-eastern and south-eastern urban corridors of the city, while peripheral wards exhibited only transient activity. Persistent low-level transmission in these high-risk zones beyond peak seasons throughout the study period indicates their role as stable transmission hotspots. Our analysis helps to identify spatial and temporal clustering of dengue risk, including persistence during low-transmission and non-seasonal periods. This further highlight that hotspot wards could be prioritized for year-round mosquito surveillance and targeted vector-control strategies. Our findings support a shift from city-wide surveillance and reactive control to spatially focused strategies aimed at preventing broader urban spread.

Keywords: Bengaluru wards, Dengue, Hotspots identification, Spatiotemporal clustering

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Title of the Abstract:
Beyond Access: Building Trust, Capacity, and Inclusion in AI for Women Farmers

ABSTRACTS

Women constitute nearly 40% of the global agricultural workforce, yet their productivity remains approximately 23% lower than that of male counterparts. While disparities in access to phones, internet, training, and advisory services contribute to this gap, access alone does not translate into meaningful use. Agriculture inherently local, with variation in soils, climates, and cropping systems demand AI solutions that are context-specific & relevant. The challenge is no longer simply to develop digital tools, but to ensure they are trusted, usable, and scalable within real-world systems.

Crucially, access to digital platforms does not guarantee that women have the digital literacy, confidence, or social permission required to use them effectively. Significant drop-offs occur where there is a lack of trusted agricultural content, weak system governance, limited human capacity to support AI-enabled tools, and inefficient delivery mechanisms. Meaningful inclusion requires recognizing that women are often excluded from training opportunities and have limited exposure to digital devices. In the case of AI there is also a responsibility to make sure users understand the limitations and risks of AI systems whilst also making the most of the benefits, to minimize the effect of misplaced trust. Foundational digital skills, confidence-building, and extension-led support are essential precursors to effective tool adoption.

This calls for a shift from tool-specific training towards building broader digital capabilities. Such an approach not only enhances adoption but also contributes to longer-term empowerment. To address this, CABI launched an initiative to train women extension officers and farmers in digital skills to support improved decision-making. Delivered through the CABI Academy, the program covers digital security, identifying trusted information sources, responsible use of AI, application management, and communication tools. Implemented across five countries in Africa and Asia, it reached 6,400 women farmers, who reported a 38% increase in confidence in using digital tools and accessing AI.

Keywords: Gender, Advisory, AI, skilling, empowerment

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Title of the Abstract:
How do aquatic invertebrate assemblages vary in the water-filled tree holes of Evergreen Rainforests in the Western Ghats along an elevational gradient?

ABSTRACTS

Dendrotelms are ephemeral water bodies that provide unique microhabitats that support diverse organisms, ranging from bacteria and protists to invertebrates and higher-order taxa. Widely occurring in both temperate and tropical forests, together with other phytotelmata, they constitute a significant yet understudied component of global aquatic ecosystems. Despite their ubiquity, the diversity of aquatic invertebrates inhabiting water-filled tree holes in the tropical forests of Asia remains poorly understood. This study highlights the abundance of different taxa in 46 dendrotelms across four sampling sites in the Western Ghats.

Water-filled tree holes were identified and sampled using a syringe, sucking tube, dip spoon, and trays, and the coordinates of the sampling sites were recorded using GPS devices in the field. The samples were then stored in separate bottles and transported to the laboratory. Sorting and preliminary identification were performed using an Olympus trinocular microscope. Data were analyzed using different diversity indices, such as the Shannon, Simpson, and Bray–Curtis dissimilarity indices.

The Shannon index revealed that Sairandhri had a comparatively higher diversity (0.695), and the Walakkad Region had low diversity measures (0.325) among the study sites. Despite the higher abundance, more dominance was observed in the Sispara region. Simultaneously, the dendrotelms of the Kakkadampoyil region have more evenly distributed fauna. Scirtidae and Culicidae were the most dominant taxa in the aquatic invertebrate assemblages of water-filled tree holes at the study sites.

Further investigations are needed to elucidate how dendrotelmic parameters regulate spatiotemporal variations in community structure and shape predator–prey interactions within these specialized aquatic ecosystems.

Keywords: Western Ghats, tree holes, elevation, Aquatic Invertebrates, diversity.

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Title of the Abstract:
Bringing ecophysiology to the forefront of India's mangrove conservation and restoration drives

ABSTRACTS

Objective: Species' ecophysiological traits are an effective metric for uncovering community assembly and ecosystem function in tropical forests, and therefore can serve as an important variable in understanding overall ecosystem functions. However, the absence of ecophysiological monitoring at species- and community-level has created critical gaps in the conservation and restoration efforts of mangroves in India. The existing studies from Indian mangroves largely gravitate towards either conventional ecological traits or remotely sensed canopy traits. However, these metrics are inadequate proxies for ecophysiological traits. Several challenges exist in conducting ecophysiology research in India. Grants for large/ambitious risk-taking projects are limited, and frameworks are not in place for strategic partnerships between government agencies and academia. One of our objectives is to develop a mangrove ecophysiological research and monitoring framework for Kerala that is region- and location-sensitive.

Methods and results: To bridge some of the existing gaps, we have initiated field-based ecophysiology experiments at selected mangrove sites in Kerala. We are collecting high-precision data across different scales on co-existing mangrove species. We are identifying species and site-level differences in leaf gaseous and energy fluxes, along with spectral characteristics that are indicative of the relative efficiency in species' function, resilience, and acclimation capacity. These experiments are performed by the young researchers in collaborations with a diverse group of experts from state and national-level premier universities and institutes, local colleges, and NGOs. Strategic grants from the ANRF, CIFOR-ICRAF, and TREE Fund are supporting these research and training activities.

Conclusions: We are identifying the bottlenecks and challenges with species and community-level understanding and projections of vulnerability, impact, response, and rapid assessment of thresholds to stressors and disturbances in the mangrove ecosystems of Kerala. Also, we are gaining a deeper understanding of challenges and opportunities in developing collaborations and amplifying the benefits of mangrove research to the stakeholders.

Keywords: collaborations, critical gaps, ecophysiology, Kerala, mangroves

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Title of the Abstract:
The Spilled Calabash: Ecological Drivers of Venom Variation and Implications for Snakebite Therapy in Nigeria

ABSTRACTS

Snakebite envenoming remains a major yet neglected tropical disease in sub-Saharan Africa, where treatment is often compromised by variation in venom composition and inconsistent antivenom performance. In Nigeria, medically important species such as *Naja nigricollis, Bitis arietans,* and *Echis ocellatus* contribute substantially to morbidity and mortality, yet the extent and therapeutic implications of venom variation remain poorly understood. This study investigates venom variation and its consequences for snakebite treatment in Nigeria. Preliminary findings reveal significant interspecific differences in venom composition and functional activities, reflecting distinct toxin profiles among medically important species. Early analyses also indicate intraspecific variation associated with biological factors such as life stage, sex and geographic origin, with corresponding differences in venom bioactivity. Antivenom evaluations demonstrate variable recognition and neutralisation of venoms, suggesting that venom diversity may influence treatment efficacy. These findings highlight the importance of understanding venom variation at both ecological and therapeutic levels and provide evidence that variation in venom composition can influence antivenom performance. The study contributes to ongoing efforts to improve snakebite management through more effective and regionally informed treatment strategies.

Keywords: Snakebite ,venom composition, Antivenom evaluations

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Title of the Abstract:
Drone-Based Air Sampling for Biodiversity Monitoring via Environmental DNA

ABSTRACTS

Ecological conservation efforts typically face major challenges related to monitoring biodiversity across large and inaccessible landscapes. This study proposes an innovative approach using autonomous drones to collect atmospheric environmental DNA for rapid biodiversity assessment within biosphere reserves. Airborne particles such as skin cells, pollen, spores, and microbial fragments contain trace DNA signatures that can be captured using high-efficiency filtration systems mounted on unmanned aerial vehicles. The collected samples can be subsequently subjected to on-board or near-field DNA extraction and sequencing using portable platforms such, enabling near real-time species identification.

The proposed system integrates drone navigation, DNA sample processing, and AI-based taxonomic classification to generate spatially resolved biodiversity maps. By flying at different altitudes and across varied terrains, drones can capture a vertical and horizontal profile of species presence, including elusive, nocturnal, or migratory organisms that are otherwise difficult to detect. When compared to traditional field surveys, this method is non-invasive, scalable, and significantly reduces human effort and time.

It does involve some key challenges including low DNA concentration in air samples, contamination risks, and the need for efficient in situ sample preparation. Recent advances in filtration materials, edge computing, and lab-on-chip technologies have addressed some of these limitations. The proposed system also enables on-demand monitoring, making it suitable for detecting invasive species, ecosystem health, and drawing out effective conservation policies.

This approach represents a paradigm shift towards semi-autonomous biodiversity monitoring. It offers a powerful tool for ecological assessment and long-term environmental management in the face of global biodiversity challenges.

Keywords: AirDNA Monitoring, Drone-Based Sampling , Environmental DNA , Biodiversity Mapping , Real-Time Genomic Surveillance

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Title of the Abstract:
Plant chemistry reveals signals of specialized herbivory in seedling dynamics during tropical forest regeneration

ABSTRACTS

Herbivores exert substantial influence on the ecological and evolutionary dynamics of plants. Plants thwart herbivores using chemistry: producing a diverse array of secondary metabolites as defence. Intuitively, greater investment in chemical defences should protect against herbivores and improve plant survival—accordingly, the apparency hypothesis expects slow-growing species to be well defended. Highly defended plants can still be eaten by specialized herbivores, but they may find it harder to locate hosts at low density. The screening hypothesis, by comparison, posits that plants may invest in a wide array of compounds to increase the chance of having a suitable defensive chemical. This is hit or miss, but high chemical diversity of individual species may result in lower average herbivory, but chemistry would not explain density-dependence of herbivory. The relative roles of these processes remain unresolved with regard to functional consequences for plants in terms of herbivory damage and ensuing survival. In a tropical humid forest of central Western Ghats in southern India, we examined whether specific leaf area (SLA)—proxy for rates of resource acquisition and growth—and metrics of chemical diversity explained interspecific variation in herbivory rates, its density-dependence, and resulting survival of seedlings. Chemical diversity metrics comprised the primary axis of trait variation among species and were uncorrelated with SLA. Herbivory decreased with conspecific seedling density, an unexpected result, suggestive of local herbivore saturation. Higher chemical richness, which best explained the data, enhanced density-dependent herbivory suggestive of specialized herbivores on host plants with more chemicals. No metric of chemical diversity explained average rates of herbivory, but herbivory reduced seedling survival, underscoring that functional consequences of chemical differences accrue from density-dependent herbivory. Overall, our data indicate that defensive chemistry governs specialized plant-herbivore interactions to influence seedling dynamics through non-intuitive pathways.

Keywords: chemical diversity, insect herbivory, secondary metabolites, seedling dynamics, tropical forest

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Title of the Abstract:
Climate-driven elevational range dynamics of dominant trees in the Western Himalayas

ABSTRACTS

Understanding species distributions in response to climate change is crucial for developing effective biodiversity management plans. However, lack of historical data challenges our ability to monitor distribution dynamics, which can be highly variable and species-specific. This study aims to investigate the elevational range dynamics of dominant tree species under projected climatic conditions in the Western Himalayas. Based on a compiled database of species occurrences, we developed ensemble species distribution models to predict habitat suitability for current (2010) and future climatic scenarios (2040, 2070, and 2100). Then, we estimated the elevation for trailing edge, optimum range, and leading edge from the habitat suitability under different climatic scenarios. Our results indicated range contractions for *Cedrus deodara*, *Pinus roxburghii*, *Quercus lanata*, *Quercus semecarpifolia*, and *Rhododendron arboreum*; and an upward shift in distribution of *Lyonia ovalifolia*, *Mallotus philippensis*, and *Quercus leucotrichophora*. The elevation range of *Shorea robusta* and *Taxus wallichiana* can lean towards higher and lower elevations, respectively. The observed range dynamics raise concerns for the consequences of future ecosystem structure and functioning in the region. Our study will contribute to developing targeted management strategies to ensure the resilience of these dominant trees.

Keywords: climate change, habitat suitability, range dynamics, species distribution models, Western Himalayas

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Title of the Abstract:
Spatio-temporal Coexistence of Vertebrate Scavengers at Human-mediated Carcass Disposal Sites in the Aravalli Landscape

ABSTRACTS

Introduction: Livestock carcass disposal serves as an essential foraging supply to a wide spectrum of vertebrate scavengers in the semi-arid landscapes of Aravalli in Haryana. Carcass, being an ephemeral resource, is highly confined to space and time, and likely to intensify competitive interaction among scavengers. However, coexistence can be sustained through spatio-temporal resource partitioning. Yet, the functional dynamics of scavengers at the carcass site are overlooked.

Methods: We conducted camera-trapping to evaluate the scavenging behaviour of vertebrates at three types of carcass provisioning sites (frequent, infrequent, and single carcass sites) with varied disposal rates by agropastoral communities in the Aravalli landscape of Haryana. We monitored 48 carcasses over 354 trap-nights, yielding 5,251 independent detections of 28 species across all carcass sites.

Results: Species richness was highest at infrequent sites. Free-ranging dogs and Indian grey mongooses exploited all sites, while leopards and hyenas were associated with frequent and infrequent, respectively. Temporal overlaps showed low synchrony between large predators and dogs (Δ̂leopard–dog = 0.22; Δ̂ hyena–dog = 0.19). Dog activity reduced by ~37% in leopard presence, indicating a top-down effect, whereas high overlaps with treepie (Δ̂= 0.80) and mongoose (Δ̂= 0.72) suggested commensalism. Key predictors included forest type for striped hyena and human-settlement for Indian grey mongoose.

Conclusions: At a regional scale, this study demonstrates the key role of traditional livestock carcass disposal practices by local stakeholders in facilitating the persistence of vertebrate scavengers in the Anthropocene. Overall, we highlight how carcass disposal frequency, top-down effects, and interspecific interactions shape the spatio-temporal behaviour of scavengers.

Keywords: Aravalli landscape, carcass sites, scavenging behaviour, temporal overlaps, vertebrate scavengers

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Title of the Abstract:
Assortative Mating and Chemical Divergence in Red and Black Morpho-Variants of *Myrmaplata plataleoides*

ABSTRACTS

The *Oecophylla smaragdina*-mimicking red and *Camponotus compressus*-mimicking black morpho-variants of *Myrmaplata plataleoides* exhibit considerable morphological and behavioural differences, with molecular evidence suggesting some degree of evolutionary divergence as well. Nevertheless, they are recognized as a single species due to the pronounced similarity in the reproductive structures of both males and females across the two morpho-variants. In the present study, ex situ behavioural observations reveal existence of assortative mating in red and black morpho-variants of *Myrmaplata plataleoides*. Gas Chromatography-Mass Spectroscopy based chemical profiling reveals significant differences in the surface chemical profile of red and black morpho-variants. It explains the reason behind existence of assortative mating leading to reproductive isolation among morpho-variants. Due to significant differences and restricted gene flow among these morpho-variants, it has been proposed that the black morpho-variant may eventually evolve into a new species.

Keywords: Adaptive radiation, GC-MS, Magic trait, Myrmecomorph, Reproductive isolation

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Title of the Abstract:
Exploitation of host volatiles to enhance stingless bees-mediated pollination in coconut

ABSTRACTS

Coconut (*Cocos nucifera* L.) productivity is highly dependent on insect-mediated pollination, which is often constrained by adverse environmental conditions that reduce pollinator activity. The present study investigated the role of coconut floral volatiles in attracting stingless bees to enhance pollination efficiency under precision cultivation systems. Pollinator activity during anthesis was monitored through camera-based observations to assess visitation frequency and foraging behaviour. Stingless bees were identified as the predominant floral visitors, exhibiting peak foraging activity during morning hours concurrent with maximum pollen and nectar availability. To improve pollinator attraction and coconut productivity, volatile organic compounds (VOCs) emitted from coconut inflorescences were characterized using GC–MS/MS analysis. Several floral VOCs associated with pollinator attraction were identified. Electroantennography (EAG) studies revealed strong antennal responses of stingless bees to eugenol, phenylacetaldehyde, and γ-octalactone, indicating their significant role in mediating pollinator behaviour. The findings highlight the importance of floral VOCs in regulating pollinator activity and improving pollination efficiency in coconut. Volatile-based attractants may therefore provide an eco-friendly and sustainable strategy to enhance pollinator visitation, improve nut set, and increase coconut productivity.

Keywords: Coconut productivity, electroantennography, GC–MS/MS, pollination, stingless bees, volatile organic compounds (VOCs), stingless bees

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Title of the Abstract:
Precision Drone Spraying Using a Novel Thin Film in Cross-Flow (TFCF) Nozzle

ABSTRACTS

The increasing use of drones in agriculture has created a strong demand for spraying systems that can provide precise delivery of pesticides and nutrients, while minimizing spray drift and chemical wastage. Conventional hydraulic and centrifugal nozzles used in agricultural drones have important limitations. Hydraulic nozzles often require changing nozzle configurations to vary droplet size, while centrifugal nozzles produce droplets with significant tangential velocity, resulting in weak penetration and increased drift susceptibility. To address these limitations, the present work introduces a patented Thin Film in Cross-Flow (TFCF) nozzle for precision drone spraying applications.

The proposed nozzle generates spray by rupturing a thin axisymmetric liquid film through annular cross-air flow. The atomization process enables independent control of droplet size and droplet velocity through adjustment of air flow rate, liquid flow rate, and film thickness. Experimental characterization performed using the Particle/Droplet Image Analysis technique shows that increasing the inlet air velocity reduces the droplet size while simultaneously increasing the droplet penetration velocity. The nozzle produces droplets within the range commonly used in agricultural spraying while maintaining directional downward transport independent of rotor downwash.

To investigate spray behavior under realistic operating conditions, a laboratory-scale spray characterization setup has been developed. In this setup, the TFCF nozzle is mounted at a height of approximately 1.5 m above a moving belt system. Paper sheets placed on the moving belt simulate the forward motion of an agricultural drone, allowing controlled estimation of spray swath and droplet deposition distribution at practical flight speeds. The setup enables systematic investigation of spray spread and deposition characteristics during dynamic spraying conditions relevant to precision agriculture.

The proposed TFCF nozzle provides flexibility in nozzle mounting and can be integrated with robotic or telescopic arms for spraying close to crops, thereby reducing spray drift and improving directional precision during agricultural spraying operations.

Keywords: Controlled droplet generation, precision agriculture, spray drift reduction, TFCF nozzle, UAV spraying

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Title of the Abstract:
From Crisis to Circularity: Tackling Abandoned Fishing Gears Through a Community-Centered Circular Economy Model in India

ABSTRACTS

Abandoned, discarded otherwise lost fishing gears (ADLFG) has become a serious concern in the face of technological advancement of fishing gears, threatening the ecosystem as well as livelihood of fisherman community. ADLFG imposed huge threat through degradation of aquatic habitats, entangling the species, contributing to biofouling and blooms, trapping species after their entering the ecosystem in the form of ghost fishing. Apart from this, the ecological degradation is impacting the natural stock of fisheries, diminishing the livelihood of fisherman folk. Urgent scientific attention is needed to tackle the current crisis to restore the aquatic diversity.Freshwater ecosystem inspite of being potential fishing grounds and largest contribution (49.2%) to the country's GDP through inland fisheries has been widely neglected. The great ichthyofaunal diversity of freshwater ecosystem has been facing a great threat of biodiversity loss due to intensive fishing since majority of the species are highly endemic. An extensive literature review for past 64 years was conducted for developing the suitable methodology taking lessons from the international waters and considering trends of study so far. A negative binomial Generalized linear model was used to analyse the trend along with a road map.Post the nature of the raw materials for such nets has been analysed to repurpose into secondary commercial products. The model showed that there is a significant difference in studies related to ALDFG in marine vs freshwaters. Among marine few fishing gears such as gillnets, trawl nets, traps and pots were more abundantly discarded creating major menace to fish population. Nets form major part of the ALDFG, use of synthetic materials mostly nylons are great threat for aquatic biodiversity in the form of entanglements. Freshwater ecosystems are globally neglected for ALDFG related studies. ALDFG can be repurpused through circualar economy contributing to the livelihood development.

Keywords: Abandoned Fishing Gear, Circular economy, Ecosystem restoration, Freshwater, Livelihood development

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Title of the Abstract:
MSTrIPES - an Adaptive Management Tool for Conservation

ABSTRACTS

Parks and wildlife sanctuaries are established to safeguard biodiversity from human activities; yet illegal actions like poaching persist, hampering global conservation efforts. Frontline staff patrolling is vital for wildlife resource management, but data analysis gaps hinder evidence-based decision-making. The rise of Law Enforcement Monitoring (LEM) aims to counter illegal wildlife trade, and MSTrIPES (Monitoring System for Tigers- Intensive Protection and Ecological Status) is a unique LEM tool tailored to India's forest administration hierarchy. Using open-source software, it employs mobile apps, desktop tools, and a central server for data collection and analysis via GPS and GPRS. MSTrIPES enhances wildlife policies by pinpointing conservation areas, aiding anti-poaching efforts, identifying illegal activity hotspots, addressing human-wildlife conflict, and supporting scientific research. It contributes to India's National Wildlife Action Plan by strengthening protected areas, conserving threatened species, and combating poaching. With extensive data from tiger reserves, MSTrIPES strives for a holistic approach to wildlife preservation

Keywords: MSTrIPES, LEM tool,

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Title of the Abstract:
Scanning the Skies for Life: Weather Radar as a Tool for Biodiversity Monitoring

ABSTRACTS

Monitoring biodiversity at broad spatial and temporal scales remains a central challenge in ecology, particularly for highly mobile aerial taxa such as insects and birds. Weather surveillance radars (WSRs), originally designed for precipitation monitoring, offer a powerful yet underutilized solution by continuously sampling atmospheric biota across large extents. Here, I present a synthesis of recent advances in radar aeroecology in India, combined with new analyses from a ccentral Indian radar data (Silkheda, Bhopal), to demonstrate how WSRs can be repurposed for biodiversity monitoring in monsoon-dominated tropical systems.

Using a newly developed processing pipeline, radar echoes can be partitioned to distinguish insects from birds and to estimate aerial densities as a function of height and time of day. These data reveal strong structuring of aerial biomass by monsoon circulation, diel boundary-layer dynamics, and seasonal agricultural phenology. In contrast to temperate systems, where migration is often seasonally discrete, tropical aerial movement emerges as a more continuous yet dynamically organized process governed by atmospheric variability.

I argue that India's rapidly expanding radar network presents a transformative opportunity to establish a national-scale, high-resolution biodiversity observing system. Integrating radar with ecological theory and ground observations can enable real-time monitoring of aerial ecosystems, offering critical insights into species movement, ecosystem function, and responses to climate and land-use change.

Keywords: aeroecology, biodiversity monitoring, birds, insects, radars,

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Title of the Abstract:
Symbiotic hologenome enrichment by habitat-adapted fungal endophytes exhibits growth promotion and stress resilience

ABSTRACTS

Plants and microbes have co-evolved ever since the beginning of life on Earth for their better adaptation. The plant genome, together with its associated symbiotic microbial genome, functions as a single entity called the hologenome. In recent years, climate change has worsened the severity of abiotic stress, posing serious threats to agricultural productivity. In the past two decades, extensive research has shown the beneficial effects of fungal endophytes in activating physiological traits in crops to adapt to stresses through a habitat-adapted symbiosis mechanism. However, specific mechanisms, communication signals, and downstream signalling processes are not well understood. From this context, this study employed *Arabidopsis thaliana* to investigate plant-endophyte interactions using eight habitat-adapted endophytes isolated from extreme environments. Endophytes colonized Arabidopsis and promoted growth, and notably, a few endophytes altered root system architecture (RSA), a critical trait for water acquisition and water mining under drought stress. Endophyte colonisation triggered activation of key signalling molecules and also accumulation of sugars, sugar-based alcohols, and compatible osmolytes for the establishment of symbiotic interaction. The findings demonstrate the significance of hologenome enrichment in modifying plant phenotypes and make the plants climate-ready without host genome manipulation. Selected endophytes provide a powerful platform for identifying novel molecular mechanisms governing plant-endophyte symbiosis and abiotic stress tolerance, offering sustainable alternatives for developing stress-resilient crops.

Keywords: *Arabidopsis thaliana*, Cherry tomato, Endophytic fungi, Habitat-adapted symbiosis, Plant–endophyte interaction

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Title of the Abstract:
Optimization of sedaDNA metabarcoding approach to investigate biodiversity changes at Mudumalai Wildlife Sanctuary, southern India

ABSTRACTS

Tropical biomes are widely regarded as the first frontier of human occupation in addition to being hotspots of biodiversity and speciation. However, they are thought to be unsuitable for ancient DNA studies. The Nilgiris Biosphere Reserve (NBR) in southern India, has seen human occupation for centuries (perhaps millennia), as evidenced by megalithic dolmens and a living heritage of 6 protected vulnerable tribal groups. Sedimentary ancient DNA (sedaDNA) gives us access to unexplored dimensions on the peopling of NBR, and the creation of the 'hotspot' itself by targeting DNA from plants and mammals. Optimization of DNA metabarcoding approach in targeted wetland sites for assessing plant and mammal diversity is critical since no previous work has been done in India. We know that composition in taxa and history deduced could depend on protocols applied. Hence, we evaluate whether one or more protocols in combination would lead to better understanding of ecosystem change. Through literature review, we identified 3 sedaDNA protocols that targeted different DNA fractions: extracellular (exDNA), intracellular (inDNA) and total DNA (totDNA). exDNA from literature typically targets DNA bound to particles (often clays), but when swelling clays are present, exDNA can be intercalated. For this second fraction, a new protocol was developed. We tested 15 samples from across a ~8000-year-old peat core from the Mudumalai Wildlife Sanctuary in NBR. NMDS ordination of sequence dissimilarities suggests protocol-dependent differences in recovered DNA composition, with samples clustering primarily by extraction method rather than by sample identity. Combining the DNA results from the mineralogy and element chemistry gives us novel interactions between the nature of sediment and the protocol's success. We are currently analysing our results to establish the "best" method for DNA recovery and appropriate "multi-DNA" method for maximum taxonomic richness, which are original contributions with potential for application in tropical biomes and beyond.

Keywords: ancient DNA, deep time, protected areas, plant diversity, fires

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Title of the Abstract:
Plasma-Activated Water as a Sustainable Nitrogen Source for Precision Agriculture: Opportunities for Decentralized Fertilizer Production

ABSTRACTS

Global fertilizer demand has increased considerably due to rising food production requirements, particularly in agrarian economies such as India, where intensive farming practices depend heavily on nitrogen-based fertilizers. Conventional nitrogen fertilizers such as urea and ammonium nitrate are primarily produced through the Haber–Bosch process. Although this process has enabled large-scale fertilizer production, it is highly energy-intensive and contributes substantially to greenhouse gas emissions. In agricultural systems, inefficient nitrogen utilization further aggravates environmental concerns, as a significant portion of applied nitrogen is lost through volatilization, leaching, and nitrification, leaving only a small fraction available for plant uptake. In many agricultural regions of India, urea application often exceeds 300 kg ha^{-1} in an attempt to maximize crop productivity, resulting in soil degradation, nutrient imbalance, groundwater contamination, eutrophication, and increased economic burden on smallholder farmers.

Plasma-activated water (PAW) is emerging as a promising and sustainable alternative nitrogen source for precision agriculture. In the present study, a 5 L indigenous non-thermal plasma reactor was designed and developed for the generation of PAW through plasma–water interactions, producing reactive nitrogen species predominantly in the form of nitrate (NO_3^-) and nitrite (NO_2^-), which are readily available for plant uptake. Importantly, PAW production requires only air, water, and electricity and can be integrated with renewable energy sources such as solar power, enabling decentralized and on-demand fertilizer generation. Conventional urea production currently requires approximately 250-300 MJ kg^{-1} N when nitrogen losses are considered, whereas the theoretical energy limit for plasma-based nitrogen fixation is estimated to be ~7 MJ kg^{-1} N. The plasma system developed in our laboratory presently operates at approximately 650-700 MJ kg^{-1} N, and further optimization of reactor design and operating conditions is expected to significantly reduce the energy demand. Therefore, PAW demonstrates substantial potential as a climate-resilient, resource-efficient, and sustainable nutrient delivery approach for next-generation precision agriculture.

Keywords: Decentralized fertilizer production, non-thermal plasma, sustainable nitrogen fertilization, plasma-activated water, precision agriculture

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Title of the Abstract:
Pollinators in the Anthropocene: Pollinator responses to changing habitat features in wet tropical Indian landscapes

ABSTRACTS

Pollination is an essential ecosystem service ensuring global food security. Pollinator communities are affected by human-induced changes in biotic and abiotic environments. Community-level pollination studies are limited in Indian ecosystems, with a few exceptions, and investigations explicitly examining how habitat composition shapes plant-pollinator interactions are particularly scarce.

We examined how anthropogenic gradients influence different pollinator groups in the southern Western Ghats. The distinct climatic regime of the region and a landscape gradient enable us to understand the spatiotemporal dynamics of plant-pollinator interactions in this biodiversity hotspot. We expected generalist pollinator groups to be similarly abundant across different habitats. Since resource availability plays a major role in determining pollinator presence, we expected pollinators to show a positive response to floral resources. Further, we also expected all pollinator groups to show seasonality.

To test these hypotheses, we collected data on plant–pollinator interactions along transects across an urban-plantation-forest gradient over wet and dry seasons for two years (2023-2024). Flowers were identified to species-level, while pollinators were grouped into functional groups.

We observed ~39,000 interactions on 560 floral species, spanning 14 pollinator functional groups (based on taxa, sociality and body size). Bees were abundant in urban landscapes, and only social bees responded positively to changes in flower resources. The abundance of specialist pollinator groups like carpenter bees and birds was mostly determined by the availability of specific plant resources. Most pollinator groups did not show seasonality, but the abundance of generalist pollinators increased during drier months.

Our study highlights pollinator responses to dynamic changes in habitat features. These fluctuations among pollinator groups provide valuable insights into the inherent variation in pollinator responses to anthropogenic changes. Understanding these responses from less-studied regions can help us better frame pollinator-friendly agrarian and urban policies, enabling sustainable development and ensuring ecosystem health.

Keywords: ecosystem health, interaction, habitat, seasons, Western Ghats

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Title of the Abstract:
A decade old experiment in Indian Sundarbans - An integrative approach exploiting mangrove community's diversity-governed resilience facilitating ecosystem conservation

ABSTRACTS

Worldwide mangrove ecosystem conservation/restoration, is conventionally limited within selective monoculture practices or two-three species-based afforestation programmes, employing community-based efforts. In contrast to this, an experimental ecological restoration endeavour for degraded mangrove patches of Indian Sundarbans is underway for last 10-12 years. It aimed not only restoring the original species richness of damaged mangrove niches, but also facilitating reinstatement of overall ecosystem functions/services and diversity of above-ground (flora and fauna) and below-ground (microbiome) communities. This venture was implemented across ~65 ha of degraded shoreline mangrove patches in settlement fringe areas of western part of Indian Sundarbans, which lost its secondary succession potential due to largely anthropogenic stressors. Albeit, human-assisted plantation was a primary component of this programme, a decade-long effort was devoted to utilize mangrove ecosystem's underlying holistic resilience in designing and optimizing this restoration-cum-conservation framework. High species diversity contributes to differential inter- and intra-species relationships with predominant facilitation for survival under stress rather than competition. Propagules from remote sites that still harbour some of the rare, endangered and threatened (RET) mangrove and its associates, along with common species were collected and multiplied in on-site nurseries. Our mixed-species restoration strategy facilitates genetic variation-based resilience as mixed-mating mangrove community prefer outcrossing, decreasing "reproductive investment" in selfed seeds. Onsite multispecies assemblage comprising mangrove/mangrove associates augmented diversity in osmoregulation strategies with functional co-occurrence of primary and secondary metabolites helping niche differentiation, contrasting conventional single-osmolyte models. Finally, culture-dependent approach of enriching species-poor degraded sites with diverse species-specific indigenous plant-growth-promoting rhizobiome, controlled through varying root exudates, concurrently supplement for the most resilient microbiome. This integrative approach nurtured ~65 ha degraded mangroves gradually into a self-sustainable functional ecosystem evaluated through quantifiable metrics; created native biodiversity-rich hubs, as future source of germplasms of RET species; assisted regaining the natural regeneration potential with ~60-70% population as revived natural recruitments.

Keywords: Diversity, Mangrove conservation, Resilience, Restoration framework, Species richness

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Title of the Abstract:
Evolutionary and ecological insights from floral scents of Indian and Thai ginger lilies

ABSTRACTS

Plants adjust their volatile metabolite emission to effectively interact with their biotic partners under varied environmental conditions, while also being subjected to phylogenetic constraints. The genus *Hedychium*, commonly known as ginger lilies, comprises perennial rhizomatous herbs endemic to Asian paleotropics and is unique within the ginger family because of its highly fragrant flowers. While previous studies have chemically characterised leaves, rhizomes, and flowers, scent assemblages across clades and co-occurring populations remain largely unexplored in this genus. In the present study, we investigated floral scent variation across evolutionary and ecological scales.

A total of 28 species representing at least 50% of each major clade were sampled from ten wild populations across Northeast India, Western Ghats, and Northern Thailand over three peak flowering seasons. Floral scents were non-invasively extracted via dynamic headspace sampling in the field during both day and night and analysed using Gas chromatography-Mass spectrometry.

Most species are chemically distinct. Clades exhibited patterns consistent with moderate phylogenetic clustering, chemical convergence and divergence. The diel variations aligned with floral colour and anthesis time, suggesting the presence of pollination syndrome in the genus. Widely distributed species showed scent-class shifts between singleton and syntopic populations, a pattern consistent with character displacement. Further, co-flowering congeners exhibited chemical divergence, suggesting niche partitioning.

Floral scent diversity in ginger lilies reflects evolutionary lability, possibly shaped by distribution and local ecological interactions, particularly co-flowering congeners, at the population level. Given the increasing anthropogenic threats to tropical biodiversity, there is an urgent need to identify and conserve plant groups that produce potent bioactive chemicals, thereby developing a scent database for native gingers.

Keywords: Co-occurrence, Diel variations, Scent evolution, Zingiberaceae

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Drone-Assisted Precision Delivery of Biocontrol Agents for Sustainable Pest Management in Diverse Cropping Systems

Drone technology is rapidly transforming modern agriculture by enabling precise, efficient, and environmentally sustainable crop protection strategies. Unmanned aerial vehicles (UAVs) are increasingly used for the targeted delivery of biological control agents, including microbial biopesticides, parasitoids, predators, and sterile insects, thereby reducing reliance on synthetic chemical pesticides and supporting sustainable agricultural production systems. Compared to conventional application methods, drone-assisted delivery offers several advantages, including precision targeting, uniform spray coverage, reduced labour requirements, minimized human exposure to pesticides, improved accessibility in difficult terrain, and efficient operation in dense crop canopies. Biological control agents such as *Cordyceps fumosorosea*, *Beauveria bassiana*, *Metarhizium anisopliae*, *Lecanicillium lecanii*, *Bacillus thuringiensis*, *Trichoderma asperellum*, and nucleopolyhedroviruses play a vital role in Integrated Pest Management (IPM) programs. However, field-scale application of these agents through conventional spraying methods is often labour-intensive, time-consuming, and associated with uneven deposition and poor canopy penetration. Drone-based delivery systems provide a technologically advanced alternative capable of enhancing spray precision, improving droplet deposition, and ensuring effective distribution of biocontrol agents over large agricultural landscapes. Furthermore, specialized drones equipped with automated dispensing systems and temperature-controlled hoppers facilitate the aerial release of beneficial insects such as *Trichogramma* parasitoids, ladybird beetles, predatory mites, and sterile insects for augmentative biological control and Sterile Insect Technique (SIT) programs. Despite the increasing adoption of UAV technologies in agriculture, the scientific standardization of drone operational parameters for biopesticide application under diverse agro-climatic conditions remains limited. Therefore, the present study was undertaken to develop crop-specific standard operating procedures (SOPs) for drone-assisted application of microbial biopesticides in major cropping systems, including coconut, rice, sugarcane, banana, brinjal, mango, maize, and potato across Tamil Nadu and Karnataka, India. The investigation focused on optimizing critical operational parameters such as flight altitude, flying speed, swath width, nozzle configuration, droplet size, spray particle deposition, crop canopy characteristics, water volume, dosage, concentration of biopesticides, and suitable spray timing. Particular emphasis was placed on evaluating spray efficiency, biological efficacy, canopy penetration, and phytotoxicity under field conditions. The results demonstrated that drone operation at 4 m above the crop canopy with a 2 m swath width and evening application after 1600 h significantly improved spray deposition and pest suppression efficiency without causing phytotoxicity to crops. Standardization of droplet spectrum and spray particle deposition further enhanced canopy coverage and target-specific delivery. Drone-assisted application of oil formulations of *C. fumosorosea*, *T. asperellum*, and *M. anisopliae* resulted in effective bio-suppression of insect pests while conserving beneficial arthropods and minimizing environmental contamination. More than 100 field demonstrations were conducted across multiple agroecosystems, benefiting over 5,000 farmers through technology dissemination and capacity-building programs. In addition, substantial progress has been achieved in the development and validation of prototype drone systems for the aerial release of live beneficial

insects. The study demonstrates that drone-enabled precision biocontrol represents a scalable, climate-resilient, and eco-friendly approach for sustainable pest management. Integration of UAV technology with biological control has immense potential to revolutionize precision agriculture by improving operational efficiency, reducing chemical pesticide usage, enhancing environmental safety, and strengthening sustainable agroecosystem management.

Keywords: aerial spraying, biopesticides, natural enemies, oil-based formulation, standard operating procedures

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Incidental Detection of Nocturnal Activity in *Aedes* Mosquitoes During Routine *Anopheles* Surveillance in Arid Western Rajasthan, India

ABSTRACTS

Vector surveillance is essential for understanding local transmission risks and designing effective control strategies. In arid regions of Western Rajasthan India, malaria vectors have traditionally received more research attention; however, *Aedes* mosquitoes are important due to their role in dengue, chikungunya, and zika transmission. *Aedes* mosquitoes typically display anthropophilic and day-biting behaviours, making them less responsive to light traps used at night. Interestingly, during routine surveillance primarily targeting *Anopheles*, *Aedes* mosquitoes were collected during late night hours suggesting possible changes in their behaviour. Entomological surveys were conducted over two-year period across selected districts of western Rajasthan, India covring different seasons. All collected mosquitoes were identified morphologically using standard taxonomic keys. Light trap collections were done from Jhalawar, Sanchore, and Bikaner districts yielded *Aedes aegyp*ti and *Aedes vittatus*, whereas human landing catches from Barmer and Sanchore districts recorded the presence *Aedes albopictus* from the rural area. *Aedes aegypti* mosquitoes were found in light trap collections in late night hours, despite their typical diurnal behaviour. Additionally, human landing collections, confirming their active host-seeking behaviour. The simultaneous presence in both collection methods suggests possible behavioural plasticity influenced by artificial illumination, host availability, or microclimatic conditions in the arid environment. The incidental detection of *Aedes* mosquitoes during routine surveillance highlights emerging change in behavioural patterns in Western Rajasthan. Their presence in light trap catches indicates potential adaptation to late evening hour activity, while HLC collections reaffirm their human-biting tendencies during late hours. Future studies should systematically target *Aedes* surveillance using both methods to assess the behavioural adaptation, host dynamics, and climatic variation in shaping their behavior. Understanding these behavioural shifts is essential for strengthening vector surveillance system and developing adaptive control measures against arboviral diseases in arid regions.

Keywords: Vector surveillance, Behaviour, Adaptation, *Aedes*

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Title of the Abstract:
Community shift and spread of Sonneratia show how mangroves adapt to rising sea levels

ABSTRACTS

Understanding the long-term response of mangrove ecosystems to sea-level fluctuations is crucial for ensuring coastal sustainability and implementing effective climate adaptation strategies. Mangroves, as vital coastal buffers, play a significant role in protecting shorelines, supporting biodiversity, and sequestering carbon. However, their persistence and health are increasingly threatened by rising sea levels and climatic variability. This study focuses on the Chakra estuarine complex, located on the southwest coast of India, and utilises a high-resolution, multi-proxy sedimentary record that spans the late Holocene period. Sedimentological, geochemical, and palynological analyses identifies five distinct climatic and ecological phases within the mangrove ecosystem. Each phase is characterised by marked shifts in mangrove community composition, with notable expansion of Sonneratia species around 1200 cal yr BP. This expansion is evidenced by distinct geochemical signals and changes in sediment characteristics, suggesting a strong relationship between mangrove dynamics and environmental shifts. The predominance of C3 plants and mangrove-derived organic matter, as indicated by δ13C isotopic values and C/N ratios, further underscores the persistent influence of terrestrial and coastal vegetation on the estuarine system. Overall, the study offers a robust baseline for evaluating present and future environmental changes in coastal regions. It emphasises the importance of integrating paleoenvironmental data into coastal management and conservation strategies, ensuring that lessons from the past inform sustainable practices. Such an approach is essential for maintaining the ecological integrity of mangrove ecosystems and safeguarding coastal communities against the challenges posed by climate change and sea-level rise.

Keywords: Mangroves, Coastal resilience, Climate change, Sea level Fluctuations, Southwest India

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Title of the Abstract:
Crystallization-Induced Alteration of Evaporation in Inter-Particle Aqueous Salt Solution Bridges

ABSTRACTS

Evaporation of liquid from partially saturated, unconsolidated porous media such as soils and regolith-like granular materials governs moisture transport, mechanical stability, and evolution of the porous structure. At the pore scale, this process is mediated through inter-particle liquid bridges, whose evolution can significantly influence transport processes and the macroscopic behaviour. In particular, evaporation of bridges of liquids with dissolved salts can induce crystallization-driven processes that significantly alter liquid transport and consequent evaporation dynamics. In this study, we investigate the evaporation inter-particle bridges of a range of aqueous salt solutions exhibiting diverse thermodynamic and crystallization characteristics.

The investigated salt solutions exhibit two distinct classes of behaviour: creeping and shell-forming. Creeping solutions undergo evaporation-driven crystal growth along the substrate, creating additional liquid–air interfacial area and enhancing the evaporation rate by up to ~76% relative to pure water. In contrast, shell-forming solutions develop a crystal shell enclosing the liquid phase, suppressing evaporation by approximately 96-98%. The evaporative flux across all solutions is found to scale primarily with the thermodynamic driving force (ERH-RH), where ERH denotes the equilibrium relative humidity of the saturated salt solution, and RH is the ambient relative humidity.

Beyond thermodynamic effects, the evolution pathway is strongly influenced by crystal morphology. Prismatic, cubic, and dendritic crystal morphologies give rise to distinct crystal aggregation and liquid transport pathways, leading to different types of evolution. A particularly unique evolution is observed for dendritic systems, where shell formation and creeping coexist through liquid transport beneath the crystal layer. Furthermore, the transition between creeping and shell formation is shown to be governed by the relative wettability between the substrate, salt crystals, and salt solution.

These findings provide pore-scale insight into the coupled interplay between evaporation, crystallization, and transport in saline porous media, with implications for salt-affected soils, mineral-rich regolith-like materials, and related porous systems.

Keywords: Creeping, Crystal morphology, Evaporation, Inter-particle liquid bridges, Shell formation

Mode: Oral Presentation

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Title of the Abstract:
AI-Driven One Health Platform for Infectious Disease Surveillance and Antimicrobial Resistance Prediction in Northern India

ABSTRACTS

Objective: Infectious diseases (IDs) and antimicrobial resistance (AMR) are critical global health threats, with over 60% of emerging infections being zoonotic and AMR projected to cause 10 million deaths annually by 2050. Northern India, particularly Uttarakhand, represents a high-risk One Health setting due to close human–animal interactions, fragile ecosystems, rich biodiversity, and agriculture-dependent livelihoods. This study aims to develop an integrated One Health Intelligence Platform (OHIP) leveraging Machine Learning (ML) and Deep Learning (DL) for real-time surveillance, prediction, and intervention across human, animal, environmental, and agricultural domains.

Methods: The study will integrate multi-sectoral datasets, including human clinical records, veterinary surveillance, agricultural practices (antibiotic usage, livestock management), and environmental and biodiversity indicators (land use, climate variables, wildlife interfaces). Advanced ML/DL models will be developed for early disease detection, outbreak prediction, and AMR pattern analysis. The platform will incorporate Explainable AI (XAI) approaches, including SHAP and LIME, to ensure transparency and interpretability. Additionally, modules for drug discovery and repurposing will be developed to support rapid therapeutic responses.

Results: The proposed platform is expected to deliver an early warning system for zoonotic disease emergence, AI-enabled diagnostic decision support tools, and predictive models for AMR trends influenced by environmental and agricultural drivers. It will generate open-access, multi-domain datasets, support biodiversity-linked risk mapping, and produce peer-reviewed outputs while strengthening interdisciplinary capacity at the One Health–AI interface.

Conclusion: By integrating human, animal, environmental, biodiversity, and agricultural data streams, the OHIP provides a comprehensive and scalable solution for complex health challenges. This approach is expected to enhance surveillance, improve disease management, and inform sustainable, evidence-based policies for public health and ecosystem resilience in resource-constrained settings.

Keywords: Antimicrobial Resistance, Deep Learning, Explainable AI, Machine Learning, One Health

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Title of the Abstract:
Precipitation increases the similarity in plant species composition between grazed and ungrazed sites in semi-arid grassland

ABSTRACTS

Arid and semi-arid grasslands are grazed by wild animals and livestock. Being framed as wastelands in India leads to continuous decline in area which increases overgrazing on the remaining lands.

This study looks at effects of grazing by domestic and wild mammals on the plant community of a semi-arid tropical grassland. I compared the plant species composition, richness, plant traits, invertebrate herbivory and fungal pathogens, soil and plant nutrient stoichiometry in replicated grazed and long term ungrazed sites, in wet and dry years. I hypothesize that plant species composition and plant traits would differ between the two sites due to grazing and interspecific competition. Soil and therefore plant CN ratios would be lower in grazed site. With increased rainfall, I expected the plant community to become more similar and species richness to increase. Insect herbivory and disease incidence would increase with the increase in rainfall.

The vegetation survey was carried out during peak biomass growth season for two consecutive years which differed in the amount of rainfall.

I recorded 35 and 83 plant species in dry year and wet year respectively. As expected, plant species composition differed between grazed and ungrazed sites, but rainfall increased their similarity. Plants grew taller and had lower leaf dry matter content (LDMC) in ungrazed sites in the dry year. Disease incidence was greater in the wet year, and insect herbivory was higher in the dry year. Soil and plant CN ratio was lower in the wet year probably due to consumption of leguminous plants by grazers.

This study shows that plant species composition and associated traits in a semi-arid grassland is a result of interplay between grazing and rainfall which lead to change in plant species composition. Rain played a critical role leading to increase in plant species richness and biomass, irrespective of grazing

Keywords: grazing, plant traits, pathogens, rainfall, semi-arid grassland

Mode: Oral Presentation

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