



TROPICAL BIOSUMMIT'24



CONFERENCE PROCEEDINGS

Organised by



CENTRE FOR TROPICAL
BIODIVERSITY CONSERVATION

In association with



Conference Proceedings: Tropical Biosummit'24

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Organizing Committee, TROPICALBIOSUMMIT

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Layout and Design: Mr. Rineesh P

Event venue : Farook College (Autonomous), Calicut



About the logo

The logo of the CTBC TropicalBioSummit depicts Earth as a circle, with the central line symbolizing the Equator. Its upper half, in lush green, represents terrestrial ecosystems, while the lower half, in serene blue, signifies aquatic ecosystems. Within this representation, the inclusion of a blue whale, bird, and plant encapsulates the rich biodiversity present. This logo serves to illustrate the emergence of tropical regions from the Equator, underscoring the crucial significance of conserving the diverse life forms inhabiting the land, water, and air within these ecosystems.

-Rineesh Puliyakode
Honorary Member of Extension,
Centre for Tropical Biodiversity Conservation

Preface

The inaugural edition of the TropicalBioSummit focuses on a crucial issue of our time: Biodiversity and a Sustainable Future. As we strive to achieve CTBC's goals by 2025 and shape a global tropical vision for the future, it is essential to evaluate our progress and anticipate emerging challenges.

CTBC's goal of becoming an international community was achieved in 2018. We have made remarkable strides in engaging with international delegates and organisations, enrolling in primary biodiversity conservation, and advancing research in agriculture and climate change.

However, we must acknowledge that our progress in biodiversity research and conservation has been uneven and insufficient. Environmental sustainability is under threat due to accelerating global greenhouse gas emissions and biodiversity loss. Many people still live with the impacts of biodiversity degradation, and nearly all suffer from it. Advocating for effective policies and conservation practices must remain central to the international development agenda, especially through upcoming TropicalBioSummits.

The inaugural TropicalBioSummit reaffirmed our commitment to sustainable development and established a framework for action and comprehensive follow-up with ICBA and other national and international partners. The Tropical BioSummit 2024 serves as a valuable resource as we look towards translating its outcomes into concrete actions.

In particular, it offers in-depth analyses of key cross-sectoral issues identified at the conference, including biodiversity sustainability, agricultural and wildlife security, and access to clean energy services for all. Eradicating biodiversity loss, promoting sustainable utilisation and production, and managing the planet's natural resources for the benefit of all are the overarching challenges of sustainable development. I commend Tropical BioSummit 2024 and emphasise its value to all those seeking a solid understanding of these major issues, which will underpin our progress towards the future we desire.



Dr Haris Parengal
Chairperson
Centre for Tropical Biodiversity Conservation-CTBC

PREFACE

Greetings, Esteemed Colleagues and Conservation Advocates,

It is with great pleasure that we welcome you to **TropicalBiosummit'24**, convened by the **Centre for Tropical Biodiversity Conservation (CTBC)**. From June 8th to 10th, 2024 at Farook College (Autonomous) under the hosting of **PG and Research Department of Zoology**, we embark on a journey centered around the vital theme of "**Biodiversity and a Sustainable Future.**" This international conference serves as a platform to deepen our understanding and foster actionable solutions to safeguard our planet's diverse ecosystems.

We are thrilled to organize this significant event, bringing together researchers, policymakers, and conservationists from around the globe. The overwhelming response from participants, who have submitted numerous original research works, underscores the urgency and importance of our collective mission. After a meticulous review process, we have selected several high-quality abstracts for presentation, covering a wide range of topics within biodiversity conservation.

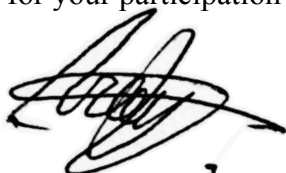
The conference will feature keynote addresses by leading experts, followed by invited talks and oral presentations that will delve into various aspects of biodiversity and sustainability. Additionally, we have organized poster sessions to showcase innovative research and initiatives. Each session is designed to facilitate knowledge exchange and inspire collaborative efforts to address the pressing challenges facing our ecosystems.

We extend our heartfelt gratitude to the organizing committee, sponsors, and all who have contributed to making TropicalBiosummit'24 a reality. Special thanks to our keynote speakers, invited speakers, national and international participants for their invaluable contributions and for traveling from afar to share their insights. We also appreciate the support from partnering institutions, whose dedication and collaboration have been instrumental in organizing this conference. We would like to extend our heartfelt gratitude to the **PG and Research Department of Zoology at Farook College** for their invaluable hosting and organizing support. Their dedication and assistance have been instrumental in the success of our endeavors.

The financial assistance received from **Research and Development Fund of National Bank for Agriculture and Rural Development (NABARD)** towards publication of conference/seminar proceedings is gratefully acknowledged. Their assistance has been crucial in bringing this conference to fruition and ensuring that the research and discussions are disseminated widely. This abstract book serves as a compendium of the diverse and impactful research being presented at TropicalBiosummit'24. It reflects the collective efforts and shared commitment of the global conservation community to promote a sustainable and resilient future for all life on Earth. We hope that this conference will inspire continued dialogue, innovation, and action in the field of biodiversity conservation.

Thank you for your participation and dedication to this crucial cause.

Sincerely,



Dr. Anoop Vijayakumar, Organising Secretary, TBS'24

Preface

The PG and Research Department of Zoology at Farook College (Autonomous), Calicut, in collaboration with the Centre for Tropical Biodiversity Conservation (CTBC), hosted the "Tropical BioSummit 2024," themed "Biodiversity and Sustainable Future." This summit brought together researchers, conservationists, and students globally to share cutting-edge research and foster collaboration.

We were honored by the presence of Dr. Tarifa Alzaabi, Director General of the International Center for Biosaline Agriculture (ICBA), UAE, and Dr. Charbel Tarraf, Chief of Operations and Development at ICBA, who played key roles in emphasizing the importance of international collaboration for biodiversity conservation and sustainable agriculture.

Thanks to the efforts of CTBC Chairperson Dr. Haris Parengal, organizing secretary Dr. Anoop, and others, the summit was a success. This collaboration opens new research opportunities, advancing tropical biodiversity studies and promoting sustainable practices.

As the program coordinator and a faculty member of the PG and Research Department of Zoology at Farook College, I hope these conference proceedings will inspire continued research and collaboration in the vital field of tropical biodiversity and sustainability.



Shabana TP
Associate Professor & Joint Org.Secretary of TBS'24
PG & Research Department of Zoology
Farook College (Autonomous) Calicut



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Preface to the Tropical Biosummit-24 Proceedings

On behalf of the TBS'24 organising committee organized by Centre for Tropical Biodiversity Conservation-CTBC, I would like to extend my warmest gratitude to all of the attendees to Tropical Biosummit'24 (TBS'24). As the Director of M.S. Swaminathan Research Foundation-Community Agrobiodiversity Centre (MSSRF CABc), I was honored to serve as advisory board member of this event. First, I would like to take this opportunity to convey my appreciation to the CTBC's organizing committee for untiring efforts to manage this convention.

Being part of the world community, we were all aware that research had consecutively played an extremely important role in its contribution to the body of knowledge and prospect development. While globalization appeared to have significant impacts for the worldwide society, this transnational assembly was intended for wide-ranging biodiversity and conservation research undertakings carried out by the involvement of industry and academic institutions. The selected topics depicted a vast pool of knowledge, resources and expertise of the scientific and technological community, which in turn made a substantial contribution for overall national development. Our sessions, therefore, represented a unique platform encouraging local/international scholars and professionals to interact for the expansion of their experiences and invaluable insights. It was anticipated that the theme "Biodiversity and Sustainable Future" would raise awareness and understanding regarding issues of global challenges, which had their immediate relevance in our personal lives. Through achieving environmental sustainability, the human society could then move toward a more sustainable and desirable future.

All in all, the TBS'24 offered a truly comprehensive view while inspiring the attendees to come up with solid recommendations to tackle hot-topic challenges. I would like to take this opportunity to thank the keynote speakers; presenters and authors for contribution, and bless you all a fulfilling experience and very pleasant stay in our country.

Dr Shakeela V.

Director, CABc MSSRF

Community Agrobiodiversity Centre

OUR VISION: An eco-sensitive self-reliant society empowered in conservation and sustainable & equitable utilization of biodiversity. OUR MISSION: Achieve social prosperity through conservation, enhancement and sustainable & equitable use of biological diversity by adopting and disseminating economically viable, ecologically sensitive and socially inclusive approaches & processes.

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Tropical Biosummit 2024

Centre for Tropical Biodiversity Conservation-CTBC
Venue: Farook College, Calicut

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7. Dr Rashid Ghazali, Syndicate Member, Bharathiar University
8. Dr Usman A, KAHM Unity Women's College, Manjeri
9. Dr Baiju PT, Department of Marine Science, CTBC
10. Arun CS, Department of Biotechnology and Genetics, CTBC
11. Dr Sherrie Jesulyn David, Associate Professor & Head, Department of Plant Biology and Plant Biotechnology, Women's Christian College (Autonomous), Chennai
12. Dr. P. Pandikumar, Senior Scientist, Xavier Research Foundation (XRF), St. Xavier's College (Autonomous), Tirunelveli, Tamil Nadu
13. Dr. Manju Vasudhevan, Founder, Forest Post, Thrissur, Kerala
14. Dr Mathimaran Natarajan, Asso. Professor and Head, Centre for Sustainability and Climate Studies, Department of Ecology and Environmental Sciences, Pondicherry University.
15. Sanil PC, Development Associate, MSSRF CAbC Wayanad

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7. Dr Muhammed Aashique Thalappil, Post-doc Researcher, School of Biotechnology, Dublin, Ireland



TROPICALBIOSUMMIT 2024: BIODIVERSITY AND SUSTAINABLE FUTURE



Date: 08th to 10th June 2024

Farook College (Autonomous)

PG & RESEARCH DEPARTMENT OF ZOOLOGY. KOZHIKODE-673632

www.tropicalbiosummit.org

Time	Title of the session	Resource person/ organizers
09:00 AM -09:05 AM	Welcome Address	Dr. A. P. Rashiba, Head, PG & Research Department of Zoology, Farook College (Autonomous), Kozhikode.
09:05 AM -09:15 AM	Presidential Address	Dr. Haris Parengal, Chairperson, Centre for Tropical Biodiversity Conservation.
09:15 AM -09:20 AM	About TBS'24	Dr. Anoop Vijayakumar, Organizing Secretary, Tropical BioSummit 2024
09:20 AM-09:30 AM	About FC	Dr. K.A. Aysha Swapna Principal, Farook College (Autonomous), Kozhikode.
09:30 AM-09:40 AM	Inaugural Address	Dr. Tarifa Alzaabi, Director General, ICBA, United Arab Emirates.
09:40 AM-09:45 AM	Felicitation	Dr. Charbel Tarraf Chief of Operations and development, ICBA, United Arab Emirates
09:45 AM-09:50 AM	Felicitation	Dr. Ali Faisal, Joint Secretary, Management Committee, Farook College (Autonomous), Kozhikode
09:50 AM-09:55 AM	Felicitation	Mr Rakesh V, DDM-NABARD, Kozhikode
09:55 AM-10:00 AM	Vote of Thanks	Ms. Shabana T P, Associate Professor & Programme Coordinator, Department of Zoology, Farook College (Autonomous), Kozhikode.



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CENTRE FOR TROPICAL BIODIVERSITY CONSERVATION (CTBC), OTTATHARA, KODUR POST,
MALAPPURAM, KERALA, PIN 676504



Dr. Tarifa Alzaabi

Director General, ICBA, United Arab

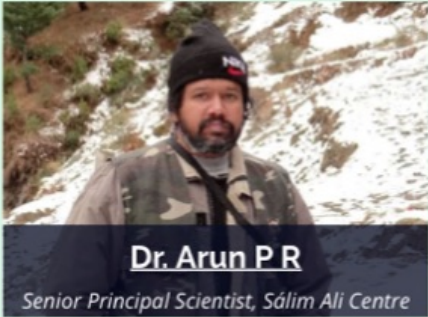
INVITED SPEAKERS

Here are some of our speakers



Dr. Andrea Claassen

Professor, Virginia Institute and State



Dr. Arun P R

Senior Principal Scientist, Sólím Ali Centre



Dr. Arya Sidharthan

Science Communications officer CSIR-IGIB



Dr. Charbel Tarraf

Chief of Operations and development



Jeffrey Schwilk



Dr. V. P. Limna Mol

Assistant professor, Dept. of Marine



Dr. Joy Scaria

Associate Professor, Oklahoma State



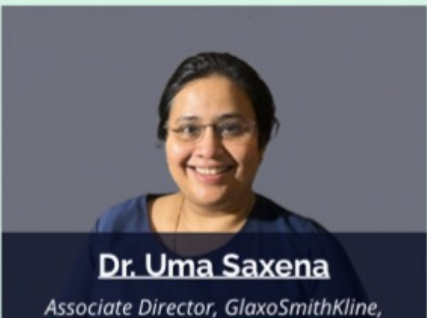
Dr. Nishith Dharaiya

Director, CWCS, Bhakta Kavi Narsinh Mehta



Dr. Rajeev Raghavan

Assistant Professor, Kerala University of



Dr. Uma Saxena

Associate Director, GlaxoSmithKline,



Dr. Vivek Philip Cyriac

Deputy Director, Centre for Tropical

TropicalBioSummit '24: Participation Report

The TropicalBioSummit '24 attracted a diverse group of delegates from 10 countries across Asia, Europe, and North America. The participating nations included India, Canada, Zimbabwe, the Philippines, Sri Lanka, Cameroon, Russia, Nepal, the United Arab Emirates, and the United States of America.

This international gathering brought together experts to present and discuss their work on various topics within biodiversity and conservation research. Each delegate contributed unique perspectives and insights, creating a rich tapestry of knowledge and experience. Their research covered a wide range of subjects, such as the impacts of climate change on biodiversity, innovative conservation strategies, sustainable agricultural practices, and the preservation of endangered species.

The presentations underscored the global nature of biodiversity challenges and highlighted the need for international cooperation and knowledge exchange. Through detailed discussions and collaborative workshops, participants explored new methodologies, shared best practices, and formed strategic partnerships to address the pressing issues facing our natural world. The diversity of topics and the expertise of the international participants not only enriched the conference but also paved the way for ongoing and future collaborations in biodiversity conservation and sustainable development.



Tropical Biosummit'24



Countries:

1. India
2. Canada
3. Zimbabwe
4. Philippines
5. Sri Lanka
6. Cameroon
7. Russia
8. Nepal
9. USA
10. UAE



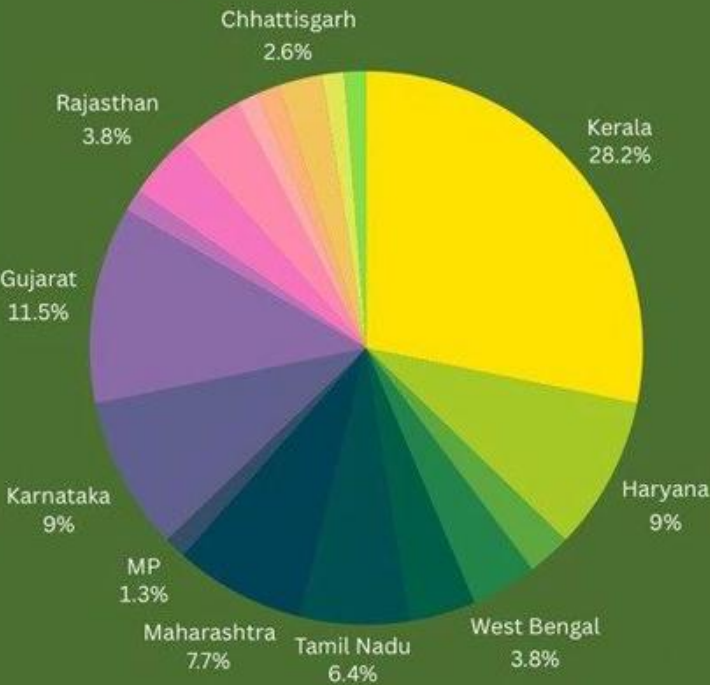
10

International Delegation

Participants from 10 countries, both Europe and Asia to present and discuss their works on a wide variety of topics provided in area of different biodiversity and conservation research.

National Delegations from India

18 states of India have participated TBS'24



Indian States:

1. Haryana
2. Odisha
3. West Bengal
4. Maharashtra
5. Uttar Pradesh
6. Kerala
7. Madhya Pradesh
8. Karnataka
9. Gujarat
10. Tamil Nadu
11. Punjab
12. Rajasthan
13. Telangana
14. Assam
15. Jharkhand
16. Chhattisgarh
17. Andaman and Nicobar Islands
18. Uttarakhand

In addition to the international presence, there was robust participation from 18 Indian states, showcasing the diverse and widespread interest in the topics of biodiversity and sustainability. The states represented included Haryana, Odisha, West Bengal, Maharashtra, Uttar Pradesh, Kerala, Madhya Pradesh, Karnataka, Gujarat, Tamil Nadu, Punjab, Rajasthan, Telangana, Assam, Jharkhand, Chhattisgarh, Andaman and Nicobar Islands, and Uttarakhand.

Delegates from these states brought a wealth of regional knowledge and experience, highlighting the unique biodiversity challenges and conservation efforts in different parts of India. Their participation underscored the national importance of biodiversity conservation and the need for localized approaches to address environmental issues.

Additionally, there was strong representation from various national universities, state universities, and other research institutions. Participants from these institutions presented cutting-edge research, shared innovative solutions, and engaged in meaningful dialogues on biodiversity conservation. Their involvement ensured that the conference was grounded in scientific rigor and benefited from the latest academic and research advancements.

Overall, the participation from these 18 Indian states and various esteemed institutions added a significant dimension to the conference, ensuring a comprehensive exploration of biodiversity and sustainability issues across different geographical and ecological contexts within India. This diverse representation facilitated a holistic understanding of the conservation landscape in India and promoted the exchange of region-specific strategies and solutions.

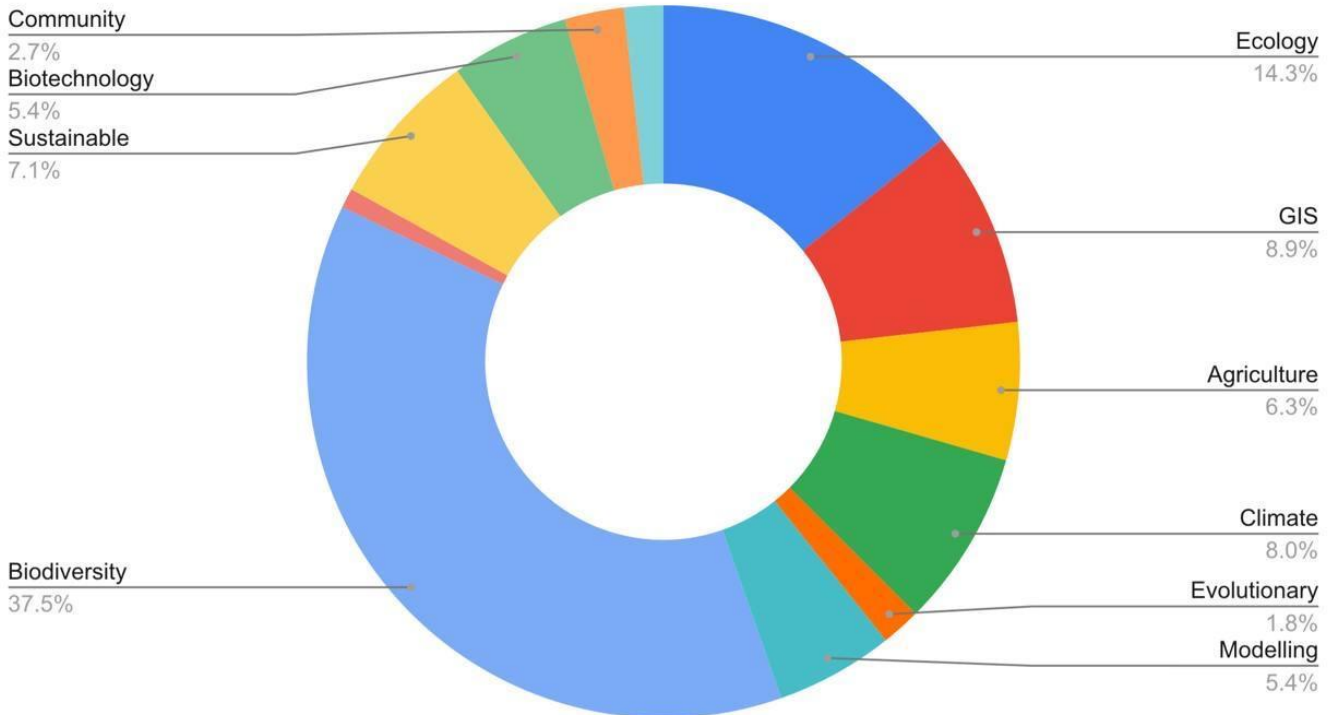
Participation Highlights:

Theme Popularity: The theme of Biodiversity attracted the highest number of participants, with 37.5% of abstracts received in this category. Ecology was the second most popular theme, accounting for 14.3% of the abstracts.

The theme of Biodiversity attracted the highest number of participants, with 37.5% of the abstracts received in this category. This high level of interest reflects the global urgency to address issues related to biodiversity conservation, species preservation, and the sustainable management of natural resources. Researchers presented a wide array of topics under this theme, ranging from conservation strategies for endangered species to the impact of human activities on biodiversity hotspots.

Ecology was the second most popular theme, accounting for 14.3% of the abstracts. This theme covered critical areas such as ecosystem dynamics, habitat restoration, and the intricate relationships between living organisms and their environments. Presentations in this category included studies on ecological balance, the role of keystone species, and the effects of climate change on various ecosystems. The significant interest in Ecology underscores the importance of understanding and maintaining the health of ecosystems to ensure long-term sustainability and resilience.

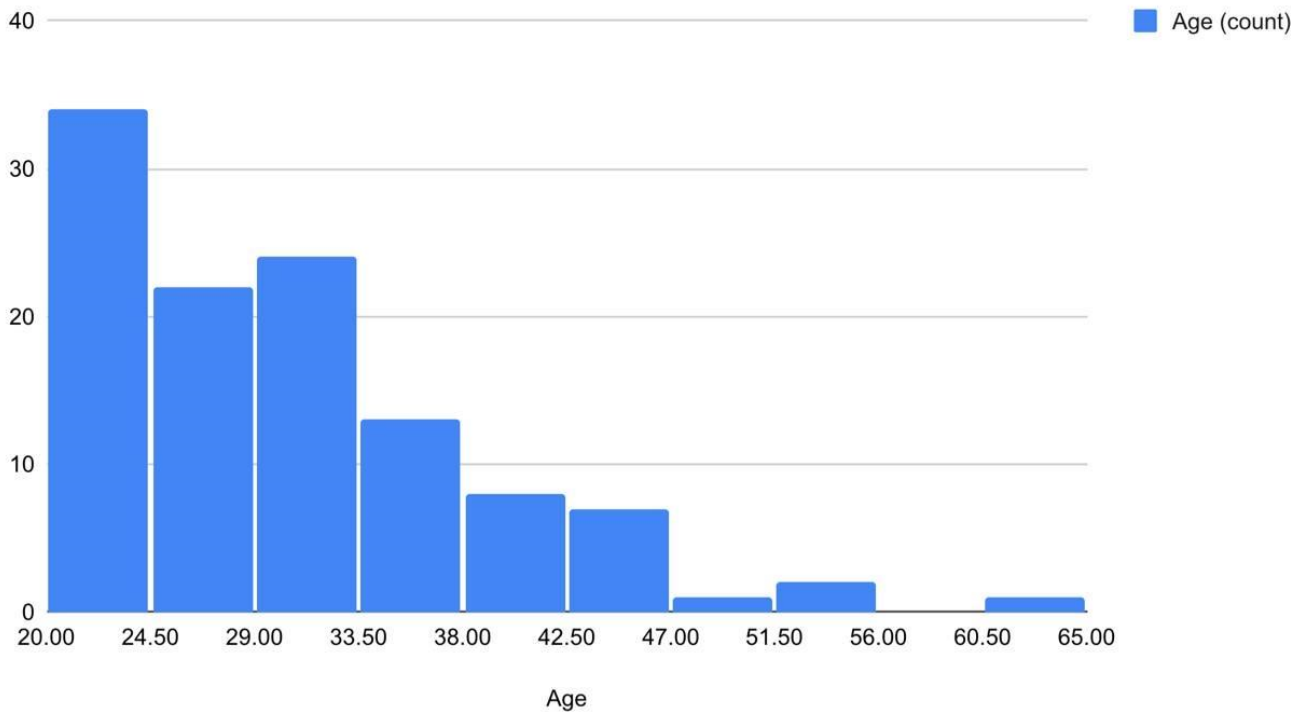
Count of theme



Age Demographics: The majority of participants fell within the 30 to 35 years age group.

The majority of participants fell within the 30 to 35 years age group, comprising professionals and researchers in the prime of their careers. This demographic choice reflects a trend towards early to mid-career scientists and experts actively engaging in biodiversity and conservation research. Participants in this age group brought diverse perspectives and innovative approaches to address pressing global challenges, contributing significantly to the depth and breadth of discussions and presentations at the conference. Their active involvement highlights a commitment to advancing scientific knowledge and promoting sustainable practices in environmental stewardship.

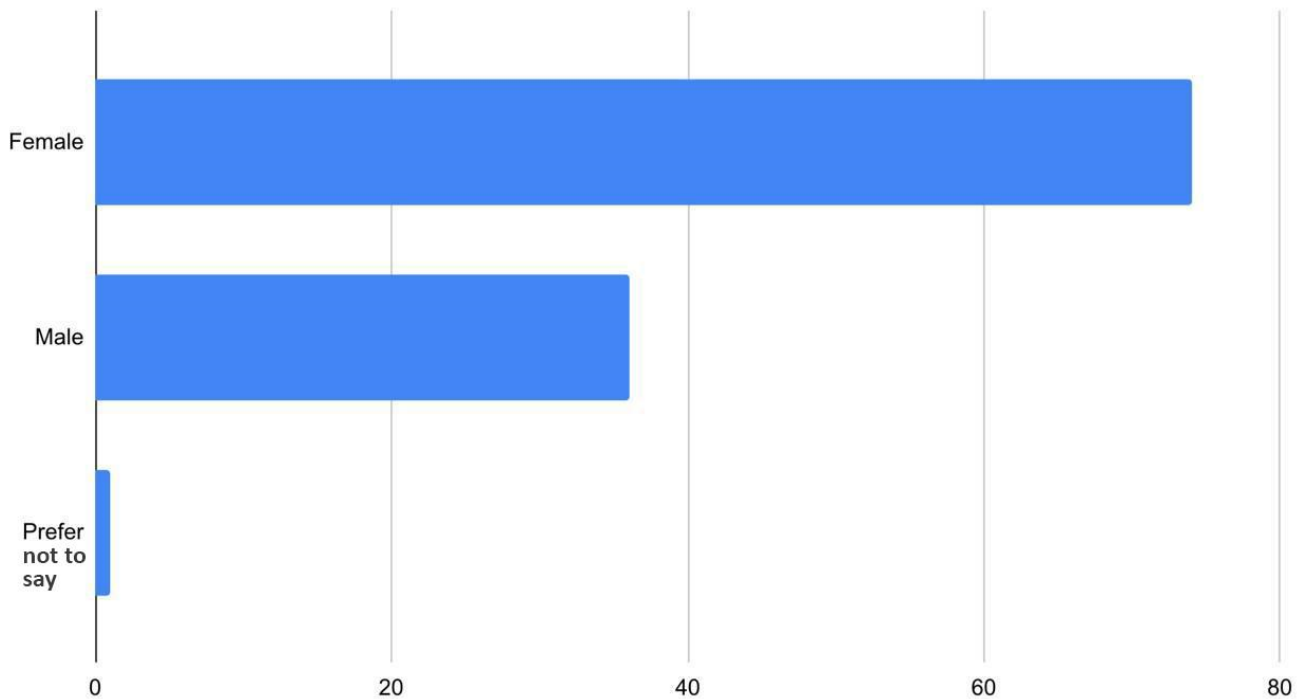
Histogram of Age



Gender Distribution: A significant 85% of the applicants were female.

A significant 85% of the applicants were female, showcasing a notable representation of women in the field of biodiversity and conservation. This gender diversity underscores the growing role of women scientists and researchers in driving impactful research and innovation within the environmental sciences. Their active participation at the TropicalBioSummit '24 not only enriched the discourse on sustainable development but also highlighted their pivotal contributions towards addressing global environmental challenges. The high participation of women underscores a positive trend towards gender equality in science and underscores the importance of inclusive representation in international scientific gatherings.

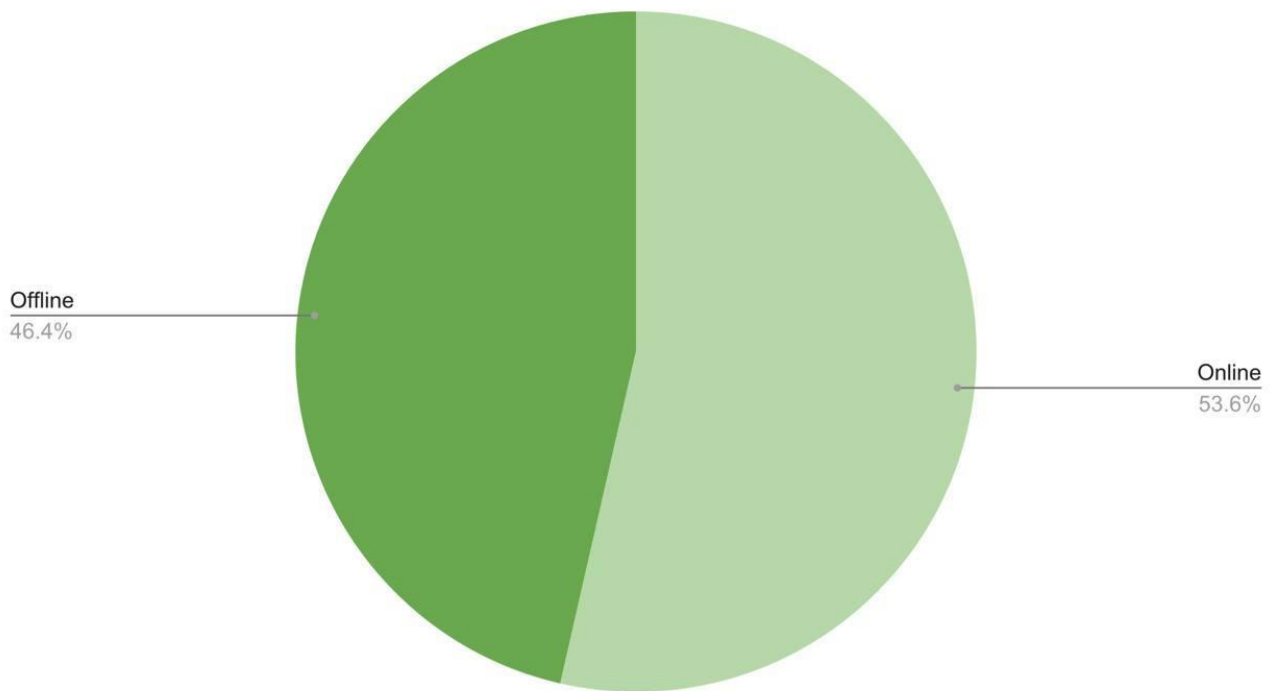
Count of Gender



Mode of Participation: In the hybrid mode of the TropicalBioSummit, 53.6% of applicants preferred participating online.

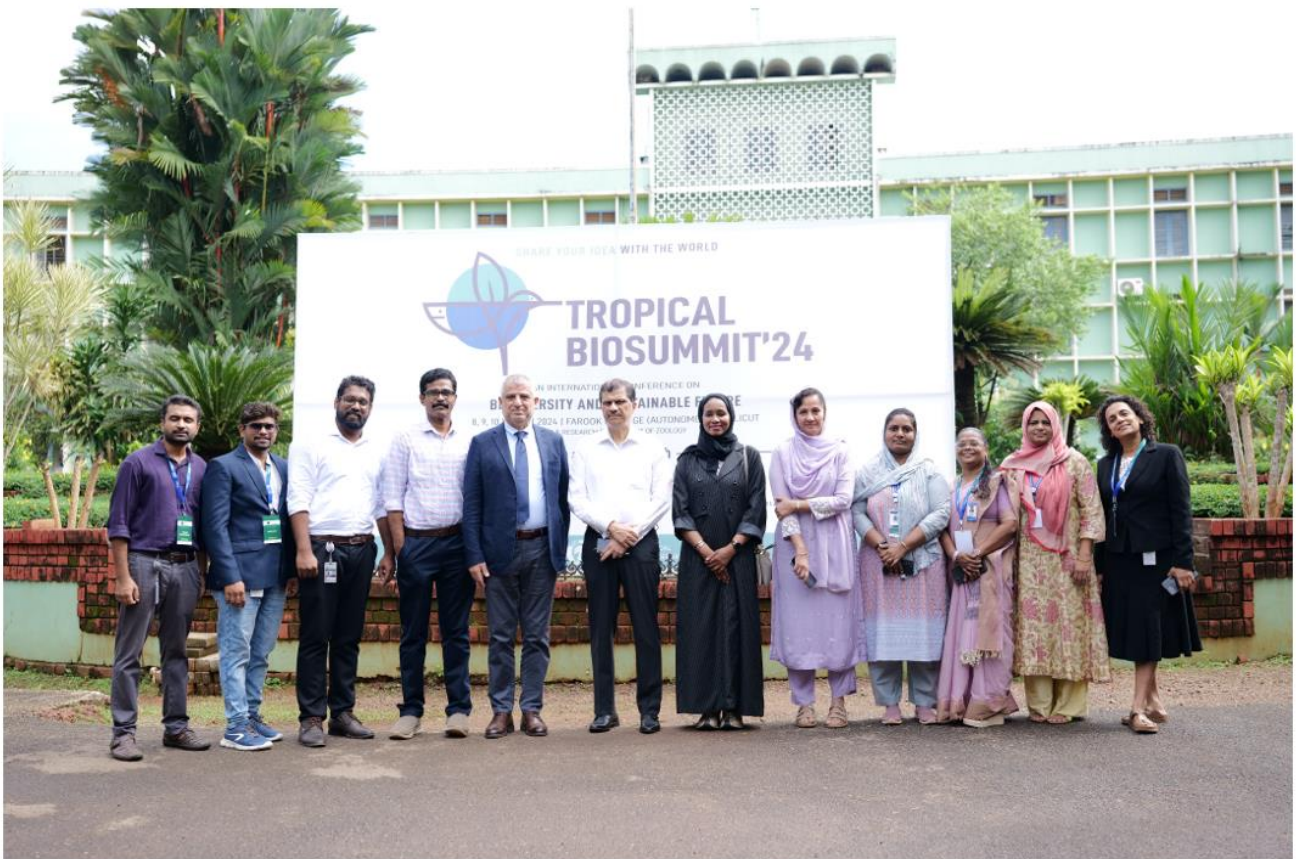
In the hybrid mode of the TropicalBioSummit, 53.6% of applicants preferred participating online, leveraging virtual platforms to engage remotely in presentations, discussions, and networking opportunities. This mode facilitated broader accessibility for participants worldwide, accommodating diverse schedules and geographical constraints. Online participants contributed actively through live sessions, virtual presentations, and interactive forums, enriching the conference with global perspectives and insights. Their involvement underscored the summit's commitment to inclusivity and innovation in fostering international collaborations and advancing knowledge in biodiversity and conservation research.

Count of Attending



TropicalBioSummit '24

The Centre for Tropical Biodiversity Conservation (CTBC) organized the three-day international conference, TropicalBioSummit '24, in association with the PG and Research Department of Zoology at Farook College (Autonomous), Calicut. This event brought together international delegates and facilitated fruitful discussions focused on "Biodiversity and a Sustainable Future." Researchers, scholars, and academicians from around the globe convened to address urgent contemporary challenges in bioscience and technology. TropicalBioSummit '24 not only provided a platform for sharing cutting-edge research but also fostered collaboration and networking among participants, paving the way for future advancements in the field of tropical biodiversity and sustainability.



Inaugural Session

The event commenced with a solemn prayer. The summit was inaugurated by the chief guest, **Dr. Tarifa Alzaabi**, Director General of the **International Center for Biosaline Agriculture (ICBA)** in the United Arab Emirates. The event was facilitated by **Dr. Charbel Tarraf**, Chief of Operations and Development at ICBA. Dr. Alzaabi highlighted the importance of international collaboration in advancing sustainable agriculture and ensuring food security in tropical countries.



Other dignitaries present included **Dr. Anoop Vijayakumar**, Organizing Secretary of Tropical BioSummit 2024; **Dr. Haris Parengal**, Chairperson of CTBC; **Dr. Ali Faisal**, Joint Secretary of the Management Committee at Farook College; **Dr. K.A. Aysha Swapna**, Principal of Farook College; and **Rakesh V.**, DDM, Calicut, NABARD. **Dr. A. P. Rashiba**, Head of the Zoology Department, delivered the welcome address, and **Ms. Shabana TP**, coordinator of the conference, extended the vote of thanks.

Keynote Speakers, Invited Speakers, and Topics

1. Dr. Tarifa Alzaabi

Director General, International Center for Biosaline Agriculture, United Arab Emirates

Topic: The Importance of International Collaboration in Developing Sustainable Agriculture and Ensuring Food Security in Tropical Countries

2. Dr. Arun P R

Senior Principal Scientist, SACON, India

Topic: Environmental impacts; Challenges and lessons from nature

3. Dr. Arya Sidharthan

Science Communications Officer CSIR-IGIB, India

Topic: Exploring the depths: citizen science and outreach unveils Kerala's groundwater and subterranean biodiversity

4. Dr. Charbel Tarraf

Chief of Operations and Development

International Center for Biosaline Agriculture, UAE

Topic: The Role of Leadership and Strategic Planning in Enhancing Sustainable Agriculture Practices: A Comparative Analysis of Institutional Approaches in the Middle East and North Africa (MENA) Region

5. Dr. Rajeev Raghavan

Assistant Professor, KUFOS, India

Topic: Keep them swimming: securing the future of South Asia's freshwater fishes

6. Dr. V. P. Limna Mol

Assistant professor, Dept. of Marine Biosciences, KUFOS, India

Ocean and Climate Change - The Way Forward

7. Dr. Uma Saxena

Associate Director, GlaxoSmithKline, Massachusetts, USA

Topic: Early detection and stratified treatment is key for improving cancer survival

8. Jeffrey Schwilk

Ornithologist-USA

Topic: Vultures of the World a book

9. Dr. Joy Scaria

Associate Professor, Oklahoma State University, USA

Topic: Biotechnological frontiers in Biodiversity Conservation

10. Dr. Vivek Philip Cyriac

Deputy Director, CTBC. India

Topic: Digging into evolutionary time: Diversity and conservation of fossorial shieltail snakes

11. Heera C K

Researcher, Pesticide Action Network (PAN) India.

Topic: Highly Hazardous Pesticides and its impact on biodiversity

12. Roshni K S

Researcher, Pesticide Action Network (PAN) India.

Topic: Adverse Effects of Herbicides on Biodiversity

13. D. Dileep kumar

CEO, Pesticide Action Network (PAN) India.

Topic: Impacts of Pesticides on Biodiversity-concerns and opportunities for conservation.

14. Dr Nishith Dharaiya

Director, CWCS, Bhakta Kavi Narsinh Mehta (BKNM) University, Junagadh, Gujarat, India

Topic: Presentation on sloth bear range mapping for 2024

Daily Sessions and Activities

Each day began with a breakfast session, followed by talks and presentations in the Audio-Visual Theatre. Lunch and tea breaks were also included.

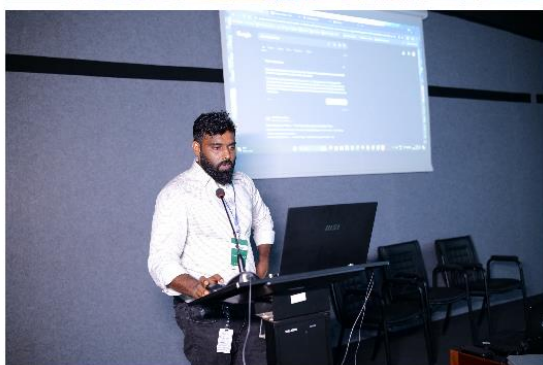
Day 1:

-After the inaugural sessions, **Mr. Jeffrey Schwilk** delivered a keynote speech on, Vultures of the World.

- Researchers presented their studies both online and offline.

- Afternoon workshops were held on 'R Programming,' 'GIS,' and 'Phylogeny' at various venues.

- The day concluded with cultural performances by the college dance and music clubs.



Day 2: Continued with paper presentations, both online and offline, and ongoing workshops. Keynote speeches included:

1. **Dr. Arun P R:** "Environmental Impacts; Challenges and Lessons from Nature"
2. **Dr. Rajeev Raghavan:** "Keep Them Swimming: Securing the Future of South Asia's Freshwater Fishes"
3. **Dr. Nishith Dharaiya:** Presentation on sloth bear range mapping for 2024
4. **Dr. Arya Sidharthan:** "Exploring the Depths: Citizen Science and Outreach Unveils Kerala's Groundwater and Subterranean Biodiversity"
5. **Dr. V. P. Limna Mol:** "Ocean and Climate Change - The Way Forward"



Final Day and Valedictory Function

The final day included keynote speeches and a symposium. **Dr. Joy Scaria** presented groundbreaking research that utilizes genetic engineering, molecular biology, and bioinformatics to conserve biodiversity. Later, **Dr. Vivek Philip Cyriac** delivered an engaging talk titled "Digging into Evolutionary Time: Diversity and Conservation of Fossorial Shield tail Snakes,"



The expert panel from CTBC, comprising **Mr. Harif P.**, Executive Director; **Mr. Sandeep Prabhakaran**, Director; **Dr. Mirium M. Abraham**, Dean and Research Coordinator; and Deputy Directors **Mr. Sethu Madhav**, **Dr. Parvathy Nair**, **Dr. T.P. Ajeesh Krishna**, and **Dr. T.P. Adarsh Krishna**, led the workshops and managed both offline and online presentations.

Symposium: Mr. D. Dileep Kumar, Ms. Roshni K. S. and Ms. Heera C. K. from Pesticide Action Network (PAN) India conducted the symposium on "Pesticides and Biodiversity" which addressed the impacts of pesticide use on biodiversity and ecosystems, discussing both the threats posed and potential solutions.

This session provided a comprehensive and engaging forum that addressed the multifaceted impacts of pesticide use on biodiversity and ecosystems. This highly informative and interactive session drew participants from various backgrounds, including students, researchers, policymakers, and environmental activists. Attendees engaged in lively discussions, exploring both the immediate and long-term threats posed by pesticides to flora and fauna. The dynamic exchange of ideas and experiences made this section a standout, leaving attendees with actionable insights and a renewed commitment to balancing agricultural needs with biodiversity conservation.



Presentations: The summit featured 109 paper presentations (48 offline and 61 online), six keynote speeches and eight invited speeches, all accompanied by lively Q&A sessions.



Awards: The best presentations were awarded as follows:

Best paper (online) was shared by two recipients:

- Mr. Kalpapran Patowary: "Potential Densities of Leopards in Sub-Saharan Africa: Target for Recovery and Informing Current Management"

- Mr. Edgar M. Anud, Jr.: “Distribution of Liverwort Flora Across Vegetation Types in Mt. Bagalbal: A Basis for IEC Material Development”

Best paper (offline):

- Ms. Amritha Jaiprekash Kurup: “Plankton - The Stewards of Ecological Health: An Analysis of Planktic Morphospecies from Pulicat Lake as Potential Ecoindicators”

Best poster award:

- Ms. Gopika S. Pillai: “Study of Forest Carbon Dynamics of Idukki District Using Forest Inventory Data”



Conclusion

The TropicalBioSummit '24 marked a significant milestone in advancing biodiversity conservation and sustainable development, fostering a collaborative environment for researchers, students, and professionals. The event concluded with a valedictory function, expressions of gratitude, and the awarding of best presenters. Participants shared feedback and captured memorable moments through photography, ensuring the event was both commemorated and celebrated.



Tropical BioSummit '24 Receives Extensive Coverage in Local and National Media

The Tropical BioSummit '24 received extensive coverage and publicity from both local and national newspapers and media outlets, highlighting its importance in the fields of biodiversity and sustainable development. Prominent publications such as The Hindu, Siraj, and People's Review extensively reported on the three-day event. The summit's in-depth discussions and contributions from renowned scholars and researchers drew attention to critical issues in bioscience and technology. Detailed articles and news features widely disseminated the summit's objectives and outcomes, enhancing its impact on environmental sustainability and global biodiversity conservation efforts.

For more details, click the QR code or follow the provided link.



[The Hindu](#)

<https://www.thehindu.com/news/cities/kozhikode/three-day-international-conference-at-farook-college-in-kozhikode/article68269801.ece>

സിറാജ്
SIRAJ MALAYALAM DAILY SINCE 1984
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ഫാറൂഖ് കോളജിൽ ട്രോപ്പിക്കൽ ബയോ സമ്മിറ്റിന് തുടക്കം

കോഴിക്കോട് ഫാറൂഖ് കോളജിൽ ട്രോപ്പിക്കൽ ബയോ സമ്മിറ്റിന് തുടക്കം കുറിച്ചു. മൂന്നു ദിവസം നീണ്ടുനിൽക്കുന്ന ഈ സമ്മിറ്റിന് ഫാറൂഖ് കോളജിന്റെ പ്രവർത്തനങ്ങൾക്കും വികാസത്തിനും വലിയ പങ്കു വഹിക്കുമെന്ന് പ്രതീക്ഷിക്കുന്നു. മേഖലയിലെ വിവിധ സർവ്വകലാശാലകളിൽനിന്നും പങ്കെടുത്ത ശാസ്ത്രജ്ഞന്മാർക്കും വിദ്യാർത്ഥികൾക്കും ഇവിടെ ഒരു സമ്മേളനം സംഘടിപ്പിച്ചു. ഫാറൂഖ് കോളജിന്റെ പ്രവർത്തനങ്ങൾക്കും വികാസത്തിനും വലിയ പങ്കു വഹിക്കുമെന്ന് പ്രതീക്ഷിക്കുന്നു.



ഫാറൂഖ് കോളജിന്റെ തലവന്മാർക്കും വികാസത്തിനും വലിയ പങ്കു വഹിക്കുമെന്ന് പ്രതീക്ഷിക്കുന്നു.

മലയാള മനോരമ



ഫാറൂഖ് കോളജിൽ ട്രോപ്പിക്കൽ ബയോ സമ്മിറ്റിന് തുടക്കം കുറിച്ചു. മൂന്നു ദിവസം നീണ്ടുനിൽക്കുന്ന ഈ സമ്മിറ്റിന് ഫാറൂഖ് കോളജിന്റെ പ്രവർത്തനങ്ങൾക്കും വികാസത്തിനും വലിയ പങ്കു വഹിക്കുമെന്ന് പ്രതീക്ഷിക്കുന്നു.

ഫാറൂഖ് കോളജിൽ 'ട്രോപ്പിക്കൽ ബയോ സമ്മിറ്റി'

ഫാറൂഖ് കോളജിൽ ട്രോപ്പിക്കൽ ബയോ സമ്മിറ്റിന് തുടക്കം കുറിച്ചു. മൂന്നു ദിവസം നീണ്ടുനിൽക്കുന്ന ഈ സമ്മിറ്റിന് ഫാറൂഖ് കോളജിന്റെ പ്രവർത്തനങ്ങൾക്കും വികാസത്തിനും വലിയ പങ്കു വഹിക്കുമെന്ന് പ്രതീക്ഷിക്കുന്നു.

ഫാറൂഖ് കോളജിന്റെ പ്രവർത്തനങ്ങൾക്കും വികാസത്തിനും വലിയ പങ്കു വഹിക്കുമെന്ന് പ്രതീക്ഷിക്കുന്നു.

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Canopy Geospatial Solutions

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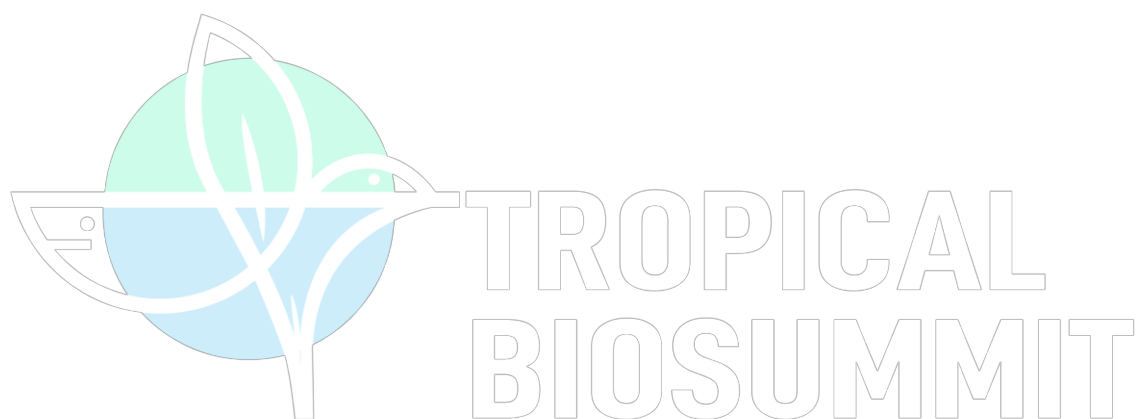
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ABSTRACTS OF ORAL PRESENTATION

BIO-01

Theme 1: Biodiversity (BIO)

Controlling Land Degradation and Desertification by Enhancing Vegetation Cover and Community Participation: Case of Chambal Ravines, India

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Abstract

Introduction: Ravine land degradation is a severe form of environmental degradation in India, particularly prevalent in the Chambal badlands, covering approximately 4000 sq. km. This highly dissected landscape within the Middle Alluvial Ganga Plains (MGAP) faces significant challenges due to gully erosion and anthropogenic disturbances, leading to unproductive and infertile land. **Objective:** This study aims to control land degradation and desertification in the Chambal ravines by enhancing vegetation cover and involving community participation. The focus is on the Morena district in Madhya Pradesh, using land reclamation measures and soil-moisture conservation techniques. **Methods:** In 2022, a 22.68 ha area was planted with seven tree species: *Acacia catechu*, *Acacia tortilis*, *Azadirachta indica*, *Anogeissus pendula*, *Commiphora wightii*, *Aegle marmelos*, and *Emblia officinalis*. The randomized block design (RBD) approach was used, with three replicate blocks incorporating various soil amendment treatments. Three bio-fertilizers—*Rhizobium*, *Azotobacter*, and *Azospirillum*—were applied in 5%, 10%, and 15% doses. Additionally, three types of mulch—wheat husk, stone pebbles, and leaf litter—were used to conserve soil moisture and enhance soil nutrient status, resulting in 27 treatment combinations. **Results:** Initial findings indicate that the reclamation measures, including native tree plantations and check-dam construction, achieved an 85% success rate. These interventions significantly improved vegetation recovery, soil health, and carbon storage. **Conclusions:** Enhancing vegetation cover and involving the local community in land reclamation efforts can effectively combat land degradation and desertification in the Chambal ravines. Continued monitoring and more extensive studies are recommended to sustain and build on these initial successes.

Keywords: land degradation, desertification, Chambal ravines, and vegetation

Distribution pattern of Genus Riccia at Girnar Wildlife Sanctuary, Gujarat, India

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Abstract

Introduction: The Girnar Wildlife Sanctuary (GWS) in Gujarat is recognized for its rich bryoflora. However, long-term studies on bryophyte diversity and distribution, particularly for the genus *Riccia*, are scarce. **Objective:** This study aims to investigate the species richness and dominance of the genus *Riccia* within GWS. **Methods:** During 2022 and 2023, a detailed study was conducted across 16 sites within the sanctuary. The random sampling method was employed to cover all possible geographic localities, focusing on the diversity and distribution of liverworts. Comprehensive field sessions were undertaken to collect samples and identify species based on their taxonomic characteristics. **Results:** Five species of *Riccia* were identified: *Riccia billardieri* Mont. et Nees, *Riccia discolor* Lehm. & Lindenb., among others. *Riccia billardieri* was found to be the dominant species, followed by *Riccia discolor*. The study highlights the importance of these species and their ecological significance within the sanctuary. **Conclusions:** The findings underscore the necessity for careful documentation and analysis of bryophyte species in GWS. Given their susceptibility to environmental changes, it is crucial to conserve these ecologically significant plants before they potentially face extinction. The study advocates for ongoing monitoring and conservation efforts to preserve *Riccia* species within the sanctuary.

Keywords: *Riccia*, Girnar Wildlife Sanctuary, Dominance, Distribution, GIS.

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Carnivores in Corridors: Patterns of Negative Human-Large Carnivore Interaction in Wildlife Corridors of Human-Dominated Terai Landscape, Uttarakhand, India

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Abstract

Background: Human-wildlife interaction has multiple aspects and patterns. To address the issue of Human-Wildlife Conflict (HWC), it is important to identify critical areas of conflict, types of conflict, wildlife species involved in the conflict, and factors of conflict. **Aim:** To identify the key hotspot areas of human-large carnivore conflict (HLCC) and patterns of conflict in wildlife corridor habitats of the Terai landscape, Uttarakhand. **Method:** The study area comprised of Kosi corridor (Study Block 1) along Corbett Tiger Reserves, and Kilpura-Khatima-Surai (KKS) and Boom-Brahmadev (BB) corridor (Study Block 1) around Nandhaur Wildlife Sanctuary at Indo-Nepal transboundary in Uttarakhand. The conflict hotspots of HLCC were identified using Kernel Density Estimation in ArcGIS 10.7 based on secondary data from the state forest department. The trends and patterns of HLCC were assessed based on questionnaire survey data of the communities, secondary data and data collected during the survey in Ms-Excel and statistical analysis of variables in PAST 4.03 tool. **Result:** The high-risk conflict hotspots identified in the wildlife corridor habitat areas are near densely populated human-habitation areas with deteriorating habitat and land-use change. The attacks related to tigers are higher than leopards in Study Block 1, and leopard cases are higher in Study Block 2. The location of the attack is significantly associated with the season and condition of the victim's body. The HLCC events peak in the monsoon season in study block 1 and in winter in block 2. **Conclusion:** The drivers and factors for coexistence transforming into conflict were modification of wild habitats due to the degradation of habitat, fragmentation, and change in land-use patterns, resulting in increased interaction of human-wildlife. The obstruction and decreasing porosity of wildlife corridors are the primary factors for aggregated and intensified conflict in specific areas of the landscape, especially at corridor bottlenecks. The study sites are important links to the terai arc landscape, providing transboundary movement of wide-ranging species between India and Nepal. To reduce the conflict, hotspot areas need to be regularly monitored, and habitats should be protected with the participation of key stakeholders.

Keywords: Carnivores, Human wildlife conflict, and Hotspot areas

Mapping and Floral Diversity Study of Mahananda Wildlife Sanctuary

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Abstract

Biodiversity Assessment is a crucial aspect of Conservation Biology. It is gaining importance as, by implementing good conservation assessment practices, efficient conservation strategies can be devised, which are not only appropriate for the conservation of the biodiversity of the region but are also designed to protect the biodiversity from the effects of climate change and the effects of changing anthropogenic influences on the forest cover of the region. In present times, forests face the impact of climate change and various anthropogenic factors which has led to the requirement of more effective conservation strategies. Understanding the diversity of the region both structurally and at the community level is important as it helps in framing appropriate conservation strategies. Mahananda Wildlife Sanctuary is among the 16 Wildlife Sanctuaries located in West Bengal. Fragmentation of forest land and habitat loss due to climate change and anthropogenic influences in forests has been an important concern worldwide leading to the extinction of many species. This study recognizes the present status of the floral diversity of Mahananda Wildlife Sanctuary, it provides information on the Tree Density, Stand Structure and Regeneration Status of the Wildlife Sanctuary, for which 88, 0.1 ha random plots were laid across the protected area. A study area map was prepared in which the plots were laid randomly, in 4 elevation ranges. Within each plot, all the tree species along with the Regenerating species in the subplots were considered. The plants were identified according to the APG IV classification system, and the current IUCN status of the species was also determined. Phytosociological attributes were calculated and further statistical analysis of the data was done. The diversity indices, stand density and regeneration status was within the range of values reported in previous studies from the Eastern Himalayas. The results indicate the importance of adopting appropriate conservational measures that can mitigate the effects of disturbances and conserve the floral diversity of the region.

Keywords: Floral diversity, Conservation biology, and Mahananda wildlife sanctuary

Managing and Mainstreaming Traditional Varieties of Agricultural Crops in Central India

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Abstract

A baseline survey was conducted at the project site, selecting 10 percent of total households to study cropping patterns and crop biodiversity utilization. A novel seed exchange system, the 'Charjhaniya Method', prevalent among tribal farmers, was identified. This method involves a blockchain-like assurance of seed distribution among farmers. Mother trials were conducted to evaluate traditional crop varieties and identify those with regional potential, followed by crowdsourcing trials in local fields. Seventy-two Mother trials for 10 different crop species were conducted, resulting in the selection of 92 varieties/landraces across eight crops: Rice (21), Urd Bean (11), Millets (13), Pigeonpea (16), Mustard (13), Gram (11), Moong Bean (4), and Wheat (3). A total of 27 crowdsourcing trials tested 428 entries in the fields of 1,043 farmers using ClimMob software for coding and shuffling seeds. Specifically, 169 entries of Rice were tested by 380 farmers, 78 entries of Pigeonpea by 190 farmers, 53 entries of Mustard by 153 farmers, 44 entries of Chickpea by 90 farmers, 39 entries of Minor millets by 110 farmers, 28 entries of Black gram by 50 farmers, and 17 entries of Grain amaranth by 70 farmers. Each year, varieties were ranked based on farmers' feedback, creating a database of preferred crop varieties. A total of 30 varieties/landraces from seven crops were selected from the crowdsourcing trials: Rice (9), Black Gram (4), Pigeonpea (4), Minor Millets (4), Mustard (5), Chickpea (3), and Grain Amaranth (2). Notable preferred genotypes included Vikram-TCR, TCDM-1, RRF105, Jeeraphool in Rice; Telia Urd, Indira Urad Pratham in Black gram; Makadi Arhar, CG Arhar-1 in Pigeonpea; Bada Kodo, CG Kutki-2 in Minor millets; Lutni Sarso, Varuna in Mustard; and Majhola Chana, RVG 203 in Chickpea

Keywords: Agricultural crops, crop diversity and Charjhaniya method

Leveraging Citizen Science to Improve Expert-drawn Range Maps and Conservation Assessments of poorly-known Shieldtail Snakes

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Abstract

Understanding species distributions is fundamental to accurately assessing their conservation needs. The International Union for Conservation of Nature (IUCN) largely relies on geographic ranges to classify species as threatened or non-threatened. Their geographic range maps, often considered authoritative, draw from expert opinions. However, the accuracy of expert-drawn range maps for rare and poorly studied species is seldom questioned. Shieldtails, a group of small fossorial snakes in Peninsular India and Sri Lanka, are among India's least-known snakes. Of 65 known species, 22 are threatened, and many lack sufficient data for IUCN Red List assessments. To address this gap, we launched the Shieldtail Mapping Project, a citizen science initiative to gather data on Indian shieldtails. By engaging communities and curating observations and literature, we collected over 1100 occurrence points. We then selected twelve species and created geographic ranges. Comparing these ranges to IUCN range maps revealed significant overestimations and underestimations in IUCN's expert-drawn species ranges, leading to inaccurate conservation assessments. Using the newly available occurrence data on shieldtails, We analyzed the elevational ranges of shieldtails in the Western Ghats, assessing threats such as human footprint, tree cover loss, vehicular traffic, and protected area presence. We discovered that the majority of shieldtails had narrow geographic distributions, frequently limited to specific hill ranges in the western ghats. Certain shieldtails have specific elevational boundaries, making them more vulnerable to climate change. Widespread patterns of human footprint and tree cover loss were seen within shieldtail ranges; species with higher protected area coverage were better shielded from these threats than sensitive species that have experienced habitat changes in recent years. Our study highlights the effectiveness of citizen science in researching elusive species. We provide suggestions to improve IUCN conservation statuses for twelve shieldtail species, some of which had never been assessed. This data-driven approach identifies species' conservation needs, demonstrating the importance of community engagement in biodiversity research.

Keywords: Conservation, IUCN and Westernghats

Conservation Status and Seasonal Dynamics of Ichthyofaunal Diversity in a Hill Stream of the Eastern Himalaya (Arunachal Pradesh), NE India

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Abstract

Introduction: The eastern Himalayas are home to unique hill streams that support a diverse array of cold-water fish species. These hill stream fishes exhibit a variety of structural adaptations and unique behaviors related to movement and feeding. However, many areas in the eastern Himalayas remain unexplored, potentially harboring unknown species. This study aims to explore the endemic ichthyofaunal diversity of hill stream fishes in Noa Dihing, eastern Arunachal Pradesh. **Objective:** To evaluate the taxonomical details, conservation status, and ichthyofaunal diversity of hill stream fishes in Noa Dihing. **Methods:** The study site Noa Dihing (96° 18' 15.437" E and 27° 31' 9.7098" N; elevation: 237 msl) is situated in the eastern Himalaya (Arunachal Pradesh). Fish sampling was carried out (from October 2020 to December 2021) seasonally in three sampling sites following local fishermen using cast net, dip net and different traditional methods used locally. The collected fish specimens were identified following Talwar and Jhingran (1991), Jayaram (1999) and Vishwanath (2021). Conservation status of fish species was followed by IUCN, 2020. The diversity indices [Shannon-Wiener index (Shannon-Weiner 1949); Simpson diversity & dominance index (Simpson 1949), Margalef index (Margalef 1968) and Pielou Index (Pielou 1975)] were estimated as per the standard methods. Seasonal differences of diversity indices were tested with one-way ANOVA (using latest SPSS 20). **Results:** The study identified 24 rheophilic fish species (EN: 2; NT: 4; VU: 2; LC: 14; DD: 2) from 16 genera and 3 orders (Anabantiformes, Cypriniformes, and Siluriformes). These fishes exhibited unique adaptations, such as adhesive apparatus and modifications in shape and size. Diversity indices indicated higher diversity during the post-monsoon season ($H=3.15$) and lower diversity during the monsoon ($H=2.65$), with significant seasonal variations. The dominance index was inversely related to the diversity index, and the evenness index ranged from 0.75 to 0.88. **Conclusion:** This study provides baseline data on the fish diversity in Noa Dihing, which is essential for the conservation and management of fish species in the eastern Himalayan region.

Keywords: biodiversity conservation, eastern Himalaya, endemic ichthyofauna, diversity indices and hill stream

***Threat and Decline in Pomfret and Hilsha Fishes: An Indicator of Mahanadi River
Estuary Biodiversity, Odisha, India***

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Abstract

The Mahanadi estuarine system is one of the major estuaries in India and the largest estuary in Odisha. It is spread over a wide area in the Cuttack and Purl districts of about 165 kilometers of coast line along the coast of Bay of Bengal. The estuarine environment is characterized by a constantly changing mixture of salt and freshwater, and is typically dominated by fine sedimentary material carried into the estuary from the sea and from rivers, which accumulates in the estuary to mud-flats. The mixture of salt and freshwater present challenges to the physiology of the fishes. Overfishing, degradation of the environment and pollution are the main causes of the decline in Pomfret and Hilsha fish populations in the Mahanadi estuary system. Four of the 121 native fish species have seen a substantial decline in population. The production of fisheries has increased overall, but non-native species now account for a considerable portion of the catch and many valuable native species are disappearing. Numerous species will vanish from the Mahanadi River as a result of untreated municipal and industrial garbage. Reducing pollution, better controlling fishing operations, and maintaining places with robust native fish populations should be the main goals of conservation initiatives. The endangered Hilsha and Pomfret fish populations in the Mahanadi estuary system may benefit from these actions.

Keywords: Mahanadi estuarine, Fishes, Pollution, and Sedimentary material

Conservation of Heronries in Malappuram, Kerala: Identifying Threats and Solutions

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Abstract

The expansion of human populations generally decreases ecologically important areas due to urbanization. It will necessitate the wildlife to adapt with urbanization and the heronry birds are the best example for it. Heronries are the important breeding sites of some wetland birds. In Malappuram, urban areas host most of the heronries. Due to this tendency, many heronries are vulnerable to various threats and are questioning their existence. We studied the threats and challenges of Malappuram heronries and formulated conservation strategies for their protection. From 2021 to 2023, we conducted regular field surveys in the heronries during breeding season (July to September). We followed standard heronry survey procedures. At each visit, we collected basic information about heronry, public attitude towards heronry and the threats in the prepared data sheet by direct observation and questionnaire methods. We also included information from reliable source in the social media platforms. We documented 51 heronries during the study period. Unfortunately, heronries encounter various threats. The major threat was loss of nesting sites, especially due to tree cutting. During the breeding period, the nesting tree cutting poses the greatest danger. In 2022, more than 200 fledglings were perished in the four heronry sites due to this activity. Human disturbances, shrinkage of wetlands, pollution and climate change pose a significant threat to heronries. These threats ultimately lead to decreasing the breeding outputs or abandonment of nesting sites. The heronries, rich in nutrients and hold ecological significance through the diversity of avian fauna. We need to develop conservation plans in collaboration with the public to increase its effectiveness. Proper documentation heronries in the biodiversity register, regular monitoring, planting trees, stringent legal actions and penalties are crucial conservation strategies. Promoting guano collections by farmers, employing heronry guards and regularly removing heronry wastes from public sites can help to change the public's negligent attitude towards these sites. In the upcoming breeding season, these essential steps should be initiated to safeguard heronries.

Keywords: Urbanisation, Consequences, reproductive output, heronry guard

*A study for the detection of microplastics in “Perna viridis” at Gotheeswaram beach,
Calicut*

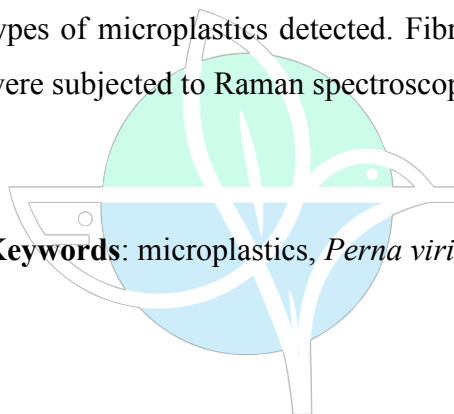
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Abstract

The rate of plastic production and usage is increasing every day. In these circumstances there is a greater chance of formation of microplastics and their incorporation to food chain. This study detected the presence of microplastics in *Perna viridis*, commonly called green mussel. The samples were collected directly from the vendors near the Gotheshwaram beach, Calicut, Kerala. Out of the 97 samples analysed, microplastics were observed in 33 samples. The particles were identified using stereo microscope. Fibres and microbeads were the **only** types of microplastics detected. Fibres were tested by hot needle test and few microplastics were subjected to Raman spectroscopy for characterisation.

Keywords: microplastics, *Perna viridis*, microbeads, and Gotheeswaram beach



TROPICAL
BIOSUMMIT

Study of Butterfly Diversity on Selected Areas and its Life Stages

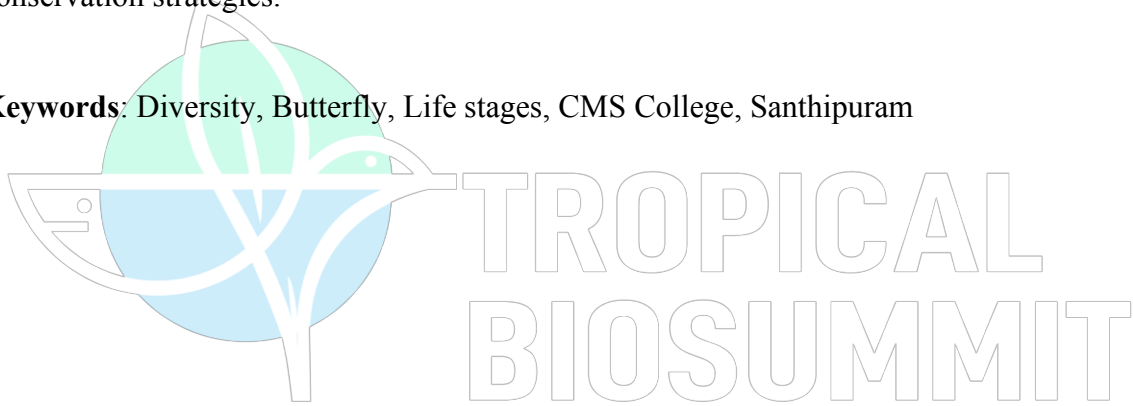
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Abstract

Butterflies are key members of our ecosystem. Their occurrence, abundance and diversity are considered as good indication of health of any terrestrial biotope. A preliminary study on the diversity of butterflies and their life stages was carried out in selected niches of Kottayam district- CMS College Kottayam and Santhipuram from September 2023 to January 2024. A total of 50 butterfly species belonging to 5 families were recorded with the help of field guides. The family Nymphalidae was the dominant among the five families with 27 butterfly species followed by family Pieridae with 8 species, family Papilionidae with 7, family Hesperidae with 5 species and Lycaenidae with 3 butterfly species. Knowledge on butterfly diversity can provide valuable insights into ecological processes, species interactions, and conservation strategies.

Keywords: Diversity, Butterfly, Life stages, CMS College, Santhipuram



Identification of spiders in selected areas and molecular phylogenetic Analysis

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Abstract

Spiders stand as one of the most important components of global diversity and play an important role in balanced, organized functioning of life on earth. Species identification and understanding their evolutionary relationships are fundamental for ecological studies, biodiversity conservation, and pest management. The study describes the Identification of Spiders in Selected Areas and Molecular Phylogenetic Analysis. Study of spider fauna was carried out in CMS College Kottayam and homeland area Kangazha in Kottayam district, Kerala from November 2023 to February 2024. Methodology involves the collection of spiders was mainly done in photography using mobile phone and species identification was confirmed with the help of the field guides and references. The collection was done by random sampling. Molecular phylogenetic analysis was done through PHYLogeny Inference Package (PHYLIP) is a free computational phylogenetics package of programs for inferring evolutionary trees (phylogenies). Thirty-one number of species of spider were identified belong to thirteen families were identified from selected areas. Spiders were identified from gardens, buildings, the microhabitat includes ground, litter, bushes, tree trunk, foliage etc. Maximum number of species were identified belong to the family Salticidae containing 9 species. Additionally, the molecular phylogeny analysis will provide insights into the evolutionary history and diversification patterns of spiders, enhancing the understanding of their ecological roles and evolutionary processes.

Keywords: Identification, spider, molecular phylogentic, CMS College, Kangazha

Enhanced chromium removal from water using ball milled nano-biochar derived from Eichhornia crassipes (water hyacinth)

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Abstract

Hexavalent chromium [Cr (VI)] contamination in water sources poses a significant threat to human health and the environment due to its toxicity and carcinogenicity. In recent years, biochar-based adsorbents have gained attention for their potential to effectively remove heavy metals from water. This study focuses on the synthesis and application of ball-milled nano-Eichhornia (water hyacinth) biochar (BMNEBC) as an innovative adsorbent for the removal of Cr (VI) from aqueous solutions. In this research, Eichhornia plant leaves were utilized as the precursor for biochar production through a pyrolysis process. The produced biochar was subjected to physical modification (ball milling) to obtain nano-sized particles, thereby increasing the surface area and porosity of the material. The resulting BMNEBC was characterized using techniques such as scanning electron microscopy (SEM) and Fourier-transform infrared spectroscopy (FTIR), analysis. Batch adsorption experiments were conducted to evaluate the Cr(VI) removal efficiency of BMNEBC under various operating conditions, including initial Cr(VI) concentration, adsorbent dosage, contact time, and pH. The equilibrium adsorption data were fitted to different isotherm and kinetic models to analyse the adsorption mechanism and kinetics. The results indicated that BMNEBC exhibited a high affinity for Cr (VI) adsorption, with a maximum adsorption capacity of 293.2 mg/optimal operating conditions were determined to achieve maximum removal efficiency, and the adsorption process was found to follow the Langmuir isotherm and pseudo-second-order kinetic model, suggesting monolayer adsorption and chemisorption as the predominant mechanisms.

Keywords: hexavalent chromium, Cr (VI) removal, ball-milled nano- Eichhornia biochar, adsorption, water treatment

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Effect of auxin hormones on shoot and root growth of Commiphora wightii (Arn.): A critically endangered species

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Abstract

Commiphora wightii (Guggal), a critically endangered species, is one common plant species used in the Indian medicinal system. The gum derived from this species has a high market price and due to indiscriminate gum harvesting the tree led to death. Propagation of Guggal through seed is not viable. However, it can be propagated through stem cutting. Address this, the present investigation was conducted to study the effect of IAA, IBA, NAA, and 2,4D on the vegetative propagation of Guggal through semi-hardwood stem cutting. The experiment was conducted at the polyhouse of the Tissue Culture Laboratory, Department of Basic and Social Sciences, College of Forestry, BUAT Banda from May to October 2023. The healthy propagated material of semi-hardwood cutting was collected from the Guggal mother block, established at BUAT. The experiment consists of thirteen treatments with three altered concentrations (2000ppm, 4000ppm, and 6000ppm) and one control (without treatment), replicated thrice. Five cuttings per replication were planted and each cutting was dipped overnight from the base in the solution of IAA, IBA, NAA, and 2,4D at 2000ppm, 4000ppm, and 6000ppm. The planting media used in the 2:1:1 ratio of soil, vermicompost, and cocopeat. The result of the experiment revealed that IBA 2000 ppm performed best for shoot and root growth with maximum establishment (96.02%) and rooting (91.25%) with significantly minimum days taken to sprout (10.33) and maximum number of sprout (12), number of leaves (33.02), leaf area (14.16 cm²), number primary roots (14.96), and total length (155.05 cm) were recorded. Thus, it can conclude that the production of quality planting material for domestication and conservation purposes, the *Commiphora wightii* can be propagated through semi-hardwood stem cutting with IBA 2000 ppm.

Keywords: Guggal, critically endangered species, propagation, conservation,

Odonata Diversity and Importance of Habitat Conservation in Bibhutibhushan Wildlife Sanctuary in North 24 Parganas District of West Bengal, India

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Abstract

This study examines the diversity and distribution of the insect order Odonata in Bibhutibhushan Wildlife Sanctuary (WLS), a protected area on the banks of the Ichamati River in West Bengal, India. Covering around 0.68 sq km, the sanctuary lies between 23°11'N and 88°45'E. The Ichamati River flows through this moist deciduous forest area. Dragonflies and damselflies are ancient aerial predators belonging to Odonata, which evolved 300 million years ago. These insects are excellent biomonitors of freshwater health and climate change indicators. India harbors nearly 494 odonates, with West Bengal accounting for 239 species. Previous research in Bibhutibhushan WLS reported 27 species, but its odonate fauna lacks comprehensive study.

This study aimed to provide a complete picture of Bibhutibhushan WLS's odonate diversity and observe human impacts on their habitats to aid conservation strategies. Surveys were conducted from 2021-2023 by Zoological Survey of India teams following standard protocols. Collected specimens were identified using literature and deposited in national collections. The study reports 32 species under 23 genera and 6 families from Bibhutibhushan WLS, with Libellulidae (dragonflies) and Coenagrionidae (damselflies) being dominant families. While this riverine ecosystem is a breeding ground for odonates, the Ichamati River faces high pollution from solid waste, wastewater, pesticides, and eutrophication. This depletes dissolved oxygen, impacting aquatic life cycles. Immediate strategies are needed to conserve odonate habitats by keeping the river unpolluted in this riverine forest ecosystem from anthropogenic threats and climate change.

Keywords: Odonata, Diversity, Conservation, Bibhutibhushan wildlife sanctuary

A preliminary study on spider diversity in Peringave village of Malappuram district, Kerala

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Abstract

Spiders are widespread and most diverse in all ecosystems. They are considered as the major agent in controlling insect populations because of their high abundance and insectivorous behaviour. The current study was conducted in Peringave village of Malappuram district, Kerala. Spiders were collected during June 2023 to February 2024. A total of 44 species belonging to 28 genera of 12 families were recorded from the study area. The spider diversity in this area was dominated by the family Salticidae with 15 species followed by Araneidae with 11 species, Oxyopidae with 6 species, Sparassidae with 3 species. The feeding guild include stalker, Orb web builders, space web builders, ground runners, foliage runners and ambushers were documented from the study area. The statistical tools to calculate species diversity used here are Simpson's diversity index and Shannon weiner index. The Simpson's diversity index is 0.1892, Simpson's dominance index is 0.8108, Shannon weiner index is 1.505 and Shannon equitability index which is used to find evenness of species, is 0.1254. This study highlights the critical role of spiders in ecosystem balance and biodiversity, underscoring their importance as bioindicators and the need for their inclusion in conservation efforts.

Keywords: Araneidae, Salticidae, Shannon index, Simpson index, Feeding guild

Incidence and Diversity of Insect Pest Complex of Rice in Selected Regions of Kozhikode and Malappuram, Districts, Kerala, India

T.R. Sobha, and Rooby Khadeeja M.V

PG and Research Department of Zoology, Farook College (Autonomous), Kozhikode, Kerala

Abstract

Rice, *Oryza sativa* is one of the staple food crops of India. The productivity of rice is facing severe threats from insect pests and will become a major problem in many rice-growing areas of the country. This study includes a survey on the incidence and diversity of insect pests in rice, its relative abundance and pest status in three study areas (A1, A2 & A3) of two districts (Kozhikode & Malappuram) about the influence of seasonal cultivation (Kharif and Rabi) and weather parameters during June 2021-April 2022. The study employed field surveys and two sampling techniques, viz., sweep net and hand pick method to document pest species, their population dynamics and the extent of damage inflicted on the rice crop. The findings revealed a diverse array of insect pests, including stem borers, leaf hoppers, plant hoppers, and defoliators, with notable variations in their prevalence and impact across different regions and seasons. A total of 800 insect pests representing 22 species in 12 families and 5 orders were recorded during the study period. *Leptocoriza acuta* was the major and abundant pest causing severe damage to the rice in each field. The results of the Shannon Wiener diversity index and richness index revealed that the diversity of pest insects is higher in site A2 during the Rabi season. Sorrenson similarity index revealed that the species diversity of pest insects were more similar in sites A2 and A3 where the same rice variety is cultivated in the same season i.e., during rabi. The diversity and abundance of rice insect pests mainly depend on the growth stage of rice plants, the season of cultivation, the variety of rice plants and the use of pesticides in the area of cultivation. The abundance of rice pest insects reaches a higher level during the panicle initiation stage and flowering stage of paddy, i.e. September and October in Kharif and February and March in the Rabi season. Additionally, the study highlights the influence of environmental factors, such as temperature and humidity, on pest population and there is no significant correlation between the rice pest insect population and these weather parameters. The study concludes the importance of integrated pest management (IPM) strategies tailored to specific pest profiles and local conditions to mitigate crop losses and enhance rice production sustainability. This study also contributes valuable insights into the pest dynamics of rice fields, offering a foundation for developing effective control measures and improving rice yield stability.

Keywords: Insect pest complex, Diversity, incidence, pest status, *Leptocoriza acuta*.

Impatiens species of Western Ghats, India: Analyzing pattern of discoveries and distribution

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Abstract

The genus *Impatiens* belongs to the family Balsaminaceae, it is one of the key genus of endemism in the Western Ghats. It is aptly called as jewels of plant kingdom due to its attractive flowers. Starting from Linnaeus, Many taxonomists across the world are continuously describing newer species of genus *Impatiens* to science. *Impatiens* species are known to have unique ecological amplitude and disjunctive in distribution across the world. The Western Ghats of India, one of the major regions for concentration of the genus *Impatiens*. Analyzing discovery pattern and distributional aspects will through light on understanding the underlining principles. The present study aiming at understanding the distribution pattern of the genus *Impatiens* of Western Ghats region, investigating the pattern of discovery and analyzing variations with respect to endemic and non-endemic species, along with their IUCN red list categories. The analysis Indicated that species discovery curve continue to increase indicating many more new species still needs to be discovered. The distribution pattern clearly showed that genus concentrated between the southern part of Karnataka state and northern part of Kerala state. Analysis indicated *Impatiens* prefer to occur in mid-elevation region of the Western Ghats. The distribution pattern between endemic and widespread species also varies. This study would helps in delineating effective measures in conserving the species.

Keywords: *Impatiens*, Balsaminaceae, Western Ghats, IUCN

A preliminary analysis on the phylogeny and host plant interaction of selected species of aphids, Family Aphididae

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Abstract

Aphids are one of the notorious plant sap - sucking insects exhibiting remarkable diversity in host selection. Identification of species and analysis of evolutionary relationship plays a role in the biodiversity conservation, pest management, ecological insights. This study deals with the preliminary analysis of phylogeny of *Aphis nerii*, *Aphis odinae*, *Aphis craccivora*, *Aphis gossypii* and *Aphis aurantia* of aphids and their host plant interaction. Aphid Species were collected from different areas of Pilicode panchayat, Kasaragod during the period of September 2023 to January 2023. A total of 12 host plant has been identified during the collection of aphids. Identified plants which belongs to 9 different families. Aphid Species were identified using taxonomic key and the host plant identification done using manuals and experts in this field. *Aphis nerii* collected from host plant of the family Apocynaceae (*Calotropis gigantean*), *Aphis odinae* from the family of Anacardiaceae (*Mangifera indica*), and Rubiaceae (*Mussaenda philipica*), Fabaceae (*Centrosema pubescens*, *Gliricidia sepium*), *Aphis craccivora* from Amaranthaceae (*Amaranthus spinosus*), *Aphis gossypii* from Malvacea of Hibiscus species, Solanaceae (*Capsicum annum*), Euphorbiaceae (*Acalypha wilkesiana*) and from Asteraceae (*Mikania micrantha*) and that of *Aphis aurantia* from Fabacea (*Tamarindus indica*) and Rubiaceae (*Coffea arabica*). The collected species was subjected for sequencing and deposited in the NCBI. With the help of these sequences a phylogenetic tree constructed using MEGAXI. Confirmation of the deposited sequences is done through BLAST(NCBI) before the tree construction. This study provides valuable knowledge in the improvement of pest management strategies, a deep understanding of evolution, ecological studies, biodiversity conservation and also advancement in agricultural practices.

Keywords: Family Aphididae, Host plant, Phylogeny.

Surveillance of annual avian mortality in NH 15 traversing through Brahmaputra River, Northeast India

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Abstract

Introduction: Roadside avian death is a new environmental dimension in developing countries. Mortality, from automobile collisions is causing alarm in the world since it poses a growing threat to the ecological integrity. Unlike predators, vehicle collision eliminates many mature & healthy breeding birds from the populations. **Methods:** The study was conducted in NH 15 (stretch of about 30 km) passing through the riverine ecozone of the mighty Brahmaputra that connects the North and South bank of Assam (Dibrugarh to the south and Dhemaji to the north). The identification of birds was carried out morphologically through photographic evidences and the carcasses were removed to avoid recounting following Rawankar and Wagh, 2018. **Results:** A total of 276 avian causality belonging to 12 species and 10 families were recorded. Common Myna (*Acridotheres tristis*) was the most vulnerable species (41%) followed by Red-vented Bulbul (*Pycnonotus cafer*) (28%) and Red-whiskered Bulbul (*Pycnonotus jocosus*) (6%) and Spotted dove (*Spilopelia chinensis*) (5%). It was recorded that the death rate of birds varied by month. August had the highest death toll (46), followed by September (40) and July (34). The lowest documented mortality rates were found in the months of December, January, and February. **Conclusion:** This preliminary study provides a baseline data on the magnitude of avian mortality on roads passing through riverine ecosystem of Brahmaputra River. As increased adult and fledged bird mortality in roadside habitats can result in sinking of avian diversity.

Keywords: Avian mortality, Diversity, Riverine ecozone, Brahmaputra River

Floristic diversity and population structure of native and naturalised tree species in the biodiversity heritage-Site, GKVK campus

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Abstract

The biodiversity heritage site of Gandhi Krishi Vigyana Kendra, University of Agricultural Sciences, Bangalore was assessed for its floristic diversity of tree species to better understand the natural forest dynamics and to provide floristic data for future conservation efforts. A total of 135 quadrats (20mx20m) were established using random quadrat sampling method for vegetation sampling. A total of 75 tree species representing 57 genera and 29 families were identified. *Eucalyptus tereticornis*, *Santalum album* and *Acacia auriculiformis* were the most frequently occurring species, *Eucalyptus tereticornis*, and *Acacia auriculiformis* were most abundant. The study area is moderately diverse with Shannon species diversity index score of 2.86 and Simpson's diversity index of 0.88. *Eucalyptus tereticornis* and *Acacia auriculiformis* had the highest basal area and they were also found to be the most dominant tree species based on importance value index (IVI). The regeneration status of the study site was found to be good with a higher number of juveniles.

Keywords: Biodiversity, Gandhi Krishi Vigyana Kendra, natural forest dynamics, Bangalore

Hidden Facets of Ant Pollination in Cucurbit Crops: Connection with Extra-Floral Nectaries During Monsoon in Deltaic Bengal

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Abstract

Ants are considered to be nectar thieves and usually do not take part in the pollination process directly. We have studied the extrafloral nectary mediated interaction of ants with cucurbit crops (*Luffa acutangula*, *Luffa cylindrica*, *Cucurbita moschata*, *Momordica charantia*, *Trichosanthes cucumerina*, *Lagenaria siceraria*, *Coccinia grandis*, *Benincasa hispida*) in the deltaic Bengal. The study suggests that the flower visiting ants *Trichomyrmex destructor*, *Monomorium sp*, *Diacamma sp*, *Camponotus sp*, *Tetramorium sp*, *Odontomachus sp*, *Dorylus sp*, *Cardiocondyla sp* may take part in the active pollination process in certain circumstances. The studied monoecious cucurbit taxa have extrafloral nectar glands and the nectar produced therein are proved to be the main attractant of the ants. While foraging extrafloral nectar the ants transfer pollen grains to the stigma accomplishing the pollination process in the plants. Abundance of extrafloral nectaries is found positively correlated with species richness of the ants during the rainy seasons and on reproductive structures during the dry seasons. As the cucurbit crops grow mainly during rainy seasons, incidence of extrafloral nectaries-mediated pollination of cucurbit crops by ants in deltaic Bengal is validated.

Keywords: Pollination, cucurbit crops, extrafloral nectaries, ants, deltaic Bengal

Prevalence of honeybees in Bodoland Territorial Region (BTR), Assam: Analyzing Nesting Sites and Beekeeping practices for India's Sweet Revolution.

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Abstract

Background: Honeybees are among the most unique and intelligent creatures in the world. This remarkable family of insects serves as major pollinators for thousands of flowering plants worldwide, providing a profound indispensable ecological service. Beekeeping and wild honey hunting are among the oldest forms of human-animal interaction. The Bodoland Territorial Region (BTR) in northwestern Assam, Northeast India, is a significant habitat for various honeybee species and beekeeping practices. Recognized as an important exporter of bee products, BTR faces threats from increasing chemical use in agriculture and other pollutants, which heighten the risk of colony collapse and disease infestations. **Aim:** To study the prevalence of honeybees and compare the rearing methods and nesting behaviour of various honeybees in Bodoland territorial Region. **Methods:** The study was conducted using a comprehensive field survey that involved personal interviews with beekeepers in the region and visits to the rearing sites. The nesting sites of different honey bees were visited and the honeybee specimens were collected in clean sterile glass containers. The species identification of preserved specimens was done at the Zoological Survey of India (ZSI) in Kolkata. All necessary information provided by the beekeepers were recorded and colonies were photographed with proper GPS tags. **Result:** Bodoland Territorial Region (BTR) is home to different honeybee species because of its rich natural resources and suitable environmental conditions. The region has a rich culture of beekeeping practices with different species of honeybees being reared. The most commonly reared honeybee species is *Apis cerana*, commonly known as the Asian honeybee, whereas *Apis mellifera* and stingless honeybees are reared in only a few places. The relatively larger-sized *Apis dorsata* was found nesting and building colonies at higher altitudes. **Conclusion:** The study provides insight into the availability of various honeybee species in the Bodoland Territorial Region (BTR) with specific nesting skills and habitats. The diversity of the honeybee species in the region is unique with some being native while others being introduced in the region for higher yield and quality.

Keywords: Beekeeping, Bodoland, Honeybees, Nesting, Rearing, Species

Astaxanthin Extraction and Characterization from Shrimp Waste: A Sustainable Approach

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Abstract

The seafood industry generates substantial waste, particularly from shrimp processing, which poses significant environmental challenges. This waste, rich in naturally occurring carotenoids, holds great therapeutic potential. Notably, shrimp waste is a valuable source of astaxanthin, a potent antioxidant and pigment with potential applications in medicine, cosmetics, and nutraceuticals. This study investigates the extraction, characterization, and antibacterial activities of astaxanthin obtained from shrimp waste. Natural astaxanthin, derived from crustacean shell waste, offers an improved alternative to synthetic orange-red pigments. Astaxanthin was extracted using organic solvents of varying polarities, specifically petroleum ether and acetone. The extraction yields were compared spectrophotometrically at 460 nm and quantified using the Kelley and Harmon equation. Acetone extracts were compared to petroleum ether extracts for astaxanthin yield. Characterization of the astaxanthin pigment was performed using Thin Layer Chromatography (TLC), with the Retardation factor (Rf) compared to the Lorenz Todd standard chromatogram, where an astaxanthin diester band (Rf = 0.86) was detected. The extracts were then subjected to antimicrobial testing against *E. coli*, *Bacillus spp.*, *Staphylococcus aureus*, and *Klebsiella spp.* Additionally, the extracts were tested for color change under acidic and alkaline conditions and analyzed for their potential as a cloth dye, producing an orange-red pigment. Through optimized extraction methods and detailed characterization, this study highlights the potential for sustainable practices in the seafood industry, promoting eco-friendly and economically viable solutions. These bioactive compounds have applications across various fields, including food and nutrition, agriculture, medicine, biotechnology, cosmetics, and pharmaceuticals. Utilizing seafood processing waste for the production of bioactive compounds is an economical and environmentally beneficial approach to mitigating pollution problems.

Keywords: mitigating pollution, Astaxanthin, Shrimp, Antimicrobial, Seafood

People's perceptions on the impacts of select Linear infrastructure projects on avifauna in Chhattisgarh, India; A Demographic Analysis

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Abstract

India, one of the world's fastest-growing economies, is fast expanding and upgrading its linear infrastructure (LI) networks significantly. Despite the potential developmental benefits, these projects frequently face public opposition due to the perceived negative impacts. Developments such as roads, railways, and power lines impact local wildlife, including avifauna. Understanding public perceptions of these impacts is crucial for effective participatory conservation planning and infrastructure development. This study assessed public perceptions of LI impacts on avifauna and examined the role of demographic factors in shaping these views. Four LI projects were analyzed: the Ranchi-Dharamjaigarh transmission line (765 kV), the Korba-Jabalpur transmission line (765 kV), the Champa-Kurukshetra transmission line (800 kV), and the East rail corridor in Chhattisgarh. Structured face-to-face interviews with 868 rural residents living near these infrastructures were conducted using close-ended questions. Responses were analyzed using a binary scoring system, percentage analyses, and chi-square tests. Results revealed a nuanced perception among respondents, with 56.6% perceiving a negative impact on local bird populations, while 43.4% did not share this view. Notably, concerns regarding safety hazards for birds, such as electrocution and collision, were expressed by 43.5% of respondents. Additionally, 51.7% observed the absence of regular/common bird species post-LI installation, while 48.3% did not notice such changes. Age, education level, occupation, and proximity to LI were all found to influence perceptions significantly. Older individuals had mixed perceptions, uneducated respondents were more negative, and labourers marginally held positive views. Proximity to LI generally correlated with more neutral perceptions. The findings reveal that while a significant portion of the population perceives negative impacts of LI on bird populations, their opinions were influenced by demographic factors. Addressing these perceptions is crucial for balancing infrastructure development with wildlife conservation. Providing people with relevant information on the possible impact of LI will increase social acceptance of LI projects. Additionally, engaging with local communities and raising awareness about the potential ecological effects of LI and its management options can foster more informed and sustainable public involvement for infrastructure development.

Keywords: Avifauna, linear infrastructure, participatory conservation, public involvement

Plankton - The Stewards of Ecological Health: An Analysis of Planktic Morphospecies from Pulicat Lake as Potential Eco Indicators

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Abstract

Pulicat lake is the second largest estuarine lagoon after Chilika in Orissa, but there is still a data deficiency on plankton diversity, encompassing various ecologically crucial species. Plankton analysis is paramount for understanding the cascading energetics of aquatic ecosystems. The diversity of planktic communities help analyze on ecological health, nutrient cycling, energy transfer and also climate change effects deteriorating and variegating the lake communities and dynamics. The assemblages of few planktic groups are of concern considering their ecological role associating with global warming, energy linkages, eutrophication, pollution, siltation and benthic strata. Study has been done adopting classical collection method using plankton nets and identification with pictorial keys. Related species or morphospecies from ceratium, nitzschia, pleurosigma, skeletonema and tintinnids were considered to be of significance regarding lake health and energy flow. The expected prediction from the analysis is in understanding the increase in their abundance in nearest future, leading to assemblage formation. This may exert impact via two ways, either through biological indication of water warming due to climate change or variation in energetics via microbial and traditional food chain linkage as well as nutrient enrichment. Primary aim was to catalogue morphospecies plankton diversity and correlating on their ecological contribution connected to nutrient intoxication as well as eutrophication, affecting other biodiversity and fisheries. The main focus is on how the change in plankton abundance and assemblages will help comprehend on sustainability of ecological processes of an estuarine system in the long run as far as climate crisis and fisheries are concerned. More of these studies has to be done at beta and gamma levels of diversity to fixate on the interdependency and interactivity of energy networks exerted by planktonic communities.

Keywords: Plankton, Pulicat, Morphospecies, Bio indicators, Wetland energetics

Distribution of Liverwort Flora Across Vegetation Types in Mt. Bagalbal: A basis for IEC Material Development

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Abstract

The study investigated the taxonomy and distribution pattern of liverwort flora of Mt. Bagalbal, Brgy. Mt. Nebo, Valencia City, Bukidnon, Philippines. Further, IEC material was developed from the data gathered during the investigation. Liverwort flora from Mt. Bagalbal comprises fourteen families, with Plagiochilaceae having the most species, followed by *Lejeuneaceae*, *Marchantiaceae*, and *Pallaviciniaceae*. The species distribution pattern showed that most lowly plants have clear dispersal, with two species found in eight coordinates and 18 species limited to only one unique coordinate. Among the 31 recorded species, 14 have no data on their conservation status, 11 are under Least concern, five have Data deficient status, one is Vulnerable, one is Critically endangered, and one is Near Threatened. An Information, Education, and Communication (IEC) material was developed to inform the public about liverwort flora biodiversity. The IEC material contains five parts, including brief information about the liverwort's biology, clear photos of liverwort representatives with their scientific names and IUCN conservation status, details on how to collect and examine liverwort taxonomy properly, acknowledgment of agencies that helped in the research, and basic information about the authors. All photo documentation used in the IEC material were products of the investigation conducted at Mt. Bagalbal, Brgy. Mt. Nebo, Valencia City, Bukidnon, Philippines.

Keywords: taxonomy, liverwort flora, conservation, vegetation, material

Metapopulation theory: a tool to address contemporary issues in forest management

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Abstract

The increasing human population and rapidly changing global climatic conditions pose significant threats to biodiversity, particularly within forest ecosystems. Forests are especially vulnerable to climate change, biological invasions, and habitat fragmentation, which disrupt the intricate ecological networks and impact numerous plant and animal species and the processes that sustain them. The degradation of these ecosystems and the alarming rates of species extinctions threaten essential ecosystem services such as pollination, climate regulation, and water purification. Addressing these threats necessitates the development of innovative technologies for monitoring biodiversity, analysing human impacts, and implementing effective mitigation strategies. Metapopulation modelling emerges as a promising approach in conservation biology, primarily focusing on conducting Population Viability Analysis (PVA) to assess the status of species populations within specific landscapes. Stochastic Patch Occupancy Models (SPOMs) represent one such technique that depicts the presence or absence of species within habitat patches and the occupancy status (empty/occupied) of these patches. SPOMs have the potential to inform and shape conservation initiatives, as indicated by their expanding diversity of taxa and landscapes. These models have significantly contributed to formulating suppression strategies for invasive species, examining the impacts of habitat changes on biodiversity, understanding the effects of landscape fragmentation on agricultural pests and predators, evaluating the persistence of prey-predator pairs and food chains in fragmented landscapes, assessing the effects of fire on species dispersal, and elucidating the recovery dynamics of species in eco-restoration efforts. Despite their utility, metapopulation models require real-world validation due to their inherent simplifying assumptions. Moreover, conservation efforts must transcend single-species approaches to address broader ecological threats. Integrating modern technologies presents a pivotal opportunity to enhance forest management practices, enabling more informed decision-making and the practical application of these models in real-world scenarios.

Keywords: Metapopulation, Forest management, Biodiversity conservation, Population

Study of microplastic in Labeo rohita and Catla catla from Pune city

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Abstract

The growing concern over the contamination of commercial fish species with microplastics is driven by its possible consequences for human health and food safety. This issue is garnering heightened international focus. This research aimed to explore the presence of microplastic contamination in the gastrointestinal tracts (GITs) of *Catla catla* (F. Hamilton, 1822) and *Labeo rohita* (F. Hamilton, 1822), two commercially significant fish species obtained from the Nanapeth fish market in Pune city. 32 Samples were quantified and identified using a Stereomicroscope and Fourier-transform infrared spectroscopy (FTIR). From the 11 individuals of *Catla catla* and 21 individuals of *Labeo rohita*, 366 and 169 microplastics (MPs) were discovered respectively. Cumulative, 43.93% were identified as fibers, while 56.27% of the microplastics found in the GITs displayed red and blue colors predominantly. 66.94% of MPs were recognized from 0.710 mm- 90 microns size range. Notably, six types of microplastic polymers, namely polyvinyl chloride, polypropylene, polyethylene terephthalate, polyamide, nylon and polystyrene, were identified. These findings indicate that microplastic pollution is prevalent within river-based food chains and can be associated with the feeding habits of the studied species. Future research should concentrate on understanding how microplastics migrate into water bodies from various localized and widespread origins. This knowledge will be pivotal in aiding pollution management initiatives in inland water bodies.

Keywords: microplastics, fishes, gastrointestinal tracts, water bodies, pollution

Frequency of Occurrence of Marine Fungi on Avicennia Sp. From Kadalundi Estuary, Kerala, India

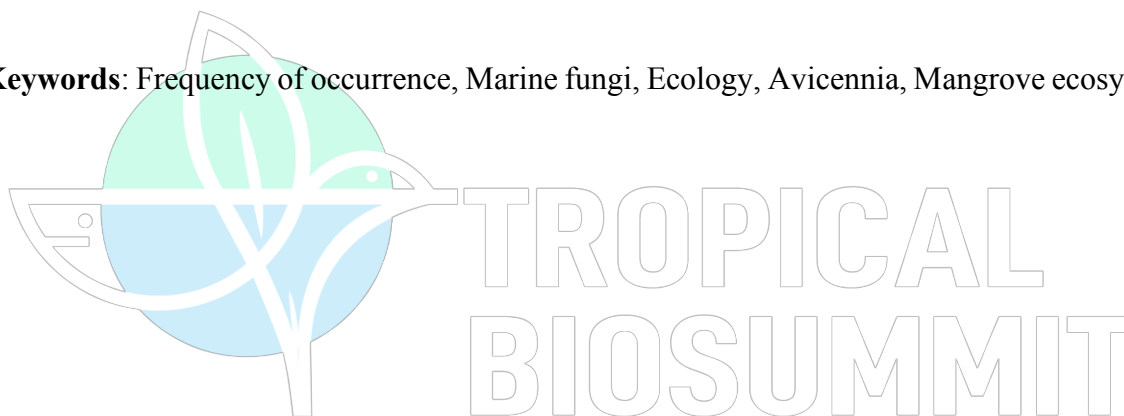
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Abstract

The mangrove ecosystem hosts a variety of fungi, each with their own location and frequency. In the estuary of Kadalundi, Kerala, South India, 27 marine fungi were identified from the host plant *Avicennia sp.* It includes 16 Ascomycetes and 11 Mitosporic fungi. The most frequent species, in terms of percent frequency of occurrence, were *Aniptodera chesapeakensis*, *Savoryella lignicola* and *Marinosphaera mangrovei*. The percentage colonisation of marine fungi on *Avicennia* was 83%. Ascomycetes were the most common taxonomic group in the mangrove species

Keywords: Frequency of occurrence, Marine fungi, Ecology, Avicennia, Mangrove ecosystem



Gut Associated Microbiome of the Blue Tiger Butterfly Tirumala limniace (Nymphalidae: Danainae)

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Abstract

The present investigation was undertaken to study the gut associated microbiome of Blue tiger *Tirumala limniace*, a milkweed butterfly, belonging to family Nymphalidae and subfamily Danainae. The microbiome is responsible for many aspects of the host's physiology and growth. These communities are of major influence on organismal fitness and population ecology. Metagenomic sequencing has made it possible to identify the gut associated microbiome of organisms. Bacterial species comprise all or the majority of organisms of the gut microbiome. Metagenomic DNA was extracted from the butterfly gut sample using rRNA primers, agarose gel electrophoresis, NGS library preparation and sequencing. 30 species of bacteria were identified from the gut sample of Tirumala Limniace which were coming under 9 phylum. The phyla include *Bacillota*, *Pseudomonadota*, *Bacteroidota*, *Thermodesulfobacteriota*, *Synergistota*, *Planctomycetota*, *Chloroflexota*, *Actinomycetota* and *Acidobacteriota*.

Keywords: *Tirumala limniace*, metagenomics, microbiome

Ex-situ conservatory for Rare, Endangered and Threatened (RET) category riparian plant species

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Abstract

Riparian landscapes are highly threatened ecosystems as they are inherently rare habitats, which play a major role in ecosystem services of social, economic, and environmental importance. The riparian vegetation ranges from emergent aquatic and semi aquatic plants through terrestrial understory and canopy species. Many of the riparian species are facing wide spread destruction and are at high risk of extinction. Riparian ecosystems are cleared for anthropogenic activities such as residential and commercial constructions and for tourism purposes. Compared to research and practice on the conservation of terrestrial plant germplasm resources, riparian species have received far less attention than they need for their diversity conservation. The present study was conducted to identify, collect, and establish a conservatory for selected RET category riparian plant species at RARS Kumarakom. The plant collection and establishment of listed RET category riparian species were done during 2023–2024 from the Pamba river basin and conservatories of different institutes in Kerala. During the work, the collected riparian plants were conserved in the nursery for propagation and for the establishment of an ex situ conservatory. A total of 8 plant species, comprising 8 genera in 8 families, were collected in this study. The collected RET category riparian plant species include different tree species, and aquatic plants viz. *Ochreinauclea missionis* (VU), *Calophyllum apetalum* (VU), *Hopea ponga* (VU), *Syzygium occidentale* (VU), *Tabernaemontana alternifolia* (NT) *Hydnocarpus macrocarpa* (VU), *Humboldtia vahliana* (EN), *Aponogeton appendiculatus* (EN). The project helps boost its populations and upsurge the sites these species occur at. This kind of work is vital to prevent these species from going extinct locally, especially in the face of climate change and to create awareness among the public.

Keywords: Ex-situ conservation, riparian plant species, RET, aquatic and semi aquatic plants

Conservation of selected Rare, Endangered and Threatened plants suitable to Kuttanad ecosystem

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Abstract

Climate change, alien species, and land use for intensive farming and urbanization are causing severe threats to plant genetic biodiversity worldwide. Hence, biodiversity conservation is a fundamental activity and provides livelihoods to millions worldwide. India is considered one of the primary centers of origin and diversity of crops and Western Ghats are the major repositories. Many plants grown in the forests are subjected to domestication with the progress of human civilization. Biodiversity museums were considered essential sites for ex-situ on-farm conservation. Kuttanad wetland is one of the most fertile regions where cultivation happens below sea level. It is part of the Vembanad estuarine system, a biodiversity paradise. Based on Kuttanad's biodiversity and socioeconomic importance, this place was nominated as a Ramsar site, and that below sea level farming of Kuttanad is recognized as part of the Globally Important Agricultural Heritage System (GIAHS). The Regional Agricultural Research Station, Kumarakom, is a part of the Vembanad ecosystem, for which a conservatory for red-listed plants is very much relevant. The present project envisages the conservation of plants enlisted in the red-listed category. Due to the specific geography of the Kuttanad ecosystem, plants that are suitable to the lower elevations are selected. Hence, Rare, Endangered and Threatened (RET) species of plants are chosen from the family Myristicaceae (*Myristica sp.*) and Myrtaceae (*Syzygium sp.*), which are suited for the Kuttanad ecosystem. Trees belonging to these species are economically important and adaptable to the region. Conservation of these species will add to the existing biodiversity of the area and act as a gene source for crop improvement programs.

Keywords: conservation, RET, aquatic, and Kumarakom ecosystem

An updated checklist of termite fauna (Blattodea: Isoptera) of Kerala

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Abstract

Introduction: Termites are a very familiar insect group and are highly destructive pests of structural wood and are economically significant. As decomposers and recyclers, they also play an important ecological role. In India, taxonomic data on many ecologically significant groups, including termites, is still lacking. Despite their ecological and economic importance, termite species diversity is relatively low compared to other insect orders. Globally, there are about 2,942 living termite species, with India hosting 302 species under 52 genera and Kerala having 92 species under 34 genera. **Objectives:** • Taxonomic studies and documentation of diversity of Termites (Termitidae: Isoptera: Blattodea) of Kerala. • Preparing checklist of a consolidated, revised and valid species of termites reported from Kerala. **Methods:** The present checklist is based on the examination of specimens collected during the course my study on termites of Kerala and on reviews of the published literature including monographs, catalogues, checklists and papers in different international and national journals. **Results:** The present paper deals with an updated checklist of termite fauna from Kerala along with their geographical distribution in Kerala. Altogether, 92 species under 34 genera grouped in 3 families with their distribution records in Kerala are listed. This report adding 32 species and 6 genera to the existing checklist of 60 species under 28 genera. Among 3 families, family Termitidae contributed to 78 % followed by family Kalotermitidae with 13% and Rhinotermitidae with 9%. Among the 7 known subfamilies, subfamily Termitinae is the most dominant with 14 genera and 82 species and among the 34 genera, the genus *Odontotermes* Holmgren is most dominant with 17 species. The termite fauna of Kerala includes 3 genera namely *Ampoulitermes* Mathur and Thapa, *Indocapritermes* Chhotani and *Rinacapritermes* Amina and Rajmohana and a remarkable number of 22 species, as endemics. Of the 92 species of termites from Kerala, 19.5% (18) of them have been categorised as pests. **Conclusion:** The present paper reveals the diversity and distribution of termites in Kerala and providing a checklist of termites so far recorded from Kerala, which will be helpful any workers of termite fauna. An extensive and intensive systematic inventory of termites of Kerala would generate species specific distributional and bioecological data, is highly recommended.

Keywords: termite fauna, geographical distribution, insect pests

*A Preliminary Study on Butterfly Diversity in Chemrakkattur, Areacode Village,
Malappuram District, Kerala, India.*

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Abstract

Butterflies are cute and marvelous creatures of nature. They are one of the best ecological indicators. The presence, diversity, and relative abundance of butterflies indicate the overall wellbeing of our ecosystem. The butterflies were recorded from March 2023 to February 2024, using line bite trap and line transect method from two different sites of Chemrakkattur, such as grassland and garden area. The objective of the study is to compare the species diversity in two sites, check the seasonal variation and habitat preference of butterflies. A total of 44 species of butterflies belonging to 36 genera, under 5 families were recorded during the study period. Out of 44 species, 20 species belong to family Nymphalidae, 8 species belong to family Lycaenidae, 7 species belong to family Pieridae, 5 species belong to family Hesperidae and 4 species belong to family Papilionidae. The family Nymphalidae is the most successful group having the greatest number of species. The present study can conclude that the species diversity is higher in grassland, due to lesser disturbances and low temperature present in this area leads the high species diversity. The indices such as Simpson's index and Shannon-Wiener index were calculated. The butterfly species composition of grass land and garden area was similar by roughly 62%. Butterflies play a key role in providing numerous ecological services and are also critical to human survival. The agricultural plantation, climate change, introduction of invasive species, pollution etc adversely affects the butterfly diversity worldwide. Proper land management and land protection are critical in terms of biodiversity and help to restore and conserve declining butterfly diversity worldwide.

Keywords: Lepidoptera, Chemrakkattur, Simpson's Index, Shannon-Wiener Index, Species Diversity

MB-01

ABSTRACTS OF ORAL PRESENTATION

Theme 2: Molecular Biology (MB)

Designing a multiplex PCR for the surveillance of avian respiratory viruses

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Abstract

Migratory avifauna is considered potential vehicles for the spread of viral pathogens across continents. Avian Influenza Virus (AIV), New Castle Disease (NDV), Infectious bronchitis virus (IBV), Infectious laryngotracheitis virus (ILTV), Avian pox (APV), and Avian Adenovirus (ADV) cause adverse effects on the wellbeing of humans and farmed animals. Even though there are different diagnostic methods to identify these diseases, multiplex PCR assays are one of the fastest and most efficient assays to identify one or more pathogens rapidly and cost-effectively. This study aims to design a multiplex PCR assay to identify avian respiratory viruses. The bacterial and viral bioinformatics resource center (BV-BRC 3.35.5) was used to extract the sequences of the required viral strains of AIV, NDV, IBV, ILTV, APV, and ADV for birds. Homologous regions for probable primer binding sites common for strains of a single viral species were selected by an alignment performed with Clustal Omega. Primers and probes were designed using NCBI primer Blast for each conserved region. Designed primers were checked with the Beacon Designer tool for self-dimer formation and other secondary structures. Positive controls were generated by cloning synthetic constructs to the plasmid pUC19. Primers and probes were validated with synthetic positive controls before preparing the multiplex assay. The predesigned primers and synthetic oligo sequences for each virus were checked together in the FastPCR tool for the performance as a multiplex assay (link). Multiplex Primers were crosschecked with the Multiple primer analyzer, ThermoFisher Scientific web tool, for the secondary structure formation under different concentrations. The designed primers and probes for each assay worked with synthetic oligonucleotides. After testing with different combinations two triplex assays gave best results that worked together in 0.2 μ M – 0.3 μ M primer concentration. AV1 triplex assay was optimized for AIV, IBV, and APV while AV2 assay was optimized for NDV, ILTV, and ADV. Further steps are warranted for determining the sensitivity and the specificity while confirming the absence of cross-reactivity.

Keywords: respiratory viruses, PCR, diagnostic, and human diseases

Unleashing Potential: Molecular Tools for Tailored Oilseed Crop Improvement

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Abstract

Oilseed crops are vital in global agriculture, providing essential commodities like edible oils, biofuels, and industrial feedstocks. Enhancing their productivity, resilience, and nutritional quality is crucial for food security and sustainability. Conventional plant breeding has significantly developed high-yielding cultivars, but these methods are cumbersome and time-consuming. Molecular biology tools have revolutionized oilseed crop improvement, offering precise methods for trait manipulation and genetic enhancement. This abstract outlines key molecular biology tools in oilseed crop improvement include Marker-Assisted Selection (MAS), which expedites breeding by identifying DNA markers associated with desirable traits, enabling early selection of superior genotypes. MAS has successfully developed fungal disease-resistant Canola varieties and enhanced drought and salinity tolerance in castor beans. Genetic engineering and genome editing techniques, such as CRISPR-Cas9, TALENs, and ZFNs, allow precise manipulation of target genes to introduce or modify desired traits. CRISPR-Cas9 has conferred herbicide tolerance in oilseed rape, improving weed control efficiency in agricultural fields. Similarly, using targeted mutagenesis with transcription activator-like effector nucleases (TALENs) high oleic acid soybean varieties were developed by targeting the FAD2-1A and FAD2-1B genes, enhancing oil stability and health benefits. Other tools like genome sequencing and bioinformatics facilitate comprehensive analysis of crop genomes, aiding in the identification of genes associated with desirable traits and the development of molecular markers. Genomic selection integrates genomic data with phenotypic information to predict breeding values, enhancing breeding efficiency. To enhance oil content or biosynthesize valuable compounds, metabolic engineering helps in manipulating metabolic pathways and have been used successfully to enhanced oil accumulation in sunflower seeds and increase the production of omega-3 fatty acids in flaxseed. Furthermore, RNA interference has been employed to suppress the expression of genes involved in the biosynthesis of anti-nutritional compounds in rapeseed, improving its nutritional quality and safety. By leveraging these molecular biology tools, researchers and breeders can accelerate the development of improved oilseed crop varieties with enhanced productivity, resilience, and nutritional value, thereby contributing to global food security and sustainable agriculture.

Keywords: Oilseed, Genome-editing, Crop improvement, Genomic-assisted breeding

SD-01

ABSTRACTS OF ORAL PRESENTATION
Theme 3: Sustainable Development (SD)***Advancements in Non-Conventional Feed Substitutes for Sustainable Aquaculture Practices***

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Abstract

The study was aimed at isolating and characterising a potential probiotic bacterium from dried anchovies (*Stolephorus indicus*) and evaluating its antibacterial, antibiofilm and growth enhancing potential in *Danio rerio*. The isolate was identified as *Bacillus subtilis* using *16S rRNA* sequencing and phylogenetic analysis. Probiotic properties were characterised based on the ability of the isolated strain to survive in simulated gastric juice and trypsin. Isolated strain was further subjected to varying pH, temperature, different concentrations of organic solvents to evaluate its potential to tolerate stress. Biofilm inhibition against *Vibrio harveyi*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus* was noted. The study showed that the isolate improved the survival rate of *Danio rerio* against *Vibrio harveyi* and *Escherichia coli*. The weight and length gain percentage was numerically ($p > 0.05$) improved in probiotic supplemented groups as compared to control. The use of probiotics from non-conventional sources can improve the diversity of the available probiotics for aquaculture practices

Keywords: probiotic bacteria, *16S rRNA*, antibacterial and antibiofilm

SD-02

*Emergence of Pharmaceutical Effluents in Urban Groundwater*Monica Gangopadhyay¹, Suman Naithani¹, Pratibha Naithani¹, Chakresh Kumar Jain²¹Department of Environmental Science, Graphic Era Deemed to be University, Dehradun, Uttarakhand, India. ²Centre for Science and Environmental Research, Roorkee, Uttarakhand, India**Abstract**

Groundwater is the main source of drinking water for the populace in many countries. Releasing untreated, polluted, and undertreated pharmaceutical wastewater into freshwater sources can have immediate, indirect, and lasting effects on the ecosystem and public health. Using a variety of sophisticated instrumental techniques, numerous types of pharmaceutical substances have been found in considerable amount in fresh water (surface water and groundwater), wastewater (household, municipal and industrial) as well as in treated water. Thus, this review places the impact and fate of some pharmaceutical wastes on the aquatic environment and describes the various expected exposure routes to the environment in order to protect communities from polluted environments. An overview of some of the methods currently used to identify pharmaceutical effluents along with the prospects for development in wastewater treatment have been outlined.

Keywords: Groundwater, wastewater treatment, pharmaceutical effluents, pollution

SD-03

Green synthesis of silver and copper nanoparticles using panchagavyamand it's antibacterial activity

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Abstract

Nanotechnology is the application of nanoscience leading to the use of new nanomaterials and nanosize components in various fields. It is the development and use of techniques to study physical phenomena and develop new design, devices and material structures in the physical size ranging from 1-100 nanometres. It is one of the most active area of substantial research in modern material science. There are two approaches that are employed in nanoparticle synthesis Top –down and Bottom-Up approaches. Green synthesis of nanoparticles is a Bottom-Up approach where the nanoparticles are synthesised through oxidation/reduction of metallic ions from the organic group derived from the biological agents. The present study deals with the biosynthesis of silver and copper nanoparticles using traditional Panchagavya, a biofertilizer formulation from cow products. The synthesis of silver and copper nanoparticles is confirmed by the colour change of the solution from green to brown and blue to greenish blue respectively. The characterization of the synthesized nanoparticles was carried out by UV-Vis Spectroscopy with the peaks obtained at 350nm and 250nm for silver and copper nanoparticles respectively. The antibacterial activity was tested using agar well diffusion method against *Bacillus* and *Micrococcus* *sps*. The silver nanoparticle have potential applications in cosmetics, electronics, human health and textiles whereas the copper nanoparticle have potential applications in catalysis and electronics

Keywords: Nanotechnology, antibacterial activity, nanoparticle, human health

Evaluation of Antibacterial Potential in Green-Synthesized Silver Nanoparticles and Soxhlet Extracts from Chromolaena odorata and Cymbopogon citratus Leaves

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Abstract

Nanoparticles are tiny molecules having size ranges from 1 to 100 nm. They can be classified into different classes based on their properties, shapes or sizes which includes fullerenes, metal NPs, ceramic NPs, and polymeric NPs. Nanoparticle synthesis can be categorized into top-down and bottom-up methods. The bottom-up method, including green synthesis, constructs nanoparticles from simpler molecules in an eco-friendly, safe process. Microorganisms such as bacteria, fungi, algae, and plants act as substrates, with plant extracts' biomolecules reducing metal ions to nanoparticles. These reducing agents include water-soluble plant metabolites like alkaloids, phenolic compounds, terpenoids, and coenzymes. Soxhlet extraction transfers partially soluble solid components to the liquid phase using solvents such as dichloromethane, acetone-hexane mixtures, and chloroform. The objective of the study was to access the antibacterial effect of *Chromolaena odorata* leaves. To conduct this study, the green synthesis of silver nanoparticles and the chloroform soxhlet extraction of *Chromolaena odorata* leaves were used. During the synthesis of silver nanoparticles, the bio-reduction of aqueous silver ions by the leaf extract is identified by its colour change. The colour of the solution changed from pale green to reddish brown. The characterization of synthesised nanoparticles was done by UV- Vis Spectroscopy. The peaks obtained at 350 nm confirmed the presence of synthesised silver nanoparticles. The antibacterial activity of synthesised nanoparticles and chloroform extracts of was studied on *Pseudomonas sp.* and *Salmonella sp.* using well diffusion method. According to the findings of the antibacterial assay, the synthesised nanoparticle and chloroform extract of the *Chromolaena odorata* leaves showed inhibitory activity for both bacteria. The chloroform extraction had a stronger effect on antibacterial activity, with a zone of inhibition of 1.4 cm, whereas the synthesised nanoparticles showed a low zone of inhibition of 1.2 cm. The results of the present study of *Chromolaena odorata* leaf-extract might be a good natural antimicrobial agent for *Pseudomonas sp.* and *Salmonella sp.* This work contributes to the scientific understanding needed to explore further pharmacological properties and biomedical uses.

Keywords: AgNPs (silver nanoparticle), green synthesis, *chromolaena odorata*, *Cymbopogon citratus*, UV- vis Spectroscopy.

Practising Sustainability: Intentions, Experiments, and the Making of Alternative Lives

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Abstract

In this paper, I draw from my ethnographic study of a rural homestead in Palakkad, Kerala, to offer provocations on the categorical capacity of the term "sustainability" as it is used popularly in charting an environmentally responsible future. Paying close attention to the claims of my interlocutors that environmental problems are fundamentally rooted in questions of ethics and values, I am interested, here, in two implications: one, the move away from articulating sustainability as a problem of inefficient energy consumption to seeing it as an expansive question of desires, imagination, and constructive possibilities; and two, the notion that the future, rather than resting on the infrastructures of the State, is something that can be made tangible in everyday life of ordinary people through intentional existential projects. Environmental questions have long been configured as a problem of balancing demands of economic growth and the necessities of planetary sustainability—evidenced in the very term "sustainable development". Emerging from the discourse since the 1970s, this commonsensical "middle path" has a curious historical resonance with a parallel sensibility taking shape in the sociopolitical arena around the turn of the century, that of a "capitalist realism". The latter has been at the heart of discussions over the nature of progressive politics and their scope for change-making at a time of seemingly global ideological stranglehold of the capitalist imaginaries. Within such a matrix, split over reformist and revolutionary considerations, claims of para-mainstream alternatives are often suspect. My discussion will explore the tangents I have proposed indirectly by taking stock of the more prominent disagreements with claims of alterity with regard to environmentally conscious living. By doing so, I hope to illuminate not so much different solutions but a different method in approaching the problem of environmental sustainability.

Keywords: Sustainability, environmental problems, economic growth, middle path

Efficiency of Tamarindus indica and Garcinia cambogia in antibacterial activity and in the green synthesis of silver nanoparticles

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Abstract

Silver nanoparticles are tiny particles of silver, typically ranging from 1 to 100 nanometers in size. They are known for their unique properties, including antibacterial, antifungal, and antiviral effects. These properties make them useful in various applications, such as medical devices, textiles, electronics, and water purification systems. However, there are also concerns about their potential environmental impact and toxicity, which are subjects of ongoing research. They could be prepared by chemical or physical methods. But these chemical methods of synthesis have some harmful effects on human health and on the environment. Silver nanoparticle synthesis by a green approach using plant extract is a low-cost effective process. Chloroform extraction of leaves is a method used to isolate various bioactive compounds from plant materials. The current study focus to find out plant based antibacterial activities. Chloroform extract of dried leaves of *Tamarindus indica* and chloroform extract of dried leaves of *Garcinia cambogia* were prepared using Soxhlet extraction. Silver nanoparticles were synthesised using crude extracts of *Tamarindus indica* leaves and *Garcinia cambogia* leaves. The plant extract served as the reducing agent in the synthesis process. The appearance of reddish brown colour indicates the formation of silver nano particles. The synthesized silver nanoparticles are characterized using various analytical techniques such as UV-Vis spectroscopy, to determine their size, shape, morphology, and crystalline structure. Chloroform extracts and silver nanoparticles synthesised using *Tamarindus indica* and *Garcinia cambogia* were tested for antibacterial activity against bacterial species *Pseudomonas sp* and *Salmonella sp* using well diffusion method. The leaf extracts of both *Tamarindus indica* and *Garcinia cambogia* showed greater zone of inhibition against each microorganism. These plant based antibacterial agents can be used in various fields like wound healing, liver health, disease treatment, treatment of bacterial diseases, cholesterol, etc.

Keywords: *Garcinia cambogia*, *Tamarindus indica*, antibacterial, *pseudomonas sp*, *salmonella sp*, chloroform extract, soxhlet extraction, silver nanoparticles, green synthesis.

Exploring the larvicidal and antibacterial potential of *Sphagneticola trilobata* and *Curcuma aeruginosa* and their role in silver nanoparticle synthesis

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Abstract

The study is conducted to check the efficiency of *Sphagneticola trilobata* which is an aromatic invasive plant species of Kerala and *Curcuma aeruginosa* which is also an aromatic plant species, in antimicrobial and larvicidal activity and in the synthesis of silver nanoparticles. *Sphagneticola trilobata*, is a species of flowering plant in the Asteraceae family. This plant is known for its ability to spread rapidly and form dense mats, making it an invasive species in some areas where it has been introduced. *Curcuma aeruginosa*, belong to the family Zingiberaceae. It has been used in traditional medicine in some regions, its rhizomes are sometimes used in herbal remedies. Chloroform extraction of plants is a method commonly used in phytochemistry to isolate various bioactive compounds from plant materials. Chloroform is an effective solvent for extracting a wide range of bioactive compounds from plants, such as alkaloids, terpenoids, flavonoids, and phenolic compounds. Chloroform extract of dried leaves of *Sphagneticola trilobata*, and chloroform extract of dried rhizomes of *Curcuma aeruginosa* were prepared using Soxhlet extraction. Characterization of the chloroform extracts was also done to find the components present in the extracts. The extracts were tested for their antibacterial activity against bacterial species *Salmonella sp.* and *Pseudomonas sp.* using well diffusion method. Both samples showed greater zone of inhibition against the bacterial species. The extracts also tested for larvicidal activity against 3rd instar larvae of aedes genus. Each sample showed greater larvicidal activity against the mosquito larvae. The ability of *S. trilobata* and *C. aeruginosa* to reduce silver ions into silver nanoparticles is also studied. The study proved that both the plants have the efficiency to green synthesis the silver nanoparticles. The phytochemicals in the extract act as reducing agents. The antibacterial and larvicidal activity of the synthesised silver nanoparticles were also studied. The nanoparticles showed greater zone of inhibition against *Pseudomonas sp* and *Salmonella sp.* The nanoparticles also showed greater larvicidal activity against 3rd instars of aedes genus. The synthesized silver nanoparticles are characterized using various analytical techniques such as UV-Vis spectroscopy, to determine their size, shape, morphology, and crystalline structure.

Keywords: *Sphagneticola trilobata*, *Curcuma aeruginosa*, chloroform extract, Soxhlet extract, *salmonella sp*, *pseudomonas sp*, aedes, antibacterial, larvicidal, silver nanoparticles, green synthesis.

Exploring the phyco-chemical constituents and in vitro antioxidant potential of filamentous green algae from freshwater ecosystems of Kerala

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Abstract

The natural antioxidant compounds from plants can contribute to diverse pharmacological activities by neutralizing free radicals. In the present study, three filamentous green algal species—*Oedogonium angustistomum*, *Ulothrix variabilis*, and *Mougeotia pulchella* were isolated from freshwater ecosystems of Kerala. The study assessed the phyco-chemical constituents, antioxidant activities, and total phenol and flavonoid contents of algae using different solvents (petroleum benzene, acetone, methanol, methanol crude, and water). Methanol crude extracts had the highest yield percentage in *Ulothrix* (11.23%) and *Mougeotia* (26.11%), except *Oedogonium* (9.3% aqueous). Petroleum benzene fractions had the lowest yield. Analysis showed presence of reducing sugars, flavonoids, phenolic compounds, and triterpenoids. Acetone extract had the most diverse compounds. *Mougeotia pulchella* had the highest total phenolic content (70.75 ± 0.12 mg GAE g⁻¹) in its aqueous extract, while *Oedogonium* had the highest total flavonoid content (47.49 ± 0.26 mg QE g⁻¹) in its acetone extract. LCMS analysis identified phenolic compounds in all three algae, with D8'-Merulinic acid A dominant across all species and Gingerol dominant in extracts of *Oedogonium* and *Ulothrix*. The *Oedogonium sp.* (acetone, aqueous, and methanol crude extracts) exhibited potent radical scavenging activity against DPPH, Nitric oxide, Hydroxyl free radicals (IC₅₀ values: 91.07 ± 4.58 µg ml⁻¹, 35.19 ± 5.71 µg ml⁻¹, and 40.51 ± 12.41 µg ml⁻¹, respectively). While the *Ulothrix sp.* (aqueous extract) showed the highest superoxide radical scavenging activity (IC₅₀: 22.23 ± 1.29 µg ml⁻¹). These findings highlight the antioxidant potential of these algae. Further analysis of these algae will help in identification and isolation of natural antioxidant compounds. It is essential to assess the extracts for their in vivo antioxidant activity before considering them for clinical use in the pharmaceutical or nutraceutical industries.

Keywords: Freshwater, Filamentous Green algae, Total phenol, Total flavonoid, Antioxidant, LCMS

ABSTRACTS OF ORAL PRESENTATION

EG-01

Theme 4: Ethnography (EG)

Sloth Bears' Dietary Patterns and Seed Dispersal in dry deciduous forests of Rajasthan, India

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Abstract

Sloth bears (*Melursus ursinus*) are myrmecophagous carnivores that eat a variety of plants across their distribution range and play a crucial role in seed dispersal. Information on sloth bear ecology in dry deciduous habitats in the western distribution range is limited, including their dietary preferences and role in seed dispersal. We conducted an extensive study in the Kumbhalgarh and Todgarh-Raoli wildlife sanctuaries in Rajasthan, India, to elucidate sloth bear dietary patterns and seed dispersal dynamics. Through field surveys carried out over two seasons, we recorded a varied diet that is influenced by fluctuations in weather patterns. Plant-based food materials were more prevalent in winter diets than animal components, particularly termites (FO% 52.22), which were favored during the summer. Our findings revealed selectivity in the sloth bear diet, with certain plant species such as *Grewia flavescens* and *Cassia fistula* being preferred. Their role in seed dispersal was demonstrated by germination experiments in the lab involving seeds obtained from sloth bear scats and tree sources from forests, which demonstrated accelerated germination in scat seeds, indicating the potential role of sloth bears in seed dispersal processes. However, survival analysis between scat and tree seed groups revealed minimal differences in survival probabilities between seeds derived from scats and tree sources for most species except *Diospyros melanoxylon*. Our study underscores the adaptive capabilities of sloth bears in response to seasonal fluctuations and highlights their significance in forest regeneration through seed dispersal. Furthermore, our research identifies previously unreported plant species dispersed by sloth bears, contributing to a deeper understanding of their ecological importance in threatened ecosystems.

Keywords: Sloth bear, Dietary patterns, Seed dispersal, Rajasthan, India

Preserving Pulicat's Natural Heritage and Livelihoods

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Abstract

Pulicat or Pazhaverkadu, located in Thiruvallur district of Tamil Nadu, houses the second-largest brackish water lake in the coast of Coromandel (Aves, 2020). Being a former Dutch-occupied colony, it has played an historical role in hosting a port for trade and commerce. Its significance as a port town reduced as Madras presidency, located south to Pulicat, turned into a port city in itself, and became one of the central places of governance for the East India Company (EIC) in the 17th century (Muthiah, 2018). The natural heritage of Pulicat consists of a diverse range of flora and fauna, which have constituted its human and physical geography. Fishes, shrimps, crabs and prawns are found in the lake of Pulicat (Aves, 2020). Fishing communities have built their livelihoods around the lake and the sea. Mangroves are also abundantly found in the area, and they support the livelihoods of Adivasi women and men who handpick fishes, crabs and prawns near the mangroves (Aves, 2020). Contemporarily, Pulicat's ecology is endangered by the active industrialisation process occurring in northern parts of Madras. The notification about Kattupalli port expansion, at the Ennore suburb in Madras, further threatens to destroy the livelihoods based out of fishing in Pulicat (Lakshmi, 2021). The expansion of the port further makes the communities living in the area vulnerable to coastal flooding, sand erosion and displacement (Lakshmi, 2021). Within the praxis of human and physical geography (Holifield & Day, 2017), production for accumulation or profit leads to the loss of land and water, harnessed initially to support the livelihoods, histories and biographies of the community members. This paper tries to understand the historical significance of Pulicat as a natural heritage and the necessity to view it as a site of heritage to be preserved. Secondly, it attempts to map the varying livelihoods that emerge from the ecology of Pulicat and which have supported Dalit, Adivasi and fishing communities for generations. Lastly, it places the current degradation of the natural heritage of Pulicat due to the notification of Kattupalli port expansion, and the need to preserve the area.

Keywords: Pulicat, natural heritage, livelihoods, industrialization, conservation, Kattupalli port

ABSTRACTS OF ORAL PRESENTATION

EL-01

Theme 5: Evolutionary (EL)

Phylogeny, Divergence Time Estimation and Biogeography of Army ant Genus Aenictus Shuckard, 1840 (Hymenoptera: Formicidae: Dorylinae)

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Abstract

The geological history of the Indian subcontinent involves its separation from Gondwana around 200 million years ago, subsequent northward drift, and eventual collision with Asia around 60 million years ago. These events profoundly influenced the biota within the subcontinent through processes of divergence and dispersal. Within this context, the army ant genus *Aenictus* (Hymenoptera: Formicidae: Dorylinae) presents an ideal model system for testing patterns of diversification. With its distribution spanning the Old World tropics, *Aenictus* exhibits the unique army ant syndrome, which is characterized by nomadism, foraging in mass, and a highly specialized permanently wingless queen. Analyzing the phylogeny and divergence times of this species can provide valuable insights into how these geological events have shaped contemporary patterns of speciation and biogeography. The objective of this study is to analyze the phylogenetic relationships within the genus *Aenictus* across their distributional range. The primary focus is on understanding the interconnections among *Aenictus* populations and investigating the time and manner of their dispersal to different geographical regions, despite their limited dispersal capabilities. We constructed a comprehensive, genus-level phylogeny using a multigene dataset. The dataset includes specimens across the Indian subcontinent, Africa, South East Asia, and Australia. The genes analyzed were *COI*, *Cytb*, *18s*, *Wg*, *LRh*, *EF1a F1*, and *EF1aF2* genes. The research findings indicate the non-monophyly of the genus *Aenictus*, with individuals of the Indian subcontinent nested in multiple clades. One of these clades traces its ancestral lineage endemic to India, suggesting a possible scenario where the ancestor originated in India and subsequently spread to Southeast Asia. The findings reveal weak branch support for certain lineages, primarily attributed to limited sampling. This underscores the necessity for a more extensive representation, particularly from Africa and Australia, to achieve greater accuracy in our findings.

Keywords: Phylogeny, divergence, biogeography, *Aenictus*

***Ultra-Morphological Investigation of Genital Markings of the Terrestrial Oligochaetes
(Annelida, Clitellata) by Scanning Electron Microscope***

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Abstract

Earthworms are known for their promiscuous and polygamous nature, often considered to be hermaphrodites capable of cross fertilization. Studying the ultrastructure of the genital pore of earthworm at a microscopic level is crucial for several reasons. Despite its importance in the reproductive process, the ultra-morphology of the genital pore remains relatively understudied, particularly at the microscopic level. SEM allows for the visualization of fine-scale features of the genital pore, such as surface textures, openings, and glandular structures, which are essential for understanding reproductive mechanisms. Examining the ultrastructure of the genital pore provides insights into its functional adaptations and physiological processes associated with reproduction. This novel study aims in investigating SEM images of the genital pore in *Megascolex* spp., which offers a unique opportunity to explore the ultrastructure of this specialized reproductive organ with exceptional detail. By examining SEM images, we can identify and characterize various structural components associated with the genital pore, including pores, glandular features, and surface textures. Furthermore, comparative analysis across different earthworm species and taxonomic groups allows for insights into evolutionary adaptations and species-specific variations in reproductive anatomy. It yields valuable insights that extend beyond basic anatomical descriptions. By examining this specialized reproductive organ at a microscopic level, we can uncover crucial information regarding reproductive biology, evolutionary adaptations, and ecological interactions within soil ecosystem.

Keywords: ultra-morphology, terrestrial oligochaetes, *Megascolex* spp., genital pore, SEM

ABSTRACTS OF ORAL PRESENTATION**Theme 6: Geographic information system (GIS)****GIS-01*****Modeling Habitat Suitability for The Leopard in Southern India Through Ensemble Species Distribution Modelling***Daksh Singh^{1,2}¹National Tiger Conservation Authority; ²Wildlife Institute of India

Abstract

In the southern Indian provinces of Tamil Nadu and Kerala, anthropogenic influences and habitat fragmentation have exerted significant impacts on the Indian leopard's environment within the biodiverse Western Ghats. As a globally recognized UNESCO World Heritage site, the Western Ghats' diverse ecosystems and rich biodiversity are integral to the survival of these leopards. This study analyses the implications of integrating anthropogenic variables with environmental variables, assessing their cumulative impact on the precision of Species Distribution Models (SDMs). Four distinct SDMs utilizing techniques Maximum Entropy (Maxent), Random Forests, Generalized Linear Models (GLM), and Boosted Regression Trees (BRT) were employed. In subsequent runs, anthropogenic variables were introduced, enhancing the integrated model's overall accuracy, thereby underscoring their pivotal role in forecasting habitat suitability. Moreover, this investigation estimates the viable habitat area for leopards outside the prescribed protected zones within Tamil Nadu and Kerala. An exploration into the influence of dataset selection on leopard habitat suitability modelling was also undertaken, utilizing two divergent datasets: the Global Biodiversity Information Facility (GBIF) and the official Indian government report on leopard status. A significant discrepancy was noted when each dataset was applied individually, resulting in the deployment of a combined dataset for the final analysis. The ensemble model predicts a total suitable habitat area of 21,797 square kilometres within these southern Indian states. From this, 7,426.015 square kilometres are within protected areas, leaving 14,370.985 square kilometres of appropriate habitat situated outside these zones. It also provides a district-wise breakdown of the predicted leopard habitat and protected areas in both states. Representing the pioneering application of machine learning techniques in Tamil Nadu and Kerala for predicting suitable habitats for leopards, this research significantly contributes to the region's conservation initiatives.

Keywords: Species Distribution Modelling, Ensemble Model, Habitat Suitability, Human-Wildlife Conflict, Western Ghats, Tamil Nadu, Kerala

Unravelling Vulnerabilities: A Case Study of Disaster Risk Assessment at a pilot site of Kailash Sacred Landscape, India

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Abstract

The current study delves into the susceptibility of the Kailash Sacred Landscape in Uttarakhand's Pithoragarh district, focusing on regional-level disaster risk assessment in the Gori Ganga watershed as a case study, with the goal of developing foundation maps for recurring disasters such as landslides, floods, and forest fires. Remote sensing and geographic information systems, frequency ratio, and correlation analytics were used to identify hazard-prone locations in the valley, employing a number of topographical, environmental, and anthropogenic parameters. The accuracy of the maps produced by the modelling technique was evaluated using validation data and a receiver operating characteristics curve (ROC) with area under the curve (AUC). The investigation found that 83.5 km² was extremely vulnerable to flooding, 133.1 km² to landslides, and 147 km² to wildfires. The determined area under the curve value for flood susceptibility was 88.6%, with landslides at 89.5% and wildfires at 90.9%, indicating that the model worked exceptionally well. The findings show that precipitation, lithology, and elevation were the most important factors in causing floods. Precipitation, profile curvature, elevation, and distance to thrust are the key causes of landslides; however, proximity to the road and villages, as well as vegetation indices, were significant predictors of fires. The Lower Kumaon Himalayan region of the valley was identified as being particularly vulnerable to all three major disasters. This research identifies potentially hazardous regions for adaptive sustainable conservation actions, integrating local communities in decision-making to reduce impacts and aid in the prevention and management of impending landscape-level threats.

Keywords: Vulnerabilities, Landscape, Disaster risk assessment, Himalayan

Accessibility of health care centres in Kasaragod district

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Abstract

The public healthcare system in Kasaragod district, Kerala, is grappling with inadequate accessibility, which has a significant impact on the quality of healthcare services provided to the residents. Despite the government's efforts to improve the situation, several factors contribute to this issue. Firstly, the geographical location of the district, with its vast expanse of land and scattered population, makes it challenging for people to access healthcare facilities easily. This is further exacerbated by the lack of transportation infrastructure, which makes it difficult for people to travel to the nearest healthcare centre. Secondly, the shortage of healthcare professionals and resources in the district adds to the problem. With limited staff and equipment, the healthcare centres are unable to cater to the growing needs of the population, leading to long waiting times and inadequate care. To address these challenges, the government needs to invest in improving transportation infrastructure, increasing the number of healthcare professionals, and providing better resources to the existing healthcare centres. By doing so, the accessibility of public healthcare in Kasaragod district can be significantly improved, ensuring that the residents receive the quality care they deserve. Kernel density estimation in GIS and statistical methods used to analysed this study.

Keywords: public healthcare system, GIS, Kasaragod, Kernel density

Multi -Criteria Flood Risk Assessment & Mapping for Nanded City using GIS & Analytical Hierarchy Process (AHP)

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Abstract

Flood risk assessment is a critical component of urban planning and disaster management, especially in regions prone to frequent flooding. This study presents a comprehensive flood risk assessment for Nanded City, utilizing a GIS-based approach combined with Multi-Criteria Analysis (MCA) and Analytic Hierarchy Process (AHP) techniques. Key factors influencing flood risk, including Digital Elevation Model (DEM), Land Use/Land Cover (LULC), soil type, drainage density, rainfall data, and proximity to streams, were integrated to develop a detailed flood risk map. The methodology involved preparing essential spatial data layers, such as DEM and LULC, followed by processing them through a series of hydrological modeling steps including fill, flow direction, and flow accumulation. The weighted sum tool in ArcGIS was employed to combine these criteria, with weights assigned through the AHP method to reflect their relative importance in flood risk determination. The resulting flood risk map categorizes Nanded City into four distinct zones: low, medium, high, and highest risk. The study also incorporated 3D visualization techniques using Arc Scene to enhance the spatial understanding of flood-prone areas. The findings indicate that low-risk zones are generally located in higher elevation areas with permeable soils and sparse drainage networks, while high and highest risk zones are concentrated in low-lying floodplains with dense urban development and impervious surfaces. This detailed flood risk assessment provides valuable insights for urban planners, policymakers, and emergency responders. It highlights critical areas requiring targeted flood mitigation measures and supports the development of robust flood management strategies. Future research directions include the integration of real-time data for dynamic flood forecasting, climate change impact analysis, and community-based flood risk management approaches. The study underscores the efficacy of combining GIS, MCA, and AHP techniques in urban flood risk assessment, promoting informed decision-making and enhancing urban resilience to flooding.

Keywords: Flood Risk Assessment, GIS, Multi-Criteria Analysis (MCA), Analytic Hierarchy Process (AHP), Nanded City, Urban Flooding, Spatial Analysis.

Unveiling Ecological Patterns: Spatial Mapping and Patch Matrix Analysis of Mathikettan Shola National Park

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Abstract

Mathikettan Shola National Park located in the High Ranges of the southern Western Ghats is undulating landscaped with hillocks of varying heights. It is situated on the north-east side of the Cardamom Hill Reserve, within the geographical limits of 9.997583°-9.975766° North latitude and 77.222074°-77.271975° East longitude with an area of 13.00 km². Administratively, the park falls under Poopara village of Udumbanchola Taluk in the Idukki district, Kerala and it is one of the national parks under the administrative control of Munnar Wildlife Division. This study was designed to understand the vegetation patterns of Mathikettan Shola National Park through fine-scale (high-resolution) satellite data with Level V/VI classification using GIS (Patil et al 2012; Jensen 1996 & 2002; Thomas 2001; Lillesand & Kiefer 2004; Xuerong Li et al. 2010; Chao Yang et al. 2017; Dante Medina Aquino et al. 2015; José M. Peña et al. 2014; Robert C. Weigh et al. 2010; Kindu et al. 2013; Borkar et al. 2017; Asadi et al. 2012; and Aher et al. 2012) and access Landscape level patch matrix analysis (Jung M, 2017). A total of 10 land use/landcover classes, both natural and man-made. The Patch metric analysis identified more than 200 patches in MSNP of which the majority (149) are rocky outcrops. Although the canopy of PA looks uniform, the disturbance created by humans in the past has created patches. It is interesting to note that these patches are well connected and placed adjacently facilitating the movement of wild fauna, both terrestrial and arboreal as well as small and large. Among the vegetation types, subtropical hill forests and montane grassland have more patches compared to other landcover classes. One of the major management issues noticed during the fieldwork is the presence of invasive species, *Ageratina adenophora*, which needs to be controlled. The land use and landcover of the PA are highly heterogeneous and support rich biological diversity and natural resources.

Keywords: Landscape Patch Analysis, Object Based Image analysis, LecoS, SVM

Coastal Vulnerability Assessment: A study of shoreline changes of Mumbai coast using Remote Sensing & GIS

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Abstract

The Mumbai coast, a vital hub of economic and social activities, is increasingly threatened by coastal erosion & rising sea levels. The study area spans from Colaba in the south to Virar and Vasai in the north, covering approximately 150 km along the Arabian Sea. The present study assesses the vulnerability of the Mumbai shoreline by employing advanced Remote Sensing (RS) & Geographic Information System (GIS) tools. High resolution satellite imagery & historical shoreline data were analyzed to detect & quantify shoreline changes over recent decades. The study identified significant areas of erosion & accretion, highlighting zones at high flood risk, quantify coastal vulnerability & characterize shoreline dynamics around Mumbai. Assessing vulnerability helps in planning & decision making. Using GIS based spatial analysis vulnerability maps were generated, incorporating factors such as land use, population density & infrastructure. The results provide critical insights for coastal management & urban planning, emphasizing the need for sustainable development practices to mitigate the adverse effects of coastal dynamics, socio economic implications along with climate change adaptation. Both natural & anthropogenic processes along the coast modify the shoreline configuration & control the erosion, accretion activity of the coastal zones.

Keywords: Coastal dynamics, Remote sensing & GIS, shoreline, erosion, coastal zone

Influence of Floods and Land Use Change on Endemic Grassland Bird Distributions

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Abstract

Floods and land use changes have significantly impacted the distribution of endemic grassland bird species in the Brahmaputra floodplain. This study characterizes landscape structure changes between 1985 and 2004 across eight regional environmental gradients. Utilizing remote sensing data, we generated land-use and land cover maps, analyzed landscape metrics, and computed annual transition probabilities between land cover types. Results indicate a dramatic decrease in grassland coverage from 72% to 42% during the study period, primarily driven by land use changes.

Advancements in remote sensing have greatly enhanced hydrological studies in sparsely gauged basins. In this research, we employed large-scale hydrological and hydraulic modeling using freely available global datasets for the Brahmaputra basin. A semi-distributed conceptual hydrological model was developed using HEC-HMS, with rainfall estimates from the Tropical Rainfall Measuring Mission (TRMM) compared to limited gauge data for simulation. The Nash Sutcliffe coefficients for the model were 0.75 and 0.61 for uncorrected rainfall data in calibration and validation, respectively, and improved to 0.81 and 0.74 with corrected rainfall data.

Hydrological model outputs served as boundary conditions and lateral inflows for the hydraulic model. Comparisons of results using uncorrected and corrected rainfall products with discharge values at the basin outlet and altimetry data from the Jason-2 satellite showed a good match. Simulated flood inundation maps for the lower Brahmaputra basin also demonstrated reliable detection probabilities, success ratios, and critical success indices. This study highlights that robust hydrological and hydraulic modeling outcomes can be achieved using remote sensing data, providing valuable insights into the impacts of floods and land use changes on grassland bird distributions.

Keywords: Endemic Grassland Birds, Land Use Change, Remote Sensing, Hydrological Modeling, Brahmaputra Floodplain.

Delineation of Urban Heat Islands using Spatial Data – a Case Study from Central Vembanad Lake, West Coast of India

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Abstract

This study investigates the role of urban green spaces (UGS) in mitigating urban heat islands (UHI) in the Central Vembanad Lake (CVL) region of Kerala, India, from 2017 to 2022. Sentinel-2 multispectral imagery and Landsat 8 TIRS data were used to analyse vegetation abundance, land surface temperature (LST), and landscape patterns. The results showed a decrease in vegetation cover, particularly in urban and peri-urban areas, and a consistent increase in LST, indicating the intensification of UHI effects. Landscape metrics revealed changes in the configuration of green spaces, with increasing fragmentation and isolation of vegetation patches. Regression analyses confirmed the negative relationships between vegetation indices, landscape metrics, and LST, highlighting the importance of vegetation extent, fragmentation, and connectivity in mitigating UHI effects. Geographically weighted regression models revealed spatial non-stationarity in these relationships, emphasizing the need for context-specific urban planning strategies. The findings underscore the importance of preserving and enhancing green spaces, considering their spatial configuration and connectivity, and integrating these elements into sustainable urban development strategies to enhance urban resilience and improve the quality of life for residents in the CVL region and similar urbanized coastal areas globally.

Keywords: Delineation, Urban Heat Islands, vegetation, green spaces

Spatial Assessment of Invasive Alien Plant Species in Shola-Grasslands of the Nilgiris and Idukki Districts

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Abstract

Shola-grasslands in the upper reaches of Western Ghats is a unique ecosystem supporting diverse plant and animal species and a high-priority ecosystem for conservation. These habitats have undergone extensive habitat loss due to the conversion into plantations of exotic species such as Acacia (*Acacia spp*), Eucalyptus (*Eucalyptus spp*), Pine (*Pinus spp*) and Tea (*Camellia sinensis*) in the past. These habitats are also affected by the invasion of alien species. Knowledge about the spread of invasive species in shola grasslands has immense importance for taking rapid response and mitigation measures. Shola grasslands of the Nilgiris and Idukki districts were selected for the present study to assess the spread of invasive alien plant species (IAPS). The study area was divided into 5 x 5 sq km grids and occurrence points of major invasive alien plant species were recorded from the grids. The major IAPS recorded are *Ageratina adenophora*, *Acacia sp.* (Wattle), *Lantana camara*, *Ageratum houstonianum*, *Bidens pilosa*, *Solanum mauritianum*, *Cestrum aurantiacum*, *Chromolaena odorata*, *Sphagneticola trilobata*, *Eucalyptus sp.*, *Cytisus scoparius* and *Ulex europaeus*. Out of these species, we mapped the spatial extent of Acacia sp. and Eucalyptus sp. in various habitats of the study area using Sentinel-2 satellite image. The satellite images were classified into various land cover classes with the help of data collected from fieldwork and Google earth using random forest algorithm. The accuracy of the classification has been assessed using confusion matrix and the overall accuracy is 80.34% and 73.77 % for the Nilgiris and Idukki districts respectively. The extent of each class has been calculated.

Keywords: Invasive alien plant species, Shola grasslands and Spatial mapping

ABSTRACTS OF ORAL PRESENTATION**Theme 7: Modelling (ML)****ML-01*****Multifactorial Prediction of Malaria High-Risk Areas in the Philippines Based on Vector Distribution***

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Abstract

In the tropics, the Philippines is a data-limited yet high-burden country. Among notifiable endemic diseases, malaria is at risk of reemergence due to its urban-adapted biological vector *Anopheles flavirostris*. To generate heat maps of malaria risk areas, an optimized bipartite pipeline developed for Maximum Entropy (Maxent) species distribution modelling (SDM) accounting for limited records was used. A total of 44 bioclimatic, anthropogenic, and topographic covariates were screened then associated with 16 occurrence records. Variables relating to temperature trends and habitat loss, particularly those pertaining to residential and commercial development and human intrusions and disturbance, have the most influence on the potential distribution of *An. flavirostris*. The parsimonious model revealed that Pasig City, Santa Rosa City, and Davao cities, among others, as possible hotspots for malaria vectors as indicated by high habitat suitability values. These localities are characterized by substantial urbanization and anthropogenic activity, accounting for urban sprawl, land fragmentation, and population growth that increase the risk for malaria transmission. Several predicted high risk areas are historically malaria-free, and these represent areas requiring stringent malaria surveillance and control. This study contributes to understanding the human-animal-ecosystem interface, and adheres to the One Digital Health initiative operationalized under the Sustainable Development Goals (SDGs).

Keywords: Malaria, *Anopheles flavirostris*, Public health, human-animal-ecosystem interface

Environmental Modeling for Controlled Crop Growth in Off-Season Experiments

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Abstract

The study of environmental modeling, focusing on the meticulous measurement of various field weather parameters using sensors to facilitate controlled crop growth experiments during off-season periods. The initial phase involves precisely measuring critical environmental factors essential for plant growth, including temperature, humidity, light intensity, duration, light spectrum, soil temperature, and soil moisture. Additional key parameters include atmospheric pressure, wind speed, carbon dioxide (CO₂) concentration, and rainfall. Utilizing advanced sensor technologies, the research captures real-time data to comprehensively understand the ambient environment's dynamics. This integration ensures a holistic view of environmental conditions, facilitating accurate modeling and simulation. Following data collection, the study creates controlled environments within specialized growth chambers, where environmental variables are precisely manipulated. These chambers replicate specific field conditions, allowing researchers to simulate off-season scenarios and cultivate crops under controlled parameters. This setup provides a versatile platform for experiments on various aspects of crop growth, enabling year-round cultivation and experimentation by mimicking diverse climatic conditions. This approach not only extends the growing season but also provides insights into crop responses under varying environmental stimuli. The integration of environmental modeling techniques with controlled growth chambers holds immense potential for advancing agricultural research and innovation. By elucidating the intricate interplay between environmental factors and crop growth, researchers can devise strategies to enhance crop productivity, resilience, and sustainability. Moreover, the ability to conduct off-season experiments empowers researchers to explore novel cultivation techniques and crop varieties, ultimately contributing to the advancement of agricultural science and food security. In conclusion, this study underscores the significance of environmental modeling and controlled environments in facilitating off-season crop growth experiments. By leveraging sensor technologies and growth chambers, researchers can unravel the complexities of plant-environment interactions, paving the way for innovative agricultural solutions and practices.

Keywords: Crop growth, environmental modeling, weather parameters, sensor technologies

Trophic state indexing and eco-hydrological assessment of wetlands in Sonitpur district, Assam

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Abstract

Wetlands are one of the most productive and biologically diverse system. There are numerous freshwater ecosystems in Sonitpur district, Assam, and most of these are under mild to severe environmental and anthropogenic stresses. The topography, climatic features, and anthropogenic activities in Sonitpur make its wetlands prone to nutrient enrichment and eutrophication. This study aims to evaluate the nutrient dynamics and trophic status of selected wetlands in Sonitpur using eco-hydrological interventions to identify nutrient enrichment pathways. An interdisciplinary eco-hydrological approach, including Carlson's trophic state indexing, was adopted for nutrient assessment. Carlson's method uses three variables: chlorophyll-a, Secchi disc depth (SDD), and total phosphorus (TP), to classify water bodies as oligotrophic (<30), mesotrophic (30-50), eutrophic (50-60), and hypereutrophic (>60). Water sampling, wetland monitoring, and trophic state indexing were conducted during two periods: winter and pre-monsoon. These investigations were supported by the assessment of physicochemical parameters of wetland, and the dominance of aquatic vegetation such as *Eichhornia sp.*, *Salvinia sp.*, *Ludwigia sp.*, *Lemna minor*, *Pistia sp.* and *Hydrilla sp* was observed. Moreover, cyanobacterial species – *Microcystis* and *Dolichospermum* were observed, which are active cyanotoxin releasing agents in the study area; along with high nutrient load stimulated a suitable environment for *Eichhornia sp.* invasion. TSI exhibited a range of eutrophic to hyper-eutrophic wetlands in winter as well as pre-monsoon periods, according to standard TSI values by Carlson. High P concentration (1.21 ± 0.028 mg/L in winter) and chlorophyll-a concentration (0.70 ± 0.006 mg/L in winter), and low SDD (62.67 ± 0.577 cm in winter) moderated the trophic status of wetlands. This study helped in generating useful baseline information on the trophic status of wetlands. This study also aims at developing some futuristic innovative eutrophication remediation techniques and sensitizing the people residing at the vicinity of wetlands in the study area about eutrophication and cyanotoxin pollution. This study also helped in providing important insights into routine monitoring of wetland water quality and trophic status such that the wetland water resources will be sustainably utilized by the users without compromising the ecosystem services.

Keywords: Ecohydrological assessment, Trophic state index, Wetlands, Eutrophication

Potential Densities of Leopards in Sub-Saharan Africa: Target for Recovery and Informing Current Management

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Abstract

Global leopard (*Panthera pardus*) populations have declined due to increasing anthropogenic pressure, and the species has disappeared from 40% of its historical range in Africa. Despite advancements in understanding leopard population distribution, the lack of empirical data impedes range-wide assessments. To address this gap, we developed a model to predict leopard abundance on a continental scale across sub-Saharan Africa by considering environmental and anthropogenic factors that influence leopard population density. The most parsimonious model found statistically significant associations between leopard population density with shrubland, woodland, predator species richness and prey species richness. Our model estimates the current leopard population within its current range in sub-Saharan Africa to be approximately 120,600 – 287,400 individuals. Based on leopard age and sex population structure, these estimates translate to 17,066 – 39,667 adult male leopards in countries in non protected areas where trophy hunting occur, of which an unknown proportion is above the threshold of the recommended legal hunting age of 6 years old or more. Under current conditions, the sub-Saharan leopard population could potentially reach around 335,500 – 738,200 individuals within its historical range, provided measures are taken to increase the prey base and improve habitat conditions and connectivity. Our estimates can serve as a foundational target for leopard conservation, providing a more robust estimate compared to previous findings still in use to date. Efforts should be directed towards conducting more on-the-ground surveys in undersampled areas to enhance the accuracy of this model and simultaneously assess whether the leopard population in the studied region falls below or exceeds the target population. This approach can serve as a dynamic baseline for determining harvesting quotas and advancing leopard conservation efforts.

Keywords: Global leopard, anthropogenic, Sub-Saharan Africa, conservation

Species Distribution Modelling for the Endangered Species *Hopea ponga* in Western Ghats, India Using MaxEnt

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Abstract

Species distribution modeling (SDM) is a method used in ecology, biogeography, and conservation biology to predict the distribution of species across geographic areas. The use of SDM is increasingly important in the aspect of building awareness of environmental change and its biological consequences in individual species. MaxEnt model for SDM uses presence only data for the modeling. *Hopea ponga* is distributed in semievergreen and evergreen forest areas in southern western ghats and it is an endemic and endangered species. It has patchy distribution associated with the sacred grooves as well as along the banks of rivers. The present work is an attempt to predict the potential current distribution *Hopea ponga* in southern western ghats using Species distribution modeling (MAXENT). Future distribution model predicts the suitable areas for the *Hopea ponga*. The main aim of research is to map geographic range of *Hopea ponga* in Southern western ghat using maxent technique for determining the suitable areas for conservation. Extensive field surveys were conducted to find the distribution of *Hopea ponga* from 2018 July to 2022 July. Distribution data is also collected from the herbarium. R, Arc GIS, Diva GIS and MaxEnt are the software used during the analysis. The potentially suitable habitats for *Hopea ponga* in southern western ghats is modelled using maxent. The effect of climatic variables on the SDM modelling of *Hopea ponga* were done. The predicted distribution model is mainly concentrated in the Kongan area of Western ghats. The AUC value for the current is 0.990. The effect of climatic variables on the ecological niche modelling of *Hopea ponga* indicates that Bio 19, bio 4 and bio 3 has the highest contribution value. While considering area of potential distribution of *Hopea ponga*, only 0.42% highly suitable and 98.6 % is unsuitable habitat. In the future prediction modelling (RCP 4.8 & RCP 8), the highly suitable area for *Hopea ponga* is slightly increased as 0.44 and 0.60 respectively. Even though the highly suitable area is slightly increasing from the map we could say that there is significant downward shift in the distribution status of *Hopea ponga*. Even though shifting downwards is unexpected, in warmer climatic conditions there are plant species which shows a shift in downwards. As for many species, other than the bioclimatic factors, anthropogenic habitat fragmentation will be the one of the major causes for the destruction of *Hopea ponga* population. Further studies are needed to evaluate other environmental variables, which can affect the *Hopea ponga* population

Keywords: Species distribution modelling, *Hopea ponga*, MaxEnt, Western Ghats, habitat suitability, conservation

ABSTRACTS OF ORAL PRESENTATION

AG -01

Theme 8: Sustainable Agriculture AG

Spiders as Agrobionts: Exploring Their Role in Sustainable Agriculture and Citizen Science Engagement

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Abstract

Spiders, crucial in ecological balance, thrive as agrobionts, providing vital services in agricultural ecosystems. Their roles in pest regulation, nutrient cycling, and soil health make them integral to sustainable farming. Spiders curb pest populations through natural predation, reducing pesticide dependency, and promoting environmental health. This enhances nutrient cycling and soil quality and bolsters agricultural resilience. This research underscores the interconnectedness of spiders as agrobionts and citizen science in advancing our understanding of spider dynamics within the Andaman and Nicobar Islands agroecosystems. Citizen science engages the public in data collection, enriching an understanding of agroecosystem dynamics. We implemented questionnaire surveys involving comprehensive forms to standardize the data collection, recruiting diverse participants, collecting data on spider sightings, validating entries, and analyzing trends through PERMANOVA among various local farmers and residents. We also compared results at the various family and genus levels to study the taxonomic sufficiency required for future studies. We found that genus level was important for elucidating the effects of urban land use on these spider assemblages. Digital database searches using systematic strategies to extract relevant information from academic repositories and spatial databases (Google Earth Pro) were stratified to assess the distribution of agricultural lands across various regions. The integration of citizen science methods in studying spiders as agrobionts is expected to yield insights into population dynamics, informing targeted pest management strategies and promoting sustainable farming practices. This collaboration aims to empower local farmers through knowledge sharing and capacity building, leading to cost savings, increased crop yields, and improved soil health. By fostering environmental stewardship and community engagement, the research endeavors to create long-term benefits, including reduced pesticide usage, enhanced biodiversity, and resilient farming systems for the future.

Keywords: Spiders, agrobionts, sustainable agriculture, citizen science, pest regulation, nutrient cycling, soil health

Sustainable Agriculture: Addressing The Dual Challenges of Environmental Sustainability and Food Security.

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Abstract

Sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs. The important goal of sustainable agriculture is the responsibility of all participants in the system, including farmers, laborers, policy makers, individuals and researchers. Agriculture exerts a substantial stress on natural resources and the environment. However, sustainable farming practices aim to safeguard the environment, enhance the natural resources and improve soil fertility. Sustainable agriculture refers to a holistic approach to farming and food production that aims to meet the current needs for food and fiber while ensuring the long-term viability of agricultural systems and preserving natural resources for future generations. It encompasses various practices and principles such as Crop Switching, Organic Farming, Community Supporting Agriculture etc, that focus on environmental stewardship, economic profitability, and social equity. This paper presents a policy framework aimed at promoting sustainable agricultural practices that prioritize environmental stewardship, economic profitability, and social equity for farmers. It focuses on initiatives such as crop switching, organic farming, and community-supported agriculture. The framework addresses both global and local issues, with a specific emphasis on Kerala, aiming to enhance climate change mitigation through carbon farming. The Principles of Sustainable Agriculture covered in this proposal include: - Environmental Sustainability: This involves implementing practices that safeguard, recycle, replace, and sustain the natural resource base, including land (soil), water, and animals.- Economic Sustainability: Achieved by improving crop rotation and soil management practices to increase yields.- Social Sustainability: Emphasizes the importance of maintaining social justice and cultural unity for overall social sustainability.

The dissertation delves into significant advancements in sustainable agriculture, including the dissemination of terms in semantic and conceptual spaces, and explores three central ideas:

- The importance of sustainable agriculture in addressing global concerns.
- Governmental policies and initiatives by international organizations that focus on sustainable agriculture.
- Programs and schemes designed to tackle global and local issues, particularly in the context of Kerala, including grassroots level initiatives.

This study sheds light on key developments in sustainable agriculture, governmental policies, and grassroots programs.

Keywords: sustainable agriculture, environmental conservation, soil health, biodiversity, organic farming, food security, climate resilience, social responsibility.

Evaluating the efficacy of organic based nutrient solutions for small scale hydroponics systems for Ipomoea aquatica (water spinach)

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Abstract

Use of liquid organic nutrient solutions produced from industrial, agricultural and domestic wastes are increasingly popular in hydroponic systems. Considering the demand and price for organic products in the market growers are also enthusiastic about organic based crop production specially in the small scale. Therefore, the objective was to evaluate the efficacy of household waste compost tea and fish pond effluents compared to control (water) and the standard (albert's solution). Individual hydroponic units were used as replicates. The four treatments were laid in randomized complete block design (RCRD) with four replicates for each treatment. Each replicate consisted of a hydroponic unit with two sections; top coir dust substrate container and bottom container with nutrient solution. Each replicate unit was consisted of ten plants of *Ipomoea aquatica* (water spinach) plants and altogether each treatment had 40 plants. Nutrient solutions including control and standard were changed weekly. The EC of both albert's solution and compost tea solutions were adjusted to 2.4-2.8 mS/cm. However, average EC of pond water was low as 213 μ S/cm. The plant height, number of leaves and fresh weight were measured at the time of harvest after 06 weeks of planting and analyzed using one-way ANOVA. Accordingly, the treatment effect was significant ($p < 0.05$) on plant height and the highest plant height (47 cm \pm 3.4) compared to other treatments was observed in the plants treated with Albert's solution and there was no significant difference between control, compost tea and fish pond effluents for plant height. Compared to control and compost tea treatments, number of leaves was significantly higher in plants treated with Albert's solution (10 \pm 1.7) but with no difference to the plants in fish pond effluent treatment. The shoot fresh weight was significantly higher in Albert's solution (3.95g \pm 0.03) compared to all other treatments. Accordingly, Albert's solution treated plants had higher vegetative performances, however, based on observations, other organic nutrient solutions may be suggested as cost effective alternatives specially for small scale organic production even though the production is not significant as the standard treatment. In future, the plant performances need to be tested with increased concentrations of organic solutions and heavy metal accumulation should also be tested.

Keywords: Hydroponics, organic nutrient solutions, compost tea, fishpond effluents, *Ipomoea aquatica*, small-scale farming, sustainable agriculture

Impact of Deforestation on Crop Yield: A Bayesian Network Analysis.

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Abstract

Introduction: Deforestation, a significant global environmental issue, alters land use patterns and subsequently affects agricultural productivity. Understanding these dynamics is crucial for developing effective land management policies and ensuring sustainable agricultural practices. This paper examines the causal relationship between deforestation and its impacts on agriculture, measured by crop yield, in the state of Assam. Hypotheses: The primary objective of this research is to elucidate the effects of deforestation on agricultural productivity. The study hypothesizes that deforestation negatively impacts crop yield by altering land use patterns. Furthermore, this study hypothesizes that deforestation impacts agriculture both directly and indirectly, mediated by climatic conditions like rainfall, water erosion, and soil erosion in a causal network. Finally, we examine the hypothesis that excessive use of NPK fertilizers exacerbates plant diseases, further diminishing crop productivity. Together, these conditions form a vicious cycle that adversely affects agriculture. **Methods:** To examine the causal relationships between deforestation, soil and water erosion, rainfall, and their impact on agriculture, we employ a probabilistic graphical model such as Bayesian Networks. The data for these models comes from spatial-temporal analysis of Land Use Land Classification changes, conducted using satellite imagery and geographic information systems (GIS), which is not in the scope of this study. We obtain deforestation data from the University of Maryland's portal, soil and water erosion data from Bhuvan (maintained by ISRO), rainfall and temperature data from the Indian Meteorological Department's annual summary, and fertilizer data from ICRISAT. We perform various ETL activities to suit this data for model training and inference. **Results:** The causal analysis supports the hypotheses that deforestation, both directly and mediated through other factors such as soil and water erosion and rainfall, adversely affects agriculture. Additionally, the study highlights the detrimental effects of excessive NPK fertilizer use on plant health, leading to increased plant diseases and reduced agricultural productivity. **Implications/Conclusions:** The findings of this study have significant implications for land management policies and agricultural practices aimed at mitigating the adverse impacts of deforestation on crop yield. The study advocates for the adoption of organic farming methods to mitigate the negative effects of excessive NPK fertilizer use. Overall, this research underscores the need for integrated approaches to land and agricultural management to sustain crop productivity and environmental sustainability.

Keywords: Deforestation, crop yield, Bayesian Network, land use, soil erosion, water erosion, sustainable agriculture, organic farming

Exploring Phytochemical Diversity: Solvent Based Extraction of Makhota Dewa (Phaleria Macrocarpa) Fruit For Medical Applications

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Abstract

The Makhota Dewa plant (*Phaleria macrocarpa*) is well-known in traditional medicine, yet scientific validation and detailed phytochemical profiling of its fruit are still limited. This study aims to address this gap by performing an in-depth phytochemical screening to identify and quantify the key secondary metabolites responsible for its medicinal properties. We extracted compounds from the fruit using solvents of varying polarities: methanol, ethanol, petroleum ether. Phytochemical analysis revealed the presence of several secondary metabolites. Notably, the methanolic extract contained flavonoids, saponins, alkaloids, tannins, terpenoids, polyphenols and glycosides. Each solvent highlighted a different profile of these metabolites, emphasizing the significance of solvent choice in phytochemical studies. The high concentrations of these compounds indicate the fruit's potential as a source of natural antioxidants, antimicrobial, anti-inflammatory agents, and antidiabetic substances. Our findings revealed significant antimicrobial activity of the methanol extract against a range of pathogenic bacteria, including both Gram-positive and Gram-negative strains. Furthermore, the extract exhibited potent antioxidant activity in vitro by DPPH radical scavenging assay, and its total phenolic content. This comprehensive phytochemical profiling not only validates the traditional medicinal uses of Makhota Dewa but also supports its potential for therapeutic applications and drug development.

Keywords: *Phaleria macrocarpa*, phytochemical screening, secondary metabolites, medicinal plants, antimicrobial activity, antioxidant activity, solvent extraction, traditional medicine

AG-06

Plant-Microbe Interaction through Image Processing

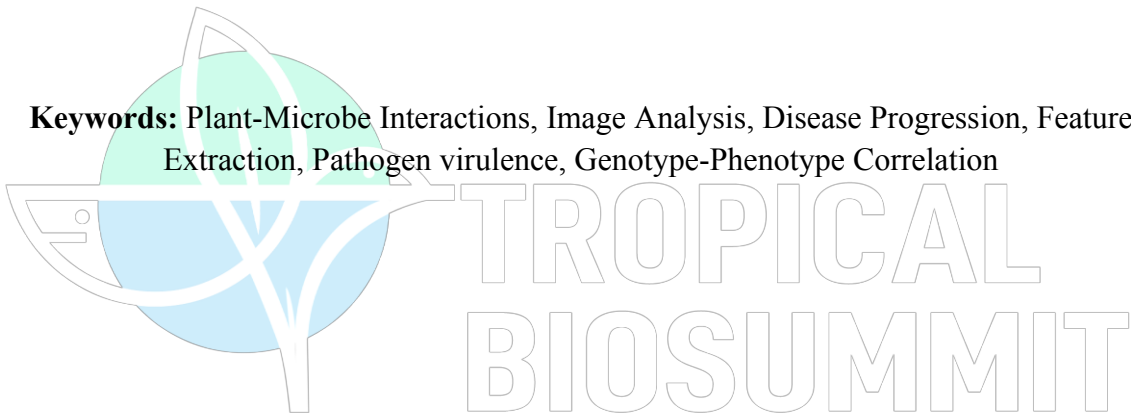
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Abstract

Plant diseases have notable impact in agricultural productivity and the economy. Traditional methods for identifying plant infections such as visual assessments are labor-intensive and limited in frequency. This research aims to improve understanding of plant-pathogen interactions through efficient digital imaging and image analysis. Key objectives include collecting high-resolution images, developing preprocessing pipelines, extracting quantitative features, and analyzing temporal changes in disease progression. Integrating image-derived features with genomic and environmental data will deepen insights into genotype-phenotype interactions and pathogen virulence. This study aims to enhance disease monitoring and management strategies, ultimately improving crop health and productivity.

Keywords: Plant-Microbe Interactions, Image Analysis, Disease Progression, Feature Extraction, Pathogen virulence, Genotype-Phenotype Correlation



ABSTRACTS OF ORAL PRESENTATION**Theme 9: Biotechnology (BT)**

Biological Activities of Commercially Cultivated Mushrooms from Tamil Nadu, India.

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Abstract

According to the National Horticulture Board, India's mushroom production has increased significantly since 1961 and peaked in 2021 with a total output of 243 million tonnes. Although they are very perishable, mushrooms provide substantial nutritional and health advantages, but their cultivation and use are sluggish. Value-added products are being created to solve this issue by meeting the general public's needs for protein and micronutrients while also addressing short shelf lives and postharvest losses. The possible use of by-products from the mushroom manufacturing process, such as caps, stipes, and non-compliance with commercial requirements, in the extraction of bioactive components for highly valuable nutraceuticals is being examined in current study. The study examines the antioxidant, antimicrobial, and anti-inflammatory properties of mushrooms like *Agaricus bisporus* and *Pleurotus ostreatus*. It analyzes their quantitative and qualitative properties, as well as molecular docking of their bioactive compounds against targeted proteins. The ethanolic extract of *Pleurotus ostreatus* contains high amounts of carbohydrates, phenolics, and flavonoids. *Agaricus bisporus* hot water extract shows highest antioxidant activity, and also has the highest inhibitory activity against *Escherichia coli*. In silico analysis reveals high binding affinity of chlorogenic acids towards protein targets.

Keywords: Value-added products, Mushrooms, Antioxidant, Antimicrobial, Anti-inflammatory, Nutraceuticals, Molecular Docking

Evidence of origination of miRNAs from *A. esculentus* chloroplast genome and role in gene regulation

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Kumar, Saravanakumar S., Gopal Pandi

Abstract

The microRNAs are emerging as important gene expression regulators either at the DNA or RNA level. Despite the availability of extensive studies on microRNA generation in plants, reports on their abundance, biogenesis, and consequent gene regulation in plant organelles remain to be explored. Despite extensive studies being available on microRNAs in plants, the study on their presence in plant's organelles has not yet gained attention from researchers. From the previous studies on pre-miRNA sequencing in *Abelmoschus esculentus*, we demonstrated that three putative microRNAs were raised from the chloroplast genome. In the current study, we have characterized the genesis of the three microRNAs by the combination of bioinformatics and experimental approaches. Gene sequence for a miRNA named as AecpmiRNA1 (*Abelmoschus esculentus* chloroplast miRNA) is possibly located in both the genomic DNA i.e. nuclear and chloroplast genome, whereas gene sequences for another two miRNAs (AecpmiRNA2 and AecpmiRNA3) are certainly present only on the chloroplast genome. The target prediction revealed many potential mRNAs as targets for AecpmiRNAs and further analysis by 5' RACE-PCR determined the AecpmiRNA3 binding and cleavage site at the photosystem II protein N (psbN). These results indicate that AecpmiRNAs are generated from the chloroplasts genome and have potential to regulate the mRNAs arising from chloroplast gene(s) and on the other side, the possibility of nuclear genome derived mRNAs regulation by AecpmiRNAs cannot be ruled out.

Keywords: miRNAs, Chloroplast Genome, Gene Regulation, *Abelmoschus esculentus*, Bioinformatics, Photosystem II

Variations in the phytochemical profile of *Hyophila involuta* (Hook.) A. Jaeg. from Rajasthan with respect to altitude.

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Abstract

Bryophytes are the reservoirs of many antimicrobial compounds, phytochemicals and antioxidants as a source of novel medications and promising natural plant-based treatment options for many ailments. Their physiologically active molecules play a critical role in their defense mechanism against microbial infections due to the presence of unique phytochemicals. In the present study, *Hyophila involuta*, a lawn-forming moss was collected from three different areas of Rajasthan with varying altitudes. For the morphological study, the collected plant specimens were air dried at room temperature and kept in brown paper herbarium packets. Plant materials were kept at 4° C until the isolation procedures were completed. The plant material was cleaned with running tap water, followed by autoclaved water to eliminate dirt. After drying for 10 days at room temperature, the materials were pulverized using liquid nitrogen. Methanolic extracts of the powdered plant materials were prepared for qualitative screening to identify various classes of phytochemicals. Quantitative screening was done for Total Phenolic Content (TPC) and Total Flavonoid Content (TFC). The Folin-Ciocalteu technique was used to determine the plant extract's total phenolic content. The absorbance was measured at 765 nm. Results were presented as gallic acid equivalent (GAE) of mg/g for each gram of dry weight. Using the aluminium chloride technique, the total flavonoid content was determined; quercetin was chosen as a benchmark for assessing the flavonoid concentration. Absorbance was recorded at 415 nm. Results were given in milligrams of quercetin equivalent (mg/g QE) per gram of dry-weight extracts. Banasthali Vidyapith samples exhibited significantly better results compared to samples from Mount Abu and Ranthambore. In the Quantitative screening for TPC and TFC, highest concentration of total phenolics and flavonoids was observed in the Banasthali Vidyapith region, followed by Ranthambore and Mount Abu regions. Maximum TPC was obtained in *Hyophila involuta* collected from Banasthali Vidyapith (0.57 ± 0.009 mg/g GAE) and lower yield was obtained in Mount Abu (0.53 ± 0.006 mg/g GAE) Whereas maximum TFC yield (0.5 ± 0.008 mg/g QE) was also obtained with extracts collected from Banasthali and lower yield in Mount Abu (0.12 ± 0.004 mg/g QE) was obtained. This study highlights the variability in the plant's phytochemicals at different altitudes. The findings suggest that this moss has significant potential as a natural source of antioxidants, making it a promising candidate for inclusion in future herbal formulations aimed at boosting immunity and preventing infections.

Keywords: Bryophytes, Phytochemicals, Antioxidants, Altitude, *Hyophila involuta*, Total Phenolic Content, Total Flavonoid Content

***Phytochemical, Antioxidant, Antimicrobial and Molecular study of a therapeutic weed
Tridax procumbens L.***

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Banasthali Vidyapith

Abstract

Tridax procumbens L., a member of the Asteraceae family, is a widespread weed in India. This plant, originally native to tropical America, has become naturalised in tropical Africa, Asia, and Australia. Locally, it is known as "Ghamara," while in English, it is commonly referred to as 'coat buttons' and is recognised as "Bhringraj" in Ayurveda. *Tridax procumbens* is a widely used medicinal herb with various pharmacological activities, such as hepatoprotective, hypotensive, wound healing, anti-inflammatory, antidiabetic, immunomodulating and for treating bronchial catarrh, dysentery, and diarrhoea. The present study focuses on exploring the phytochemical composition and antioxidant and antimicrobial properties of *Tridax procumbens* leaves. The dried powder of *Tridax procumbens* was sequentially extracted using methanol, chloroform, petroleum ether, and water and then tested for the presence of different phytochemicals and antioxidant and antimicrobial activities. The plant leaves were further studied using the Sanger Sequencing Technology method to analyse their molecular characteristics and phylogeny. DNA was extracted using the high salt CTAB (Cetyl trimethyl ammonium bromide) method, and the partial plastome sequence obtained was subsequently submitted to GenBank for further analysis and reference.

Keywords: *Tridax procumbens*, Phytochemicals, Antioxidants, Antimicrobial, Molecular Analysis, Sanger Sequencing

Gene Revolution: Biotechnology for a Sustainable Tomorrow.

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Jawaharlal Nehru Krishi Vishwavidlya, Indira Gandhi Krishi Vishwavidlya

Abstract

In today's scenario numerous of threats like climate change, resource depletion, pollution, and population growth strain our planet. These interconnected challenges demand innovative solutions for a sustainable future, therefore, as humanity progresses through time marked by groundbreaking advancements, a new paradigm emerges: the gene revolution. Biotechnology, the evolution of living organisms and their processes at the molecular level offers a powerful toolkit to address these issues and explores various applications of biotechnology across different sectors standing in frontline for developing a sustainable future. In agriculture, genetically modified crops with enhanced drought tolerance, pest resistance, and nutrient efficiency can reduce reliance on pesticides and fertilizers, minimizing environmental impact. These engineered plants go beyond disease resistance producing natural medicines, offering exciting healthcare options offering exciting possibilities. Bioengineered drugs and vaccines can combat existing and emerging diseases, promoting human and animal health. Gene editing technologies like CRISPR-Cas9 hold promise for treating genetic disorders at the source and can be boon for the future to develop cure of incurable disease. Additionally, their resilience to harsh conditions like drought boosts yields, ensuring food security for a growing population. Beyond crops, biotechnology can be used to develop climate-resilient forests, genetically modified trees with faster growth rates can sequester atmospheric carbon dioxide more efficiently, mitigating climate change. Techniques like mycorrhizal inoculation can enhance the symbiosis between trees and fungi, improving drought tolerance and nutrient uptake and also bioremediation can leverage microorganisms to clean up contaminated soil and water, restoring polluted ecosystems. Apart from this, biotechnology lays its roots in enhancing the energy sector., Biofuels derived from renewable plant resources hold immense potential as a clean alternative to fossil fuels. Microbial fuel cells can generate electricity from organic waste, creating a sustainable energy source from our everyday discards. However, ethical considerations and potential risks associated with biotechnology cannot be ignored. The responsible development and implementation of these technologies are crucial which requires special considerations. This review concludes by highlighting the transformative potential of biotechnology in building a thriving and sustainable future for generations to come. It emphasizes the need for a balanced approach, maximizing benefits while mitigating risks, to harness the power of gene revolution for a healthier planet

Keywords: Biotechnology, Sustainable Agriculture, Gene Editing, Climate Resilience, Bioengineering, Ethical Considerations, Sustainability

Low Cost Methods of In Vitro Propagation In Two Commercial Diploid Bananas of Kerala

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Abstract

Cost-effective methods for in vitro propagation of two commercial diploid bananas of Kerala, namely Musa (AB) 'Njalipoovan' and Musa (AA) 'Nivedyakadali' were carried out to reduce unit production cost. Sword sucker, peeper sucker and eye bud explants were found to be equally effective concerning the number of axillary shoots from a single explant in both cultivars. Sucrose 3.0 per cent and table sugar 2.0 per cent produced the maximum number of multiple shoots in Njalipoovan. In the case of Nivedyakadali, table sugar at 2.0 per cent recorded the maximum number of multiple shoots. Half strength of vitamins in full MS medium observed more multiple shoots in cv. Njalipoovan. Half a tablet of vitamin B complex (2.0mg⁻¹) in the medium resulted in more shoots in the case of cv. Nivedyakadali. Agar 0.7 per cent recorded a significantly higher number of multiple shoots per culture in both cultivars. The treatments involving different types of paper support (filter paper, brown paper and ordinary paper) in liquid media were inferior to agar 0.7 per cent treatment.

Keywords: In vitro propagation, diploid bananas, cost-effective methods, *Musa njalipoovan*, *Musa nivedyakadali*

ABSTRACTS OF ORAL PRESENTATION**CL-01****Theme 10: Climate(CL)*****The State of Climate Change in the Various Agroecological Zones of Cameroon and the Administrative Policies.***

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Ministry of Environment, Nature Protection and Sustainable Development

PLOMB Yannick, University of Dschang

Abstract

Climate change presents a significant threat to agriculture in Cameroon, affecting various agroecological zones across the country. The Sahelian and Sudanian zones in the north are experiencing increased temperatures and erratic rainfall patterns, leading to water stress and reduced agricultural productivity. In contrast, the Equatorial and Guinean zones in the south are facing more frequent and intense rainfall events, causing soil erosion, flooding, and crop damage. These changes in climate patterns are disrupting farming practices, threatening food security, and exacerbating rural poverty in Cameroon. To address the challenges posed by climate change in the country's agroecological zones, the Cameroonian government has implemented several administrative policies and strategies. These include the National Climate Change Adaptation Plan (NAPCC), which aims to enhance the capacity of local communities to adapt to climate variability and mitigate its impacts on agriculture and other activities. The government has also established climate-smart agriculture initiatives, promoting sustainable farming practices that improve resilience to climate-related risks. Furthermore, the government has integrated climate change considerations into national development planning, such as the National Development Strategy and the Agriculture Sector Development Plan. These initiatives seek to mainstream climate change adaptation and mitigation measures into agricultural policies and programs across all agroecological zones in Cameroon. Additionally, the government has collaborated with international organizations and development partners to access funding and technical support for climate change adaptation projects in the agricultural sector. In conclusion, climate change poses a significant threat to agriculture in Cameroon's diverse agroecological zones, impacting farmers' livelihoods and food security. The government's administrative policies and initiatives aim to build resilience and mitigate the impacts of climate change on agriculture, fostering sustainable development in the country. However, greater efforts are needed to scale up climate-smart agricultural practices and strengthen adaptation measures to safeguard the future of agriculture in Cameroon.

Keywords: Climate change, agro ecological zones, Cameroon, climate-smart agriculture, adaptation policies

Climate Change: Urgent Global Crisis Requiring Immediate Action.

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Abstract

Climate change is a pressing global crisis that demands immediate attention and action from individuals, communities, governments, and businesses worldwide. It refers to long-term shifts in global weather patterns primarily caused by human activities, including the burning of fossil fuels, deforestation, and industrial processes that release greenhouse gases into the atmosphere. These activities have led to a rapid increase in greenhouse gas concentrations, trapping heat and altering the Earth's climate system. The consequences of climate change are profound and wide-ranging. Rising global temperatures have resulted in the melting of ice caps and glaciers, leading to sea-level rise and increased coastal flooding. Extreme weather events such as hurricanes, droughts, and heatwaves have become more frequent and intense, posing threats to ecosystems, agriculture, and human lives. Biodiversity loss and ecosystem disruptions further exacerbate the impacts of climate change, affecting the delicate balance of ecosystems and the services they provide. The social and economic implications of climate change are equally significant. Changes in rainfall patterns and temperature have a direct impact on agriculture, food production, and water availability, leading to reduced crop yields, increased food insecurity, and conflicts over scarce resources. Public health is also at risk as changing climatic conditions contribute to the spread of diseases, heat-related illnesses, and respiratory problems. Addressing climate change requires transitioning to renewable energy, adopting sustainable practices, and implementing resilience measures. Communities and governments must invest in infrastructure that can withstand extreme weather events, implement early warning systems, and develop climate-resilient agriculture and water management strategies. Climate finance and international cooperation are crucial to support developing nations in their adaptation efforts and to address the disproportionate impacts faced by vulnerable communities. The Paris Agreement provides a framework for collective action, but increased ambition is essential. Addressing the urgent global crisis of climate change requires a fundamental shift in our individual and collective behaviors, policies, and practices. By embracing sustainable lifestyles, reducing carbon footprints, and advocating for climate-friendly policies, individuals can contribute to the global effort. Governments must implement robust climate policies, support renewable energy transitions, and prioritize sustainable development. Businesses have a responsibility to adopt sustainable practices, invest in clean technologies, and consider environmental and social impacts in their operations. The time for action is now. By acknowledging the urgency of the climate crisis and taking immediate and meaningful steps to mitigate its impacts, we can forge a path towards a more sustainable and resilient future for current and future generations.

Keywords: Climate change, renewable energy, sustainability, Paris Agreement, resilience

Climate Resilient Coping and Adaptive Practices for Sustainable Agriculture and Horticulture Development in Karnataka

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Abstract

To mitigate impact of climate change in southern Agro-climatic zones of Karnataka. field data was collected from farmers in 7 districts on selected crops. Coping and Adaptive practices adopted by farmers while growing crops to mitigate impacts of climate change were recorded. Farmers experienced impact of climate change in terms of decreasing, unpredicted rainfall, variation in rain days, increase in max temperature and decrease in min temperature and frequent failure of monsoon rains. Due to high-temperature low fruit set, yellowish veins, reduced number of catkins resulted in less yield in Black pepper. Adaptive measures like placing cement rings around the pepper vines to maintain the soil micro-biome healthy and collection of mother creeper born seedlings for planting were adopted. Irregular rainfall effected blossom and decreased pollination rate in coffee. Coping practices like supplementary irrigation; bee hives; bee forage plants to attract honey bees; canopy for shades to C.arabica. were useful. Deficit rainfall to an extent of 25% in 2023, led to decreased sowing of paddy. Adaptive practices like cultivation of paddy with azolla; SRI method; mechanised farming are practiced to reduce dependency on labour for paddy cultivation and to reduce the cost of cultivation and preparation of channels inside the field to drain excess water. Unseasonal rainfall increased incidence of soft rot in Ginger which led to 90% yield loss among few farmers. Selection of disease-free rhizomes treated with micronutrients; mulching-paddy/maize straw; trenching; planting short duration crops; integrated farming system were adopted. Use of Cowpea, Diancha, Sunhemp and Napier are grown as mulch and ploughed into soil to improve soil quality; use of Trichoderma. Application of sanjeevini /amritha as biopesticide to reduce pest infestation provided helpful. Planting fruit plants such as Sapota, Butter fruit, Laxmana pala, Jamun and others for additional income and construct Vermicompost units for organic manure sustained farmers income. Construction of farm pond to avoid water problem during irrigation and drought. Cultivation on climate resilient crops, changing crop varieties, dry ploughing/planting, diversifying income through off-farm activities. Planting drought-tolerant crops, early planting, crop diversification, rainwater harvesting, income diversification and credit schemes, developing meteorological forecasting capability, sustained crop yields and income of farmers under extreme weather conditions.

Keywords: Coping practices; Adaptive practices, Climate resilience, Sustainable agriculture, Karnataka, Soil health

Impact of Climate change on Agricultural and Horticultural Crops production in Karnataka

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Abstract

EMPRI initiated a project on Impact of Climate change on Agricultural and Horticultural crops production in Karnataka with a view to identify climate related upheaval events and develop ameliorative practices for farmers. Climate change is widespread; the consequences have been witnessed world over. Climate change has already affected people, their livelihoods and ecosystems. A validated comprehensive questionnaire comprising 30 parameters of weather, agriculture and livelihoods was used to generate field data. Weather data sets of past 40 years were used for interpretation of impacts descriptively on 11 crops from 5 southern agro climatic zones. Fifty field visits to 7 districts and 210 farmers were interacted. The results revealed higher climatic variability in rainfall of Ramanagara compared to other districts. Impacts were positive as well as negative, altering pests, diseases and weed distribution, with reduced crop yields, quantitatively and qualitatively. Increased temperature of 1-3 0C affected coffee flowers with burning symptoms; reduced on an average 20-30% in coffee productivity. In ginger, soft rot disease occurred due to above 30 0C and waterlogging in the field which led to a loss of 1.2 tonnes yield per acre. High moisture and relative humidity during 2023 July late blight disease spread to potato which led to 50% yield loss. In 2022 unseasonal and erratic rainfall in non-monsoon months, Anthracnose (*Colletotrichum gloeosporioides*) caused black spots in mango and reduced the quality resulted into less market price 10-15 Rs/kg and increased rainfall during January – February, 2023 caused flower drop and reduced 50% yield than previous year. Increase in 100-150mm rainfall than average in Kodagu during cardamom harvesting period, the capsules were dropped. Due to less rainfall in August, 2023 caused late flowering and led to 30% catkin dropping and also affected inflorescence. In paddy, increased temperature of 2-3 0C reduced 15% yield and affected reproductive stage by reducing spikelet number and sterility. Heavy rains in 2021 and 2022 led to bacterial wilt disease; high moisture and warm conditions led to the rapid spread of the diseases, serpentine leaf miner infestation by about 5% in the field was noticed on tomato crop in one acre. Rainfall during harvesting time of finger millet led to complete yield loss.

Keywords: Climate change; Crop production, Agricultural productivity, Sustainability, Karnataka.

Spatiotemporal Analysis of Rubber Expansion and Carbon Stock Estimation in the Kottayam District of Kerala

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Abstract

Human activity, particularly monoculture plantations, significantly alter natural landscapes. Monitoring these activities in global biodiversity hotspots is crucial. This study focuses on spatiotemporal changes in vegetation and carbon dynamics in the Kottayam district in Kerala. The primary objective of the first study was to monitor the expansion of rubber plantations in Kottayam, Kerala, which is the state's highest rubber-producing district. Mapping and estimating carbon stocks are essential to understand the environmental impacts resulting from rubber plantation growth. Remote sensing technologies, including Landsat 7 and LISS-IV satellite images and topographical maps, were used to identify spatiotemporal dynamics and assess carbon stock. Forest cover dynamics were evaluated using the Forest Survey of India (FSI) and multi-temporal data, revealing that rubber plantations now cover 56.93% of the district's total geographical area. Additionally, 4.48% of the area consists of natural forests, including teak monoculture (2.01%). Estimating aboveground biomass (AGB) and carbon stock is critical for climate change considerations. The study estimated a total carbon storage of 8.3 teragrams for the entire study area in 2018.

Keywords: Rubber plantations, spatiotemporal analysis, carbon stock, Kottayam, remote sensing

Assessing Climate Change Effects for Extreme Temperature Events on the Lower Tapi River Sub-basin: A Statistical Downscaling Approach

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Abstract

Climate change is a global challenge with regional implications, and understanding its effects on local climatic parameters is essential for sustainable water resource management. Climate change is regarded as one of the world's greatest environmental challenges, and changes in climatic extremes are expected to have detrimental impacts on human society and the natural environment due to an increase in Global warming and evolving GHG. This research presents a comprehensive analysis of climate change impacts on extreme temperature events on the Lower Tapi River sub-basin, a region of critical importance for water resources in India. Using the Statistical Downscaling Model (SDSM), historical observed climate data and future climatic scenarios from global climate models (GCM) have been downscaled and compared in this study to assess how the Lower Tapi Basin's climate is likely to evolve in the coming decades. The National Centre for Environmental Prediction (NCEP) reanalysis dataset for the years 1961–2001 is the first source from which the predictor variables are taken. The second source is the simulations from the third-generation Hadley-centre Coupled Climate Model (HadCM3) and Coupled Global Climate Model (CGCM3). Future maximum temperature (T-max) and minimum temperature (T-min) have been projected using these two Global Climate Models (GCMs) under scenarios A1B and A2 of the CGCM3 model, and A2 and B2 of the HadCM3 model for future periods of (2020s, 2050s, and 2080s). The study showcases a rise in annual mean T-max and T-min under all scenarios A1B and A2 for the CGCM3 model as well as under A2 and B2 scenarios for the HadCM3 model for the whole future time series. An increase in mean monthly T-min is also observed for all months of the year specifically the winter season. This is followed by a decrease in T-max during January and February under the A1B and A2 scenarios of CGCM3. The scatter plots and cross-correlation are used for validation and verification of simulations.

Keywords: Climate change, extreme temperature events, statistical downscaling, Lower Tapi River, water resource management

Navigating Environmental Shifts: Climate Change Impact on Agriculture and Livelihoods in Munsyari Johar Valley, Uttarakhand

Shalini Rawat, Pradeep Kumar Sharma, Suman Naithani, VP Uniyal

Graphic Era Deemed to be University

Abstract

Uttarakhand's Himalayan region becomes especially susceptible to the effects of climate change. Due to its diverse topography and delicate ecosystems, Climate change has significant impacts on livelihoods and agriculture, affecting the lives of residents that depend upon agriculture and related sectors. The Himalayan region has witnessed an increase in temperature, which triggered seasonal variations and interruptions to traditional agricultural calendars. With special attention to the Johar Valley in the Munsyari region, 100% of respondents indicated that snowfall had reduced from five feet to one foot over the ten years preceding the survey. Crops that have historically been grown at a particular elevation may be no longer suitable because, in such a scenario, farmers may need to adapt their methods of cultivation or grow new crops. A few instances of modified precipitation patterns that could lead to excessive runoff or water scarcity are changes in the timing and intensity of precipitation. In both cases, agriculture faces numerous challenges that influence agriculture productivity and water availability. The Himalayan region is habitat to numerous glaciers, which offer essential nutrients for agriculture. The faster glaciers melt, the more water flows out for agriculture altogether and for irrigation systems, increasing the volume and velocity of the water flowing in rivers and streams. Numerous glaciers, including Rahlam Glacier, Nanda Devi, Hira Mani, and Milam Glacier, encircle Munsyari. Climate change is resulting in catastrophic weather conditions, notably deadly droughts, avalanches, and disasters. Such unforeseen circumstances could cause significant damage to crops, traffic jams, and loss of livelihood. Climate change can be attributed to alterations in plant succession and an overall reduction in biodiversity. For countless individuals living in the Himalayan region, agriculture is a key source of livelihood. The general prosperity of communities, compensation, and food security may all be negatively impacted by agricultural disruptions brought on by climate change. To safeguard livelihoods and crops against ongoing climate changes, community-based resilience projects, sustainable practices, and adaptive solutions are urgently required. This study, conducted through surveys in 15 villages in Munsyari Tehsil in the Pithoragarh district to discover how climate change influences livelihood and agriculture, found that over 96% of respondents experienced changes in seasonal timings, while 83% reported reduced crop output. Adaptation strategies are urgently needed to build resilience and sustain livelihoods in this region.

Keywords: Climate change, agriculture, livelihoods, Uttarakhand, adaptation strategies

ABSTRACTS OF ORAL PRESENTATION**CO-01****Theme 11: Community (CO)**

Unlocking the Mysteries: Exploring the Hidden Realms of Gujarat's Wildcat Trio through Virtual Survey

Sweety Merrin Sam , Nishith Dharaiya

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Hemchandracharya North Gujarat University, Patan (Gujarat), Centre for Wildlife and
Conservation Studies, Bhakt Kavi Narsinh Mehta University, Junagadh (Gujarat)**Abstract**

There are fifteen cat species found in the Indian subcontinent out of the forty existing species in the Felidae family. Seven of these cat species are known to occur in the state of Gujarat including two greater cats, Asiatic lion and leopard; however the other cats are of medium to small sized. The lesser studied wildcats of Gujarat include: Caracal, Leopard cat, Jungle cat, Asiatic Wildcat and Rusty-spotted cat. The objective of the study was to identify the potential sites of where Jungle cat, Asiatic Wildcat and Rusty-spotted cat is found in Gujarat so as on ground surveys are conducted in selected areas to validate the findings and gather first-hand knowledge of locals about these small wildcats. A virtual questionnaire survey was conducted to assess the presence of small wildcats in different areas of Gujarat and identify their status, distribution, and food preferences based on the knowledge and perspectives of local people. The virtual survey was disseminated across various social media platforms, offering bilingual options in both Gujarati and English to maximize accessibility and engagement within the local communities. In order to authenticate the reported sightings of the said cat species, all respondents who provided location details were individually contacted with follow-up questions. A total of 85 respondents participated in the survey, with 47 reporting wildcat sightings within Gujarat and 3 outside the state. The study identified Indian Desert cats, Jungle cats, and Rusty-spotted cats primarily in the North, Saurashtra, and Kachchh regions, while Jungle and Rusty-spotted cats were found in Central and Southern Gujarat. The study also revealed that these cats occupy a variety of habitat from forests to agricultural lands including human-dominated areas. The reports on wildcat sightings and location details in Gujarat serve as invaluable resources for understanding the local distribution patterns of these felids within the state. This information may aid in pinpointing potential habitats that align with their fundamental niche, where environmental conditions are conducive to sustaining viable populations of these species. This comprehensive understanding of their distribution enables conservationists to prioritize conservation efforts and implement targeted strategies to safeguard these understudied and unappreciated felids in Gujarat.

Keywords: *Virtual Survey, small felids, Jungle cat, Rusty-spotted cat, Asiatic Wildcat, Gujarat.*

CO-02

A Path to Coexistence Through Perceptions

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Abstract

With an increasing urbanization and population, humanity is making its way into wild for her survival. But this is affecting the natives of the wild and their living. Also, human greed alone is causing a great decline of the wildlife and on the other side of the coin the mere negligence of human is leading to the same harsh ending. Climate change, habitat loss, species recovery and reintroduction also increase the chances of human wildlife interactions. But there are few major dynamic characters of the human civilization including history of land use, community conservation interaction, ethnographies, psychology of traumatic events and cultural history (Pooley et al., 2020) that are needed to be studied, understood, assessed and reviewed along with action plans that are accepted by stake holders (Madden 2004) in order to get a better understanding of the human wildlife interaction. For the conservation of carnivores and large mammals multiuse landscapes are quite helpful, but they also pose a threat to human life in the areas of overlap (Kshetry et al., 2017). Apart from biological studies, study of the human dimension is very important in order to get a successful outcome (Madden 2004). The success of any conservation study depends on the role of the conservationists and researchers in properly enforcing the approach important for conservation in that area (Keane et al., 2008).

The study aims to understand the perception of people about elephants and leopards in the northern West Bengal, India. Also, the changes in perception with social and demographic factors is studied along with their effect on wildlife and conservation actions. In the project area forests are fragmented all across the landscape by human settlements, tea plantations, fields and other anthropogenic developments. Such situations force the wild animals to include the anthropogenic habitats as a part of their niche. Thus, multi-use landscapes are the only possible solutions here. For planning the same, perception of the people associated is also critical to be studied. It is seen that here perceptions of people do get affected by the change of several factors and situations the person is living in, and in turn affects their actions towards the animals. The same was noted, and previous studies were seen to develop ideas to form an efficient coexistence model in this landscape. This study's outcomes emphasise the need to study the dynamic social aspects of a landscape alongside the ecological landscape for planning conservation models.

Keywords: Human-wildlife interaction, perceptions, elephants, leopards, multi-use landscapes, West Bengal

Influence of Past Management regimes on the Landscape Configuration and Floristic Diversity of the Community Reserves of Meghalaya

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Abstract

The establishment of Community Reserves (CRs), a category of Protected Areas, serves as a conservation model to safeguard the rich biological diversity of forest patches owned by local communities of Meghalaya. Prior to the establishment of CRs, these forest patches were managed under different regimes, such as sacred groves, community forests, and private forests. Present study investigated whether the historical management practices have influenced the landscape configuration and floristic diversity of the CRs in Meghalaya. Six CRs were studied, two each from sacred groves, community forests, and private forests. Vegetation data were collected through stratified random sampling methods, while people's dependencies on the CRs were gathered through questionnaire survey conducted in the respective villages. The level of human intervention in each reserve was analysed by ranking various ongoing activities within the respective CRs. Additionally, the land use patterns were classified using available spatial tools (QGIS), and landscape metrics were analysed using FRAGSTATS for landscape metric analysis. The results demonstrated that the past management regime exerted a strong influence on the floristic composition and vegetation structure. Sacred groves, such as Tuber and Kpoh-Eijah CRs, exhibited higher Shannon indices (3.54 and 3.39, respectively) and Simpson indices (0.94), indicating high species diversity and distribution. These sacred groves also exhibited less fragmentation, as indicated by lower Division indices (Tuber CR: 0.22 and Kpoh-Eijah CR: 0.27). Notably, Kpoh-Eijah Sacred grove had the highest patch density (250.83), while Tuber CR displayed the highest patch connectivity (MESH index- 74.91) and a lower human intervention index (2). In contrast, Community forests and private forests exhibited moderate to high levels of disturbance and fragmentation, with community forests like Aruvagre (human intervention index: 4, Shannon index: 2.91, Simpson index: 0.91, Division index: 0.68) and Kitmandangre CRs (human intervention index: 3, Shannon index: 2.64, Simpson index: 0.89, Division index: 0.80) showing high human intervention, moderate diversity indices, and patch connectivity. Private forests, including Chimanpara (Shannon index: 2.89, Simpson index: 0.90, Division index: 0.71) and Thokpara CRs (Shannon index: 2.78, Simpson index: 0.91, Division index: 0.73), displayed moderate diversity but high fragmentation levels, indicating lower species diversity and evenness compared to sacred groves. Further research involving the additional CRs is in progress which will be of great advantage in attaining concrete conclusion about the influence of past management regimes in the whole protected area.

Keywords: Ethno-geography, Protected area, Community Reserves, landscape configuration, floristic diversity, sacred groves, Meghalaya.

ABSTRACTS OF ORAL PRESENTATION**EC-01****Theme 12: Ecology (EC)*****Spatial Distribution and Patterns of Human-Sloth Bear Conflicts to Identify the Conflict Risk Zones in Central Gujarat, India***

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WCB Research Foundation, Center of excellence for Wildlife and Conservation Studies

Abstract

The escalating encounters between humans and sloth bears pose significant challenges for mitigating conflicts and ensuring the safety of communities living in bear-inhabited regions. A survey was conducted in Dahod and Chhota-Udepur districts of central Gujarat to understand the patterns of sloth bear attacks. The study area falls in non-protected forest which links two PAs, namely Ratanmahal and Jambughoda wildlife sanctuaries. This study investigates the dynamics of human-sloth bear interactions. Interviews of 108 victims of sloth bear attacks and other (n=363) people who have not encountered sloth bears from 28 villages of central Gujarat were conducted. Gender disparities emerged, with 76% of victims being males between 41 to 50 years, followed by those aged 31 to 40, indicating varying susceptibility across age groups. Over fifteen years, reported attacks showed variation across years. Still, overall increasing trend was observed, potentially attributed to increased human encroachment into bear habitats and diminished food resources in bear habitat. The attacks occurred predominantly in forest (54%), agricultural (33%), and village (13%) areas. No seasonal variations were observed, however, mornings emerged as peak times, with 68% of incidents transpiring between Early to late morning hours. The study reveals that minor to severe injuries were prevalent among victims, with fatalities reported due to the severity of wounds, highlighting the grave consequences of such encounters. We incorporated analytical hierarchy process (AHP) and GIS tools to map the predictive conflict zones. Along with AHP, expert opinion weights were given for conflict risk factors such as distance to human settlements, forest boundary, water, roads, and elevation to identify the conflict risk zones. Findings underscore the need for comprehensive strategies to mitigate human-sloth bear conflicts, especially in the identified risk zones. Efforts aimed at fostering coexistence between humans and sloth bears are imperative to ensure the harmonious cohabitation of these species in shared landscapes.

Keywords: Human-wildlife conflict, sloth bear, GIS, Analytical Hierarchy Process, Central Gujarat

Epizootic Ulcerative Syndrome in Striped Snakehead (Channa striata) Collected from Paddy Fields of Kodinji, Malappuram, Kerala.

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Abstract

Epizootic ulcerative syndrome (EUS) is an infectious disease caused by oomycetes *Aphanomyces invadans* (Manas kumar ,1993). In addition, parasites and viruses (notably rhabdoviruses) had also been associated with particular infection. EUS also known as red spot disease (RSD), Mycotic granulomatosis (MG) and ulcerative mycosis (UM). Freshwater and brackish water fishes have been recorded in India that are prone to EUS. In 2018, after two subsequent flood in Kerala, sporadic occurrence of EUS is reported in Kerala. From 2023 December to 2024 February EUS is identified in *Channa striata* from paddy field of Kodinji venjali, Malappuram, Kerala. The 350 hector-long Kodinji venjali paddy field is home to a variety of wildlife, including water birds, freshwater fish and reptiles. From November through April, paddy is the primary crop grown in this region. This area entirely floods during the rainy season, more number of fishes visit this area for breeding. By *Channa striata* using various types of fishing gear, a collection effort is carried out and each fish specimen is examined morphologically for the identification of EUS. Among collected fish specimens, only shows morphological symptoms of EUS. The acute stage of the disease only seen when a diseased organism is capable of surviving under adverse conditions such as *Channa sp.* Single or multiple lesions covering approximately 5 per cent of the body surface were reported on the abdomen, the side of the body, near the dorsal fin, near the vent and at the base of the tail. Some *Channa* species were collected from the site which was recovered from the EUS and they are identified by the scars and marks on the body which is caused by the lesion. Six months of collection efforts revealed that EUS infected specimens were only collected in the winter season (DEC-FEB). EUS occurs mostly during periods of low temperatures or 18–22°C and after periods of heavy rainfall. The water temperature is between 19-29°C from the field during the collection period. They grow best at 20–30°C and this temperature is helpful for the sporadic spread of *Aphanomyces invadans* (World Organisation for Animal Health 2016).

Keywords: Epizootic Ulcerative Syndrome, *Channa striata*, fish disease, *Aphanomyces invadans*, Kerala

Seasonality In Breeding of Chital (Axis Axis) In Kanha Tiger Reserve

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Abstract

Mammalian breeding patterns, particularly among herbivores, are intricately linked to environmental factors such as resource availability and climatic conditions. While temperate regions often exhibit distinct breeding seasons, the tropical environment presents a unique case due to relatively stable food and water resources year-round. This study investigates the breeding patterns of chital in the Kanha Tiger Reserve, exploring the potential synchrony in breeding behavior in relation to resource availability. Field surveys were conducted weekly along fixed vehicle routes to observe breeding status indicators such as male antler condition and signs of female lactation. Antler condition served as a proxy for rutting activity, while lactation indicated fawning periods. Data were collected and categorized by month and season to determine seasonal breeding trends. Additionally, a decade-long analysis of the NDVI from LANDSAT 8 imagery assessed grassland productivity as a measure of forage availability.

The findings suggest that chital breeding peaks are synchronized with periods of optimal forage availability, specifically fresh grass shoots post-fire management, which are rich in protein and essential nutrients. This nutritional boost is critical for lactating females and supports higher reproductive success. Despite some regional variations in rutting peaks observed in other studies, in Kanha, the rutting season primarily occurs during the late summer and monsoon, with fawning peaking in April. This synchrony between reproductive cycles and forage availability emphasizes the adaptive strategies of chital to maximize offspring survival.

Understanding the seasonal breeding patterns of chital in relation to forage dynamics provides valuable insights for effective wildlife management and conservation strategies in Kanha Tiger Reserve. The synchronization of chital breeding with peak nutritional periods ensures the sustenance of both the prey population and the broader ecosystem, including predator-prey interactions involving species like the tiger.

Keywords: Chital, breeding patterns, resource availability, Kanha Tiger Reserve, wildlife management

Ecological impact of moth infestation: Understanding pest behaviour

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Abstract

Insects serve various functions and are found in most known species of insects in forest ecosystems. Because of their adaptive nature, they are widely found in a diversified forest habitat. Insects are vital components of forest ecosystems, serving various roles such as herbivores, parasites, detritivores, predators, and pollinators. They contribute to the biodiversity of flora and fauna in ecosystems, with insects, particularly moths, being the most diverse group of animal species. Lepidopteron contains a massive variety of species, such as moths and butterflies. A comprehensive moth field survey was undertaken from 2020 to 2022 in the Peruvannamuzhi forest range at Chakkittapara Panchayath in Kozhikode district, Kerala. The area is an ecological hotspot in southern Western Ghats and is geographically located at latitude 11°36'0"N and longitude 75°45'0"E. The specimens were photographed using a digital camera with macro lens, and samples were identified using taxonomic keys, available literature, and eminent expert's help. The checklist of moths is based on systematic surveys conducted primarily in the Peruvannamuzhi forest range during 82 survey nights over three years. During the survey, different families of moths were observed as major and minor pests of different ecosystems. Most common pests include different families of moths such as Erebiidae (*Cretonotos gangis*, *Mocis frugalis*, *Anomis flava*, *Olepa ricini*), Noctuidae (*Xanthodes transversa*), Crambidae (*Scirpophaga incertulus*, *Spodoptera litura*), Limacodidae (*Prasa lepida*), Eupterotidae (*Eupterote undata*) and *Endoclita malabaricus* and so on. These moths infest plants such as rubber, coconut, clove, cashew, etc., and agriculture like cardamom, paddy, ginger, turmeric, etc. Moth infestation have significant ecological impacts on both terrestrial and forest ecosystems worldwide. Ecological consequences of moth outbreaks focusing on their effect on vegetation, wildlife, and ecosystem dynamics. Agro-ecosystem destruction occurs due to the moth pest behavior. An outbreak of some moth caterpillars destroys acres of the field by voracious feeding. Moth infestations also have a significant economic impact on the agriculture and textile industries. Presently, very little information is available on insect-pests, especially on moths in the Peruvannamuzhi Forest Range, Western Ghats region in Kerala. This study provides baseline data on moth pests in this region. The present report is a preliminary step towards documenting the moth pest of the Peruvannamuzhi forest region. The result of the study signifies that the most dominant pest is included in the family Erebiidae. This survey indicates that this region has an unknown diversity of moth pests that helps to document the major and minor moth pests.

Keywords: : Moth infestation, pest behavior, Peruvannamuzhi forest, ecological impact, pest management

Physico-Chemical Analysis of Water in Najafgarh Canal of Delhi, India

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Abstract

The Najafgarh drain is the first significant drainage system to flow into the Yamuna River at Wazirabad in Delhi, India, is renowned to add the maximum amount of pollution to the Yamuna River. The drain was purposefully built as a stormwater canal and was initially an extension of the Sahibi River. However, it is now transporting additional sewage, agricultural, and industrial effluents that have been collected through numerous small and big secondary drains. The Najafgarh Canal enters Delhi from Haryana from the southwest corner of Delhi. The Najafgarh Canal has a length of 51 km before joining River Yamuna, it carries flood water, wastewater from Haryana, and surface runoff from the adjoining catchment. This wetland provides abundant macrophytes for their nutrition. The study was performed to investigate the water quality of the Najafgarh canal situated in Delhi, from Dhansa barrage to Wazirabad Barrage in Pre-monsoon and Post-monsoon in the year 2023. The objective of this study is to assess the water quality of selected sites of Najafgarh Canal, Delhi. A comparison has been made between the sampling sites of the Najafgarh Canal. Water samples were collected from 2 different sampling sites first is the entry point of Najafgarh Canal i.e. Dhansa Barrage and the second point is where this canal joined with the Yamuna River, i.e. Wazirabad Barrage in the selected wetland. Physicochemical parameters like pH, Electrical conductivity (EC), Total Dissolved Solid (TDS), Dissolved Oxygen (DO), and Biochemical Oxygen Demand (BOD), were studied to analyse the water quality of the area. pH, Electrical Conductivity, Total Dissolved Solid were measured with the help of portable multiparameter, Dissolved oxygen and BOD were analysed by Azide Winkler's method. Better water quality was found in Dhansa Barrage in both seasons than that of Wazirabad Barrage. This study shows that there are pollutants in the canal, which degrades its quality. Urbanization, sewage, industrial and agricultural effluents all contribute to pollution levels that disturb the aquatic ecosystem. Maintaining aquatic resources requires an investigation into the quality of the canal's water.

Keywords: Water quality, Najafgarh Canal, physico-chemical analysis, pollution, Yamuna River

Preliminary Study on The Diversity of Myxomycetes In Palms

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Abstract

Background: Palms (Arecaceae) represent one of the most ecologically important and taxonomically diverse plant groups and considered as a model plants for assemblages of lichens, fungi and other lower plant groups. Myxomycetes, the plasmodial slime molds or Myxogastriids have a cosmopolitan distribution that produces fruiting bodies that exhibit diverse forms, structures, and colors. They are natural decomposers seen in moist habitats. The checklist of Myxomycetes from India documented 373 species, 17 varieties and 4 forms within 50 genera, 11 families and 6 orders (Ranade et al., 2012). We conducted a preliminary survey on the investigation of the Myxomycetes at Kerala Forest Research Institute Palmetum and 33 species of Myxomycetes under 13 genera were recorded from 25 palm species. Objective: To study the diversity and association of Myxomycetes with different species of palms Methods: KFRI Palmetum (10052'66.19" N, 76035'07.50" E) is located in the tropical moist deciduous forest of Peechi WLS in Thrissur district, Kerala. Different Myxomycete samples were collected from different substratum of palms and identification was done both Myxomycete and palms using standard keys and literature. All the collected samples were maintained in the KFRI Slimarium. Results: KFRI Palmetum has 158 species of palms under 57 genera representing species from Western Ghats, north-eastern states and Andaman and Nicobar Islands. Apart from the indigenous species, several ornamental palms representing different countries are also conserved. A total of 33 species of Myxomycetes under 13 genera were recorded from 25 palm species under 19 genera. In light of the S/G ratio and density, the major association was with *Caryota urens* L. (22 sp.) followed by *Elaeis guineensis* Jacq. (8 sp.) and *Arenga pinnata* (Wurmb) Merr. (6 sp.). The highest frequency of occurrence was recorded from the spathe followed by leaf and bark. *Physarum melleum* (Berk. & Broome) Masse, *Physarum bivalve* Pers. and *Craterium minutum* (Leers) Fr. were the species characterised by the highest levels of abundance and frequency. The present study proved that palms as one of the major model plants for assemblages of different species of Myxomycetes. We recommend further long-term study for the in-depth knowledge on the association between these two groups. Conclusion: A total of 33 species of Myxomycetes under 13 genera was recorded from palms which signify the close association and intrinsic relationship between palms and Myxomycetes. More detailed in-depth studies are required to understand any species-specific relationships.

Keywords: Myxomycetes, palm diversity, KFRI, Palmetum, Physarum, *Caryota urens*

Zooplankton Community in the Chaliyar Estuarine Ecosystems

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Abstract

The Chaliyar estuarine ecosystem, a vital component of coastal biodiversity in Kerala, India, supports a diverse array of zooplankton communities that play a crucial role in aquatic food webs. This study aims to analyze the structure, composition, and seasonal variations of zooplankton communities in the Chaliyar estuary. Comprehensive sampling was conducted over a year, encompassing different seasons to capture temporal dynamics. Results indicate that the zooplankton community is dominated by copepods, followed by rotifers, cladocerans, and other minor groups. Significant seasonal variations were observed, with higher diversity and abundance during the post-monsoon period, likely influenced by changes in salinity, temperature, and nutrient influx. The spatial distribution patterns reveal a clear gradient from the freshwater upstream to the more saline downstream regions, affecting species composition and density. Environmental parameters such as water temperature, salinity, pH, and dissolved oxygen were found to significantly correlate with zooplankton diversity and distribution. The study highlights the sensitivity of zooplankton communities to environmental changes, underscoring the importance of monitoring these organisms as bioindicators of estuarine health. This research provides a baseline for future ecological assessments and contributes to the conservation strategies of estuarine ecosystems in the region.

Keywords: Zooplankton, community structure, Chaliyar estuary, seasonal variations, copepods, biodiversity, environmental parameters, estuarine health,

Isolation of Novel Fungi from long-Term Plastic Waste Landfills and Their Contribution to Enhanced Degradation of Pretreated Low-Density Polyethylene (LDPE)

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Abstract

Introduction: Approximately 80% of global plastic consumption comprises petrochemical-based plastics, including polyvinyl chloride (PVC), polyethylene (PE), polypropylene (PP), polystyrene (PS), and polyethylene terephthalate (PET). Among these, low-density polyethylene (LDPE) stands out for its strength, lightness, and durability, resulting in widespread applications. The proliferation, global distribution, and persistent nature of LDPE, however, inevitably lead to environmental accumulation, posing significant ecological and biological health risks. This study investigates the potential for LDPE degradation by fungal strains isolated from soil samples contaminated with discarded plastics, recognizing the urgent need to address LDPE decomposition. **Objective:** Isolation and identification of novel fungi from a long-term plastic waste landfill area. **Methods:** Isolation, screening, and identification: LDPE-degrading fungi were isolated from soil using enrichment culture procedures, employing minimal medium supplemented with 0.1% LDPE powder. The isolates obtained from the primary screening were further assessed for their ability to effectively utilize higher concentrations (1%) of LDPE powder in minimal medium. Potential isolates were identified through ITS region sequencing. **Degradation studies:** The biodegradation test of LDPE films were conducted using the pretreated isolates, which were exposed to sunlight for 100 hours. LDPE films measuring 2 × 2 cm were inoculated with 1000 µL of spore suspension in 100 mL of minimal medium and then incubated for 90 days. The extent of LDPE film biodegradation was assessed using the weight loss method, Scanning Electron Microscope (SEM), and Fourier Transform Infrared (FT-IR) analysis. **Results:** Among the 14 fungal isolates obtained from the primary screening, two showed potential for utilizing LDPE as a sole carbon source, as confirmed through ITS gene sequencing. BLAST search analysis revealed that the ITS sequences of these two strains exhibited the highest similarity with *Aspergillus niger* (Accession number: PP724366) and *Aspergillus tamarii* (Accession number: PP724377). The percentage weight loss recorded was 5.18±0.51% and 3.16±0.3% for the isolates identified as *A. niger* and *A. tamarii*, respectively, whereas no weight loss was observed in the control LDPE. FTIR analysis indicated the emergence of new functional groups associated with hydrocarbon degradation after incubation with the fungi. Additionally, SEM analysis revealed morphological changes on the surface of the LDPE film due to degradation. **Conclusion** The current investigation demonstrates that naturally occurring soil microbes have a propensity for degrading polyethylene, providing insights into biodegradation processes and offering a potential solution to the environmental challenges posed by LDPE waste. **Keywords:** LDPE degradation, *Aspergillus niger*, *Aspergillus tamarii*, fungal isolates, bioremediation

Floral Visitors Interactions and Diversity on Selected Plant Species in Morayur Panchayath, Malappuram, Kerala

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Abstract

Introduction: Insects, are the most diverse and numerous terrestrial animals, play crucial roles in ecosystems through their interactions with plants and the environment. They contribute to soil aeration, pollination, pest control, and nutrient recycling. In agriculture, insects act as both pollinators and pests, with bees being the most effective pollinators. Pollination, essential for plant reproduction, involves the transfer of pollen from anther to stigma. While wind-pollinated plants scatter copious amounts of pollen, animal-pollinated plants rely on insects, birds, and bats. Insect pollinators, including bees, butterflies, and flies, are vital for the reproductive success of many plants. Protecting pollinators is essential for maintaining biodiversity and ensuring stable food supplies. Understanding the intricate dynamics between plants and their pollinators is vital for conservation and agricultural productivity. Objectives : • To find the Diversity of floral visitors on the selected plant species(*Benincasa hispida*, *Solanum melongena*, *Abelmoschus esculentus* and *Capsicum frutescens*) • To identify the probable pollinators among the selected plant species. The study was conducted in Ozhukur, Malappuram district, Kerala, from July to September 2023. Floral visitors to selected plants were surveyed using the quadrat method. Insects were identified using field guides and experts, and visitation rates were calculated. Statistical analysis included Simpson's diversity index and chi-square tests. Result : There is significant variation in the visitation frequency of 14 floral visitors to the selected plant species, established through chi-square test (P value < 0.005). The diversity indices of floral visitors to the selected plant species is measured through simpson diversity index and Shannon-Wiener diversity index. The Simpson diversity index of *Benincasa hispida*, *Solanum melongena*, *Abelmoschus esculentus* and *Capsicum frutescens* are 0.8861, 0.7496, 0.7249, 0.7449 respectively and that of shanon is 2.26, 1.386, 1.328, 1.376 respectively. Diversity indices showed *Benincasa hispida* had the highest diversity, followed by *Solanum melongena*, *Abelmoschus esculentus*, and *Capsicum frutescens*. Hymenoptera were the major floral visitors. The visitor spectrum includes hymenoptera, coleoptera, and lepidoptera, with hymenoptera being the most common. Apidae family members, particularly *Apis cerana* and *Tetragonula iridipennis*, are probable pollinators. *Benincasa hispida* had the highest visitor diversity. Flower size significantly influences visitor attraction, with larger flowers attracting more visitors. Conclusions : This study reveals that *Benincasa hispida* has the highest floral visitor diversity, with *Apis cerana* as its main pollinator. Flower size significantly influences visitation rates. *Tetragonula iridipennis* is the common probable pollinator.

Keywords: Floral visitors, pollinators, *Benincasa hispida*, *Apis cerana*, *Tetragonula iridipennis*, diversity indices

***Burrow Selection by Mugger Crocodile in Agricultural Landscape of Charotar Region,
Central Gujarat, India***

Nidhi Thanki

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Abstract

Crocodile species are distributed globally, with distinct species inhabiting specific regions. In South Asia, the mugger crocodile (*Crocodylus palustris*) is found in diverse freshwater habitats, the saltwater crocodile (*Crocodylus porosus*) occupies coastal areas, and the critically endangered Indian gharial (*Gavialis gangeticus*) resides in northern Indian rivers. Gujarat, a significant habitat for mugger crocodiles, has seen population growth due to effective conservation measures, although human-crocodile negative interactions persist in certain areas. The burrowing behaviour of marsh crocodiles plays a critical role in their ecology. Burrows provide protection from predators, extreme weather, and serve as nesting sites. This study focuses on the burrowing ecology, morphology, and distribution of mugger crocodile burrows in Charotar, Central Gujarat. It aims to evaluate the feasibility of using drones for monitoring these burrows, a novel approach in the region. Previous research highlights the importance of burrows for reproductive success and juvenile protection, yet there is limited data on burrow characteristics and factors influencing site selection. Gujarat's mugger population is one of the largest in India, with significant populations in central and southern regions. Recent estimates suggest between 2000 and 2500 muggers in the state. Human-crocodile conflicts, particularly in the Vishwamitri and Narmada rivers, are linked to habitat encroachment and increased human activities. In contrast, the Charotar region, where crocodiles share resources with humans, has fewer conflicts but faces rising risks due to increasing human and crocodile populations. Effective management of these conflicts requires a multidisciplinary approach, integrating ecological understanding and community awareness. The study employs drones for high-resolution, non-invasive monitoring of crocodile burrows, offering potential benefits over traditional methods. Drone technology allows for precise mapping of burrow distribution, critical for conservation and management efforts. Previous studies have demonstrated the efficacy of drones in similar contexts, underscoring their utility in challenging terrains and inaccessible habitats. By characterizing burrow habitats and understanding the factors influencing burrow site selection, this research aims to provide insights into the ecological needs of mugger crocodiles and enhance conservation strategies. This research addresses a significant gap in the literature, providing essential data for the conservation of mugger crocodiles in Gujarat.

Keywords: Mugger crocodile, burrow selection, drone monitoring, Charotar region, conservation

ABSTRACTS OF POSTERS PRESENTATION (PP)

PP-01

*Pollination modes of tree species in a tropical moist deciduous forest, India*VM Thasini^{1,2}, VB Sreekumar¹, KA Sreejith¹¹KSCSTE-Kerala Forest Research Institute; ²Cochin University of Science and Technology**Abstract**

Introduction: Pollination is the most prominent factor limiting, promoting, and structuring organismal diversity in forest ecosystems. Forests support a diverse assemblage of tree species, which are dependent on a wide range of vectors to move pollen. **Objective:** To understand the pollination modes of tree species in the moist deciduous forest of Peechi-Vazhani Wildlife Sanctuary. **Methods:** Direct observations were made on 38 tree species. During the observation periods, only those visitors that made contact with the anthers and stigma of the flower were noted. Pollination modes were assessed through direct observations and a literature review (in the absence of flower visitors). **Results:** Biotic agents involved in pollination included insects, birds, and mammals. The majority of tree species (63%) received visits only from insects and have been confirmed to be insect-pollinated. The flowers of one species (3%) were exclusively confined to bird pollination. Both insects and birds pollinated 21% of the tree species. For 8% of the species, there were birds, insects, and mammals as pollinators. The rest of the species (5%) were wind-pollinated. **Conclusions:** Pollination affects reproductive success, other ecological processes, and the overall balance of the ecosystem. Hence, there is a need for in-depth research on this topic. This baseline data gives useful information for further studies on pollination, including plant-pollinator interactions. This knowledge also helps to improve the design of future conservation and management plans, both at the ecosystem and species level.

Keywords: Flower visitors, pollination modes, tropical moist deciduous forest and wind

Impact of urbanisation on Avian Fauna: A review

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Abstract

Urbanisation refers to the population shift from rural areas to urban areas, the gradual increase in the proportion of people living in urban areas, and eventually the expansion of the urban regions to rural areas. Urbanisation is now a global phenomenon with substantial impacts on biodiversity loss and biota homogenization, specifically the avian community. Many studies indicate a clear difference between urban and rural environments in their bird community structure. Urban areas have reduced species richness, but a few adapted species show more species abundance compared to rural areas. Urbanization favours certain bird species that are adapted to human-adjusted landscapes while negatively affecting other bird species that depend on natural habitats. Urban habitats provide modified habitats for species that can adapt their feeding and other behaviours, or avoid the new conditions. In addition, urbanisation led to a highly fragmented landscape, with few to many suitable bird habitats surrounded by highways and buildings that frequently act as barriers to birds. These altered conditions have changed the avifauna intensely, with many species disappearing once an area is urbanized, thus resulting in a significant loss of local biodiversity. In the majority of studies, urbanization resulted in increased bird density but a decline in richness and evenness. But though avian studies are common it is less understood which mechanisms make these changes. This review discusses the most important components of the Urbanisation, urban environment influencing birds' community structure and compiles several recent studies to illustrate their effects. Urbanisation in Kerala is now being associated with shifts in bird community composition, homogenisation and changes in ecosystem functioning and services. However, studies on the impact of urbanization on birds are less studied in Kerala. So further research is necessary to understand the long-term impacts of urbanization on avian communities and to enhance conservation strategies in rapidly urbanizing regions.

Keywords: Urbanization, birds, biodiversity, homogenization, Urbanisation in Kerala

A Comparative Analysis of Soil Oribatid Mite Diversity: Natural Forest Versus Plantation Ecosystem

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Abstract

Oribatid mites, also known as moss mites, are important soil microarthropods included in the class Arachnida and subclass Acari and are crucial in nutrient cycling and ecosystem functioning. The present study investigates the diversity of oribatid mites in two contrasting ecosystems: a natural forest (Kakkadampoyil) and a Rubber plantation (Thiruvambady) in relation to soil characteristics and climatic conditions. Regular sampling was carried out from the above sites for one year (June 2022-June 2023), covering three different seasons (Pre-monsoon, monsoon, and post-monsoon), for subsequent extraction. A total of 7341 mites belonging to six different families and 15 different genera were collected from rubber plantations, and 7481 mites belonging to 12 different families and 21 genera were collected from natural forest. Preliminary findings reveal a marked difference in oribatid mite species richness and abundance between the two ecosystems, with forest habitat exhibiting higher species richness and abundance than plantation. The relationship between the diversity of oribatid mite species and three different climatic seasons was analyzed using one-way ANOVA and found that the $p < 0.05$, indicates significant difference in oribatid mite diversity in different climatic conditions. That is, species diversity is higher in the monsoon than in the pre-monsoon and post-monsoon seasons. The soil properties, including pH, organic matter, moisture levels, and texture, were also analyzed using appropriate biochemical methods. Soil analysis revealed that the NPK content in forest soil is higher than that in rubber plantations, and no striking differences in other biochemical properties were found. Therefore, the presence of different flora and litter compositions and high NPK content in the soil of forest ecosystems may provide a more suitable habitat for oribatid mites compared to monoculture cultivation like rubber plantation. Therefore, the protection of natural forest is important for conserving soil inhabiting microarthropods like oribatid mites.

Keywords: soil ecosystem; biodegradation; biochemical properties; soil mites

Preliminary survey on the impact of mattress type on House dust mite population in selected houses of Malappuram and Kozhikkode districts of Kerala

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Abstract

Dust mites are one of the common triggers of house dust allergy. Mattress dust has been known to be one of the common places of infestation of dust mites, as beds provide warm and moist surroundings for the mites' survival. This study investigated the presence of dust mites on different mattress types. Dust from different types of mattresses viz. Coir, cotton, foam and spring were investigated from 60 houses in Malappuram and Kozhikkode districts of Northern Kerala. 31 cotton beds, 13 foam beds, 8 coir and 8 spring mattresses were vacuumed for about 2 minutes in a 1m² area using a portable vacuum cleaner (Eureka forbes, 700W with Hepa filter). The dust collection was done every 4 months for 1 year (February 2023-January 2024). The collected dust samples were placed in a plastic container and brought to laboratory for the microscopic analyses and mite species identification. Comparative analysis of the number of mites obtained and the type of mattresses were statistically examined by one-way ANOVA test. The present study revealed that every mattress type investigated has been infested with dust mites. Out of the 60 houses surveyed, 31 houses used cotton mattresses and a maximum number of mites (452) were recovered from cotton beds. Coir mattresses inhabited a maximum of 292 mites, followed by foam beds (249) and then spring mattresses (134). The most dominant family on all bed types was pyroglyphidae and the species was *Dermatophagoides pteronyssinus*. Other species frequently found were *Blomia tropicalis*, *Cheyletus eruditus*, *Sturnophagoides* spp. and *Glycycometus* spp. The type of mattress and the number of mites obtained from the sampled mattresses showed no statistically significant difference (p -value 0.960). Though dust mites are fairly common in all mattress types, this survey showed that cotton mattresses inhabit more number of mites. Being a widely used type of mattress, the usage of cotton beds by allergic patients can make their symptoms worse. Hence, the replacement of mattresses made of cotton with other materials can help people reduce their allergic responses.

Keywords: Mattress Dust; Pyroglyphids; Dust Allergy; *Dermatophagoides pteronyssinus*

Diversity of Erebid Moths (Lepidoptera: Heterocera) in the Peruvannamuzhi Forest Range of Kerala

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Abstract

Diversity studies are more relevant in existing circumstances, and records of the data help learn more about a specific area's flora and fauna and discover new and threatened species. Lepidopteron contains a massive variety of species, such as moths and butterflies. A field survey was undertaken from 2021 to 2022 in the Peruvannamuzhi forest range located at Chakkittapara Panchayath in Kozhikode district, Kerala. The area is an ecological hotspot in southern Western Ghats and is geographically located at latitude 11°36'0"N and longitude 75°45'0"E. The assessment on moth diversity study invented diverse species of moths from different families belonging to distinct superfamilies. During the study, 17 families of moths were collected, belonging to 9 superfamilies. Among them, the most abundant superfamily is Noctuoidea. The family-wise composition of moths showed that of the 17 families recorded, the highest number of species was from *Erebidae*, followed by *Crambidae*, *Sphingidae*, *Geometridae*, and so on. The present study observes the erebid moth faunal diversity of the Western Ghats region in Kerala, and it has been recorded for the first time in this region. During this study 40 species were recorded. This study provides baseline data on the local habitat association of erebid moths. The information can be used as evidence in formulating conservation measures in their habitat where cutting and felling of trees is continued illegally.

Keywords: Erebid moths, Diversity, Peruvannamuzhi forest, flora and fauna

Study of forest Carbon dynamics of Idukki district using forest inventory data

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Abstract

The focus of the study is on the estimation of forest biomass dynamics and analysis of Carbon stock parameters for which the district with the largest geographical area and the largest forest cover among all the districts of Kerala, Idukki is selected. Working plans prepared by Kerala Forest Department over the period of 2000 to 2030, the India State of Forest Reports over the years and data from published literatures were used for the study. The data that were extracted from Working plans include the dimensions of trees from natural forest and the total number of trees. The plantations and Reserve Forest areas are calculated by digitizing the toposheets from Survey of India (SoI). The calculated area is compared with the data from FSI to corroborate the results. Meanwhile, the mapping of beat boundaries of Idukki Forest divisions was also done. Also, the Above Ground Biomass (AGB) of the district is mapped from the data published by Santoro. The results indicate that about 22 percent of the district's geographical area is occupied with plantations which accounts for 35 percent of the district's forest cover. The Idukki comprises of approximately 1126.652 square kilometres (sq. km) of plantations out of which Tea, Cardamom and Eucalyptus plantations occupy 407.42 sq. km, 317.33 sq. km and 163.93 sq. km respectively. After mapping the Reserve Forest area, it was found to occupy 2804.82 square kilometres of the district's area. From the Working Plan data, tree cover loss and plantation tree cover loss were computed over the period of 2001 to 2023 and it could be noticed that it was especially high from 2017-2019 period. From, the AGB data, we could note that around 109 to 239 million tonnes of AGB are concentrated in the forest beat areas alone. Considering the natural forest area, certain sites were selected for the study and the volume and Growing Stock (GS) of species were computed using specific equations. The data used spanned from 2001 to 2011. The results indicate that in the Kothamangalam division, Cheeni, Kadukka, Venga, Irul and Pali are the five species with the highest volume and GS. Similarly, for the Anakulam range under Mankulam division, Miscellaneous species occupy the highest volume, and for the Mankulam range VEDIPLAVU occupies the highest volume.

Keywords: Carbon stock, Idukki, Biomass and Forest inventory

Diversity of Edaphic Mites (Acari: Mesostigmata) in Muthanga Range of Wayanad Wildlife Sanctuary, Kerala, India

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Abstract

Mites are critical components of soil arthropod communities, renowned for their diverse ecological niches and behaviors. They significantly contribute to terrestrial ecosystem functions, particularly in the decomposition and recycling of organic matter, bioindication and biological control. The present study conducted to explore the diversity of edaphic mesostigmatid fauna in Muthanga range of Wayanad Wildlife Sanctuary, Kerala. Soil Samples were collected by random sampling method using Mac-Fadyen corer (5 cm in diameter), to a depth of 10 cm (MacFadyen, A, 1962) from the study area during August 2022 to March 2023. The results revealed the occurrence of 21 species of Mesostigmatid mites belonging to 9 families. The most abundant species in the study area was Stratiolaelaps sps (Relative abundance: 18.3) and the family laelapidae. The mite diversity was measured using the Shannon diversity index, and Simpson's diversity index. The Shannon Weiner index is 2.6679 and Shannon equitability index which is used to find evenness of species, is 0.876. The Simpson's diversity index is 0.08 and Simpson's dominance index is 0.92. The study also noted the influence of soil parameters like pH, soil temperature, organic carbon, total available nitrogen and soil texture on the abundance of mesostigmatid mites in the study area. Due to their sensitivity to soil disturbances, the diversity and abundance of soil mites serve as valuable ecological indicators for assessing ecosystem health. Predatory mesostigmatid mites are especially important in forest and agricultural soil food webs, as they prey on nematodes, collembolans, and various insect and mite larvae. Further research on the long-term monitoring of mesostigmatid mite populations and their responses to environmental changes may help to understand their role as ecological indicators and their impact on soil health and ecosystem sustainability.

Keywords: Mesostigmata, Edaphic mites, Diversity index, Laelapidae.

The Panda Case Study – An Approach to Various Stakeholders

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Abstract

My poster focuses on stakeholder analysis, concentrating on the Giant Panda's NRM scenario.. The Wolong National Nature Reserve, established in 1963, is one of China's oldest and most significant nature reserves. Located in Wenchuan County, Sichuan Province, it spans 2,000 km² and is renowned for its large wild giant panda population. The reserve joined the UNESCO Man and Biosphere Reserve Network in 1980, gaining global recognition.

Wolong is situated 123 kilometers from Chengdu, on the eastern slope of Qionglai Mountain, and features a climate between the Tibetan and Sichuan zones. The landscape is picturesque, with forests, rocky, snowcapped mountains, and V-shaped valleys. The average annual temperature is about 5°C, with precipitation nearing 1,100 millimeters. The Reserve's altitude varies dramatically, ranging from 1,200 meters to 6,250 meters within 48 kilometers. This diverse topography supports a rich biodiversity, including over 4,000 plant species and numerous rare animals. The giant panda's primary food sources are two bamboo species: *Bashania fangiana* (arrow bamboo) and *Fargesia robusta* (umbrella bamboo), which grow at different elevations within the Reserve. Wolong is home to around 150 giant pandas, along with other species such as red pandas, golden pheasants, snow leopards, white-eared pheasants, and white-lipped deer. The fauna predominantly inhabits temperate coniferous and broadleaved mixed forests at elevations between 2,200 and 3,600 meters. Additionally, the Reserve supports approximately 50 mammal species and 300 bird species. As of 2000, Wolong's human population included about 4,413 farmers, primarily living along two main rivers. The population is ethnically diverse, comprising Han, Tibetan, Qiang, and Hui groups. These residents rely on the forest for wood, which they collect in winter for personal use, as there are no local markets for fuel wood transactions. The Reserve faces challenges due to the subsistence needs of its growing population. From 1975 to 2000, the population increased by 72.4%, while the number of households surged by 129.9%. This rapid growth is attributed to a low death rate and a higher fertility rate, especially among the Tibetan ethnic group, which is exempt from China's "one-child policy." The total fertility rate in Wolong was 2.5% in the 1990s. Population growth impacts the giant pandas, as increased household numbers lead to greater resource consumption. Although migration to Wolong is restricted, marriage has allowed a small number of new residents to settle in the area. Despite these demographic pressures, the conservation of giant pandas remains a priority, requiring ongoing stakeholder engagement and sustainable resource management strategies.

Keywords: Stakeholders, Giant Panda's NRM scenario, household, human health

Water Balance Study on Vamanapuram River Basin Using SWAT

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Abstract

Water is one of the natural resources that humans need. The management of water resources determines its potential to support society's goals for growth and development while striking a balance with the requirement to preserve the hydrological natural integrity. Water conservation methods are properly developed using geographical and temporal variation and understanding the interplay of various hydrologic components. The selection and use of a suitable watershed model are essential to achieve the goal. The Soil and Water Assessment Tool (SWAT) model has been used to analyse and quantify the water balance of the Vamanapuram river basin in Kerala for the period 1990-2014. It is a semi-distributed watershed model with an integrated physical basis, and its applicability to other regions of the world has also been proven. The model incorporates DEM, land use, soil and climate data. A sensitivity analysis of the model has been carried out to understand the most sensitive parameters which help in parameter reduction at the calibration phase. The Sequential Uncertainty Fitting Approach (SUFI2) has been used for the model calibration (1990-2007) and validation (2008-2014)) using observed river flow data from the Ayilam River Gauge station. The model efficiency has been tested by Nash Sutcliff's efficiency and coefficient of determination and these efficiency measures figured above 72% indicating good predictive ability of the model. The simulated and observed time series curves equally revealed a substantial extent of similarity. Because of the Mini-Hydropower Project, the model often overestimated the peak flow during the calibration period and underestimated it during the validation period. Water balance components of the basin have been simulated and it is found that the groundwater contribution is the maximum in the river flow followed by runoff.

Keywords: SWAT model, Vamanapuram River Basin, Calibration, Validation, Sensitivity Analysis

Preliminary study on diversity of moths of Farook college and construction of phylogenetic tree of family Geometridae and family Crambidae

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Abstract

Moths were observed from December 2022 to February 2023, using direct hand picking method. The present study was held in Farook College campus, Kozhikode district, Kerala, India (11.19N, 75.85E). The diversity of moth population were studied, a checklist of moths were formulated. A total of 60 moth specimens were observed in Post monsoon season. 44 Species were identified in present study which belongs to 10 Family. Most species belonging to family Erebidae (16) Followed by Geometridae(8), Crambidae(7), Nymphalidae(4), Noctuidae(2), Bombycidae(1), Pyralidae(1), Tortricidae(2), Sphingidae(2) and Lasiocampidae(1). A checklist of 44 species in Farook college campus were prepared using present study data.

A phylogenetic tree was prepared using the mitochondrial gene for cytochrome C oxidase of moth species obtained from the family Geometridae and Crambidae and interpreted the result obtained from the phylogenetic tree. The tree is prepared using the software MEGA 11.

Keywords: Phylogenetics, Moth, MEGA

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