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Foundation



ABSTRACT BOOK

International Conference on Integrated Biological Research 4th – 6th February, 2026



Organized by
Department of Zoology

(In Association with DoRD & IQAC)

Dr. Harisingh Gour Vishwavidyalaya,
(A Central University)
Sagar, M.P., India



International Conference on Integrated Biological Research 4th – 6th February, 2026

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(In Association with DoRD & IQAC)
Dr. Harisingh Gour Vishwavidyalaya,
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TECHNICAL PROGRAMME

International Conference on Integrated Biological Research (ICIBR-2026)

Organized by: *Department of Zoology, School of Biological Sciences*

Venue: Doctor Harisingh Gour Vishwavidyalaya (A Central University), Sagar, M.P., India

Dates: February 4–6, 2026

DAY 1-February 4, 2026 (Wednesday)

Inaugural Ceremony

Venue: Abhimanch Sabhagar

Time: 9:30-11:15 AM

• Welcome Address: Prof. Shweta Yadav , Head, Department of Zoology & Biotechnology, Convener, ICIBR	05 Min
• Introduction of the Conference: Dr. Shashwat Singh , Co-Convener, ICIBR	05 Min
• Address by Dean, School of Biological Science: Prof. Versha Sharma , Patron, ICIBR	05 Min
• Introduction of the Guests: Dr. Sandeep Kumar , Organizing Secretary, ICIBR	05 Min
• Address by Guest of Honour: Dr. S.P. Gautam , President, Vigyan Bharti Mahakoshal Prant and Former Chairperson, Central Pollution Control Board, Govt. of India	10 Min
• Address by Guest of Honour: Prof. U. K. Sarkar , Former Director, NBFGR Lucknow	10 Min
• Address by Guest of Honour: Prof. Appa Rao Podile , Former Vice-Chancellor, University of Hyderabad	10 Min
• Address by Guest of Honour: Prof. S. P. Singh , Vice-Chancellor, Kaushalya-the Skill University, Ahmedabad	10 Min
• Address by Chief Guest: Prof. Mewa Singh , Distinguished Professor (For life), University of Mysore	15 Min
• Address by Hon'ble Vice Chancellor: Prof. Y.S Thakur , Chief Patron, ICIBR	15 Min
• Vote of Thanks: Dr. Smita Shukla , Organizing Secretary, ICIBR	05 Min
• Performance by the students	10 Min

.....*High Tea*.....

Plenary Session I
Time: 11:30 AM –1:15 PM
Venue: Abhimanch Sabhagar

- Plenary Talk 1: **Prof. Mewa Singh**, Life-Long Distinguished Professor, University of Mysore
 - Plenary Talk 2: **Prof. S. P. Singh**, Vice-Chancellor, Kaushalya-The Skill University, Ahmedabad
- Chair: **Prof. Subodh Kumar Jain**, Former Head, Department of Zoology, DHSGVV
Rapporteur: **Dr. Priyoneel Basu**, DHSGVV

..... **Lunch Break (1:15 to 2:15 PM)**.....

Oral Sessions I (Parallel Session)
Time: 2:15-5:45 PM

Hall A (Abhimanch)	Hall B (MMTTC)	Hall C (MMTTC)
Session 1 Ecological Sciences and Evolutionary Biology	Session 2 Environmental Science Microbiology& Stress Biology	Session 3 Human Health & Welfare
Keynote 1: (2:15-2:45 PM) Prof. N. G. Prasad, IISER, Mohali Title: <i>Transgenerational effects of parental infection in Drosophila</i> IL-1: (2:45-3:05 PM) Dr. Ashish Shivam Mishra, NGBU, Prayagraj Title: <i>Benthic macroinvertebrate community in the rivers of Vindhyan region"</i> IL-2: (3:05-3:25 PM) Dr. Tripti Yadav, University of Lucknow Title: <i>Is cannibalism a survival strategy or an evolutionarily stable behaviour?</i>	Keynote 2: (2:15-2:45 PM) Prof. Ragini Gothwal, Baraktullah University, Bhopal Title: <i>Ecoremediation of religious waste by versatile native microbial consortia</i> Keynote 3: (2:45-3:05 PM) Dr. Jasmine Purushothaman, ZSI, Kolkata Title: <i>Eukaryotic Microbial Communities-Non-Celebrated Rulers in Freshwater and Terrestrial Ecosystems</i> IL-3: (3:05-3:25 PM) Dr. Rahul Kanwar Singh, HNGBU Title: <i>Cyanobacterization- a potential technique to enhance the yield of medicinal herbs</i> IL-4: (3:25-3:45 PM) Dr. Divya Bartaria, United Group of Institutes, Prayagraj Title: <i>Integrative Functional Medicine Strategies for Modulating Oxidative Stress, Inflammation, and Cellular Senescence in Autoimmune and Age-Related Disorders</i>	Keynote 4: (2:15-2:45 PM) Prof. Madhav Prabhu, JLN Hospital, Karnataka Title: <i>Evolution of Circadian Rhythm, Role of Melatonin in the Development of Metabolic Syndrome: Is There a Link We Are Missing?</i> IL-5: (2:45-3:05PM) Dr. Suchit Swaroop, University of Lucknow Title: <i>Molecular Pathways Linking Obstructive Sleep Apnea and Coronary Artery Disease: Focus on HIF1A, CLOCK, and ADIPOQ</i> IL-6: (3:05-3:25PM) Dr. A. Wani, University of Jammu Title: <i>Tuberculosis a major risk to global health, Study and Knowldge in district Doda along with Challenges and Status with special reference to Jammu and Kashmir</i> IL-7: (3:25-3:45 PM) Dr Akash Gautam, University of Hyderabad Title: <i>Remodeling of brain renin-angiotensin signaling impairs memory: evidence from rodent model of diabetes</i> IL-8: (3:45-4:05PM) Dr. Sumit Kumar Hira, University of

		Burdwan Title: <i>Harnessing Dendritic Cell–NK–T Cell Crosstalk and Metabolic Reprogramming to Overcome Immunotherapy Resistance in Colorectal Cancer</i>
Students' Oral Presentations (3:45 – 5:45 PM)		
Chair: Prof. Geetanjali Mishra , LU Co-Chair: Dr Subhash Raj Purohit , Ahmedabad University Rapporteur: Dr. Bhupendra Kumar , BHU	Chair: Prof. R. N. Yadav , Former Vice-Chancellor Purnia University, Bihar CO-Chair: Dr. Reshma Sinha , Central University of Himachal Pradesh Rapporteur: Dr. Arjita Yadav , LU	Chair: Prof. Ragini Gothwal , BU/ Prof. U.K. Patil , DHSGVV Rapporteur: Dr. Soumik Goswami , Sunbeam Women's College, Varanasi

.....**Tea Break (6:00–6:15 PM)**.....

**Poster Session I
(6:15–7:15 PM)**

.....**Dinner (7:30–9:00 PM)**.....

DAY 2-February 5, 2026 (Thursday)

Plenary Session II

Venue: Abhimanch Sabhagar

Time: 9:30–11:15 AM

- Plenary Talk 3: **Appa Rao Podile**, Former Vice-Chancellor, University of Hyderabad
 - Plenary Talk 4: **Prof. U. K. Sarkar**, Former Director, NBFGR, Lucknow
- Chair: **Prof. Mewa Singh**, Life-Long Distinguished Professor, University of Mysore
Rapporteur: **Dr. Kashmeera N.A.**, DHSGVV

.....**Tea Break (11:15-11:30 AM)**.....

Oral Session II (Parallel Session)

Time: 11:30 AM -2:00 PM

Hall A (Abhimanch)	Hall B (MMTTC)	Hall C (MMTTC)
Session 4 Aquatic Sciences, Fish and Fisheries	Session 5 Neuroscience & Endocrinology	Session 6 Taxonomy & Systematics
Keynote 5: (11:30-12:15 PM) Prof. S. K. De , Vidyasagar University, Midnapore, West Bengal Title: <i>Thymic Ecology and Glandular Protection of Fish, Anabas Testudineus (Bloch, 1792): A Climbing Perch of South East Asia</i>	Keynote 7: (11:30-12:15 PM) Dr. Ishan Patro , Jiwaji University, Gwalior Title: <i>Addressing the maxim “there is no health without mental health</i>	Keynote 9: (11:30-12:15 PM) Prof. Himender Bharti , Punjabi University, Patiala Title: <i>From Linnaeus to Phylogenetics: The Evolution of Systematic Biology</i>
Keynote 6: (12:15-12:45 PM) Dr. Iqbal Khan , Jhansi University Title: <i>Blue transformation: Aquaculture beyond production and marketing</i>	Keynote 8: (12:15-12:45 PM) Prof. Shivesh Pratap Singh , PM Excellence College, Stana Title: <i>Eco-Behavioral Study of Highly Provisioned Focal Troops of Rhesus Macaque in Chitrakoot (M.P.)</i>	Keynote 10: (12:15-12:45 PM) Dr. Anjum Rizvi , ZSI, Kolkata Title: <i>Soil Nematode: Useful Tool for The Biological Monitoring of Soil Ecosystems</i>
IL-9: (12:45-1:05 PM) Dr. Vinay Kumar Singh , CMP Degree College, University of Allahabad Title: <i>Expression and localization of Nitric Oxide Synthase in the ovary of catfish and its putative role in steroid production</i>	IL-11: (12:45-1:05 PM) Dr. Nisha Patro , Jiwaji University, Gwalior Title: <i>Maternal protein malnutrition and neurodevelopmental disorders</i>	IL-13: (12:45-1:05 PM) Dr. Tuncera Bhadauria , Babu J.S. Gaya Prasad P.G. College, (CSJM University Kanpur) Sumerpur, Unnao, UP Title: <i>Habitat Degradation and Land Use Change Impacts on Earthworm Biogeography and Functional Diversity in Raebareli, Uttar Pradesh, India</i>
IL-10: (1:05-1:25 PM) Dr. Jyoti Verma , University of Allahabad Title: <i>Harnessing R Studio package for Ecological Insights: Monitoring Diatoms with DiaThor</i>	IL-12: (1:05-01:25 PM) Dr. Soumik Goswami , Sunbeam Women’s College, Varanasi Title: <i>Beyond Sunlight: A Protective Crosstalk between Melatonin and UV Radiation</i>	IL-14: (1:05-1:25 PM) Dr. Pooja Kumari , DS College, Aligarh Title: <i>Glycoprotein Composition and Salinity-Induced Changes in Gill Mucous Cells of Channid Fishes</i>
Students' Oral Presentations (1:25 – 2:10 PM)		

Chair: Prof. U. K. Sarkar , Former Director, NBFGR, Lucknow Co-Chair: Dr. Payal Mahobiya , DHSGVV Rapporteur: Dr. Tripti Yadav , LU	Chair: Prof. Chandana Haldar , BHU Co-Chair: Dr. Malabika Sikdar , DHSGVV Rapporteur: Dr. Shashank K. Maurya , DU	Chair: Prof M. Ojit , Delhi University Co-Char: Dr. Ashish Shivam Mishra , NGBU Rapporteur: Dr. Akhilendra Kumar Maurya , BHU
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.....**Lunch Break (2:10–2:45 PM)**.....

Oral Session III (Parallel Session)
Time: 02:45-05:45 PM

Hall A (Abhimanch)	Hall B (MMTTC)	Hall C (MMTTC)
Special Session 7 Insect Science & Pest Management	Special Session 8 Cell & Molecular Biology	Session 9 Bioinformatics, Nanotechnology & Startups in Life Science
Keynote 11: (2:45-3:15 PM) Prof. Geetanjali Mishra, University of Lucknow Title: <i>The regeneration puzzle: What ladybird beetles teach us about it?</i> Keynote 12: (3:15-3:45 PM) Dr. Roy Kaspi ARO, Volcani Institute, Israel Title: <i>Biological Control: Past, Present, and Future</i> IL-15: (3:45-4:05 PM) Dr. Bhupendra Kumar, BHU, Varanasi Title: <i>Temperature-Driven Survival Strategies in Parthenium Beetles</i> IL-16: (4:05-4:25 PM) Archana Anokhe, ICAR Jabalpur Title: <i>Sustainable Management Strategies for Invasive Weeds with Emphasis on Biological Control</i> IL-17: (4:25-4:45 PM) Dr. Animesha Rath, Hebrew University of Jerusalem, Israel Title: <i>Spiroplasma induced Cytoplasmic Incompatibility in the parasitoid Lariophagus distinguendus: Effects of symbiont density, wasp development and reintroduction</i>	Keynote 13: (2:45-3:15 PM) Dr. Niraj Kumar, Former Ex. Sec., NASI Title: <i>A Marriage between Nutritional Adaptation Theory and Dogma of Biogeogens, is the Solution of Holistic Care of Human Health</i> Keynote 14: (3:15-3:45 PM) Dr Subhash RajPurohit, Ahmedabad University Title: <i>Pigmentation at the Interface of Genetics and Adaptation</i> IL-18: (3:45-4:05 PM) Dr. K. K. Soni, Barkatullah University Title: <i>Deoxylimonin derived from Clitoria ternatea (L) extract's fraction CT-3 reduces LTC-4, COX-2 and IL-6 in inflammatory models of Wistar albino rats Rattus norvegicus</i> IL-19: (4:05-4:25 PM) Dr. Shashank K. Maurya, DU Title: <i>Olfml3 and Tmem119 could be new players in the regulation of neuroinflammation</i> IL-20: (4:25-4:45 PM) Dr. Altaf. Shaik, NIH, Maryland, USA Title: <i>A Bifunctional Antibody Conjugate for Marking the Location of DNA Binding Proteins on DNA Fibers</i>	Keynote 15: (2:45-3:15 PM) Dr. Deoprakash Chaturvedi, DBT Title: <i>Building India's Biomedical Research Ecosystem: From Capacity Building to Research Excellence</i> IL-21: (3:15-3:35 PM) Dr. Amrita Yadav, Dr. Shakuntala Rashtriya Raksha University, Lucknow Title: <i>Nature-Inspired Algorithms in Healthcare: AI-Driven Approaches for Intelligent Decision-Making</i> IL-22: (3:35-3:55 PM) Dr. Akhilendra Kumar Maurya, BHU Title: <i>Harnessing Phytochemicals for CRC Chemoprevention: Mechanistic Insights into Gut Microbiota Modulation</i> IL-23: (3:55-4:15 PM) Dr. Preeti Sharma, Shmunis School of Biomedicine and Cancer Research, Tel Aviv University, Israel Title: <i>Engineering LNPs for Vaccines: Lipid Design Drives Immune Activation</i>
Students' Oral Presentations (4:45 – 5:45 PM)		

Chair: Prof. N. G. Prasad , IISER, Mohali Co-Chair: Dr. V.P. Semwal , Govt. PG. College Tehri Garhwal Rapporteur: Dr. Pooja Kumari , DS College, Aligarh	Chair: Dr. C.P. Upadhayay , DHSGVV Co-Chair: Dr Deoprasekash Chaturvedi , DBT, New Delhi Rapporteur: Dr. Dikshi Angira , DHSGVV	Chair: Dr. Raj Kumar Koiri , DHSGVV Co-Chair: Dr. A. Wani , Jammu University Rapporteur: Dr. Sumit Hira , University of Burdwan
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**Poster Session II with Tea
(5:45–06:30 PM)**

**Cultural Program and Dinner
(Venue: Abhimanch Sabhagar, Time: 7:00 PM 9:30 PM)**

DAY 3- February 6, 2025 (Friday)

Plenary Session III

Venue: Abhimanch Sabhagar

Time: 9:30–11:00 AM

- Plenary Talk 5: **Dr. Gur Pines**, University of Colorado, Boulder
 - Plenary Talk 6: **Prof. Chandana Haldar**, Former Director, Inst. of Science, BHU
- Chair: **Prof. U. K. Sarkar**, Former Director, NBFGR, Lucknow
Rapporteur: **Dr. Brajesh Kumar Maurya**, DHSGVV

.....*Tea Break* (11:11-11:15 AM).....

Oral Session IV (Parallel Session) (11:15 AM -2:30 PM)

Hall A (Abhimanch)	Hall B (MMTTC)
Session 10 Women in Science	Session 11 Biodiversity Conservation and Management
Keynote 16: (11:15-11:40 AM) Prof. Veena Batra Kushwaha , DDU, Gorakhpur Title: <i>Plant Phytochemicals in Redox Homeostasis: Mechanistic Insights into Protection Against Food Additive Induced Oxidative Stress</i>	Keynote 17: (11:15-11:40 AM) Prof. Ojit Kumar Singh , Delhi University Title: <i>Lepidopteran Diversity and Behavioural Responses in a Restoring Urban Wetland of Delhi</i>
IL-24: (11:40-12:00 PM) Dr. Reshma Sinha , Central University of Himachal Pradesh Title: <i>Emerging Contaminants: Microplastics and PCPs Risks in Freshwater Systems</i>	Keynote 18: (11:40-12:05 PM) Prof. Keshav Singh , Gorakhpur University Title: <i>Biological Waste Management through Vermicomposting</i>
IL-25: (12:20-12:40 PM) Dr. Arjita Yadav , University of Lucknow Title: <i>Time, Task, and Tiredness: Sleep Health in Police Personnel</i>	IL-27: (12:05-12:25 PM) Dr. Shivangi Mishra , University of Calgary Title: <i>Conservation Beyond Borders: A Cross-Continental Perspective</i>
IL-26: (12:40-01:00 PM) Dr. Priya Pradhan , BCS, Govt. PG College, Dhamtari, CG Title: <i>Functional characterization of the RbWRKY70 promoter regulating rose petal abscission</i>	IL-28: (12:25-12:55 PM) Dr. V. P. Semwal , Govt. PG. College Tehri Garhwal Title: <i>Aquatic Biodiversity Conservation in the Himalayan River System in Uttarakhand</i>
	IL-29: (12:55-1:15 PM) Dr. Ravi Shankar Verma , Chandra Bhanu Gupta Agricultural Post Graduate College, Lucknow Title: <i>Scaphognathite Oscillation Variability as a Predictor of Stress and Mortality in Aquatic Crustaceans</i>
	IL-30: (1:15 – 2:05) Dr. Sandeep Kuashik , IGNTU, Amarkantak, M.P., India Title: <i>Polygamy in Lac Insect: Insight into Reproductive Strategies</i>
Students' Oral Presentations (2:05 –2:30 PM)	
Chair: Prof. Asmita Gajbiye , DHSGVV Co-Chair: Dr. Deepali Jat , DHGVV Rapporteur: Dr. Jyoti Verma , University of Allahabad	Chair: Prof. Himender Bharti , Punjabi University Patiala Co-Chair: Dr. Tuneera Bhadauria , Babu J.S. Gaya Prasad P.G College, (CSJM University Kanpur), Unnao, UP

Parallel Poster Session III
(2:05 –2:30 PM)

.....*Lunch Break (2:30–3:00 PM)*.....

Valedictory Ceremony
Venue: Abhimanch Sabhagar
Time: 3:00 PM–5:00 PM

- Panel Discussion
- Summary of Conference Proceedings: By **Dr. Raj Kumar Koiri**
- Feedback
- Award Ceremony: Best Poster, Oral, Women Scientist and Young Scientist Awards
- Vote of Thanks: By **Dr. Shashwat Singh**

Summary

1. Plenary Lecture: 6
2. Keynote Lecture: 18
3. Invited Lecture: 30
4. Student Oral Presentation: 38
5. Student Poster Presentation: 46

STUDENTS ORAL PRESENTATION SCHEDULE
International Conference on Integrated Biological Research (ICIBR-2026)
Organized by: *Department of Zoology, School of Biological Sciences*
Venue: Doctor Harisingh Gour Vishwavidyalaya (A Central University), Sagar, M.P., India
Dates: February 4–6, 2026

DAY 1- February 4, 2026 (Wednesday)
Student Oral Presentations

Oral Session I

Session 1 Ecology, Ecotoxicology & Evolutionary Biology	Session 2 Environmental Science Microbiology & Stress Biology	Session 3 Human Health & Welfare
Hall A (Abhimanch)	Hall B (MMTTC)	Hall C (MMTTC)
Time-3:45-5:45 PM	Time-3:45-5:45 PM	Time-4:05-4:50 PM
OP-1: 15 min Pawan Yadav Title: <i>Multimodal Communication in Ants</i> OP-2: 15 min Rohit Chand Kabidayal Title: <i>A Convenient and effective Atropine Sulphate Nasal Formulations against Organophosphate Toxicity</i> OP-3: 15 min Sanjeev Kumar Title: <i>The Hidden Costs of Regeneration in Ladybird Beetles</i> OP-4: 15 min Jitendra Title: <i>Assessment of Functional Feeding Groups of Benthic Macroinvertebrates from the Bhagirathi River in Indian Himalaya</i>	OP-5: 15 min Ankita Dwivedi Title: <i>Cigarette Smoke Extract Accelerates Neurodegenerative Changes via Oxidative Stress: Neuroprotective Effects of Hesperetin in Adult Zebrafish</i> OP-6: 15 min Diksha Sharma Title: <i>Evaluation of therapeutic potential of extracellular vesicles derived from probiotic Lactobacillus strain</i> OP-7: 15 min Vineet Maurya Title: <i>Neurodevelopmental Consequences and Behavioural Dysregulation Following TBBPA-DHEE Exposure in Zebrafish</i>	OP-8: 15 min N.C Saxena Title: <i>Gestational Diabetes Mellitus and Future Cardiovascular Risk: Evidence from Maternal and Offspring Outcomes</i> OP-9: 15 min Anurag Namdev Title: <i>Human Health and Welfare: A Key to Sustainable Development</i> OP-10: 15 min Shashwat Singh Title: <i>Lifestyle Behaviours and Clinical Characteristics of Coronary Artery Disease Patients in a North India</i>
Chair: Prof. Geetanjali Mishra, LU Co-Chair: Dr. Subhash Raj Purohit, Ahmedabad University Rapporteur: Dr. Bhupendra Kumar, BHU	Chair: Prof. Naveen Kango, DHSGVV Co-Chair: Dr. Reshma Sinha, CUHP Rapporteur: Dr. Archita Yadav, LU	Chair: Prof. Ragini Gothwal, BU/Prof. U.K. Patil, DHSGVV Rapporteur: Dr. Soumik Goswami, Sunbeam Women's College, Varanasi

DAY 2-February 5, 2026 (Thursday)
Student Oral Presentations

Oral Session II

Session 4 Aquatic Sciences, Fish and Fisheries	Session 5 Neuroscience & Endocrinology	Session 6 Taxonomy & Systematics
Hall A (Abhimanch)	Hall B(MMTTC)	Hall C (MMTTC)
Time- 1:25–2:25 PM	Time- 1:25–2:10 PM	Time- 1:25–2:10 PM
OP-11: 15 min Raghvendra Niranjana Title: <i>Pathological, Hematological, and Ultrastructural Alterations Induced by Senga sp. (Cestoda) in Mastacembelus armatus</i> OP-12: 15 min Hitendra Sahu Title: <i>Do Sacred River Sections Safeguard Ichthyofauna? A systematic review from Selected Central Indian Rivers</i> OP-13: 15 min Aman Prakash Title: <i>Investigating the Developmental, Behavioural and Molecular Response of the sea urchin larvae to Food Availability</i> OP-14: 15 min Raksha Khangar Title: <i>Present status of ecosystem health of the central Indian waters: A systematic review and implications for conservation framework</i>	OP-15: 15 min Rishika Tiwari Title: <i>Social Isolation Reorganizes Motivational Hierarchies Through Oxytocin-Dependent Frontal Theta Oscillations in Corticostriatal Circuits in rats</i> OP-16: 15 min Sneha Bibyan Title: <i>Soy Isoflavone Genistein Mitigates Phthalate-Induced Neurodegeneration in Zebrafish Models</i> OP-17: 15 min Aamir Khan Title: <i>Synbiotic-Induced Immuno-Endocrine Regulation of Testicular Function in Adult Male Japanese Quail</i>	OP-18: 15 min Avnish Kumar Title: <i>Discovery of Endemic Earthworm Genus Perionyx Perrier, 1872 (Oligochaeta: Megascolecidae) Species Reveals Sikkim as a Natural Hub within Indian Organic Farming Systems</i> OP-19: 15 min Dr. Kiran Singh Title: <i>GC–MS metabolomics and multi-level biomarkers reveal oxidative stress and metabolic disruption in earthworms exposed to LDPE microplastics</i> OP-20: 15 min Garima Stephen Title: <i>Assessing Soil Fauna Response to Polyurethane Microplastics using Earthworm as Bioindicator</i>
Chair: Prof. U. K. Sarkar, Former Director, NBFGR, Lucknow Co-Chair: Dr. Payal Mahobiya, DHSGVV Rapporteur: Dr. Tripti Yadav, LU	Chair: Prof. Chandana Halder, BHU Co-Chair: Dr. Malabika Sikdar, DHSGVV Rapporteur: Dr. Shashank K. Maurya, DU	Chair: Prof M. Ojit, Delhi University Co-Chair: Dr. Ashish Shivam Mishra, NGBU Rapporteur: Dr. Akhilendra Kumar Maurya, BHU

DAY 2-February 5, 2026 (Thursday)

Student Oral Presentations

Oral Session III

Special session 7 Insect Science & Pest Management	Special session 8 Cell & molecular biology	Session 9 Bioinformatics, Nanotechnology & Startups in Life Science
HALL A (Abhimanch)	HALL B (MMTTC)	HALL C (MMTTC)
Time- 4:45–5:45 PM	Time-4:45–5:45 PM	Time-4:45–5:45 PM
OP-21: 15 min Dr. Shriza Rai Title: <i>How Costly Is Losing a Leg for a Predator: Cheilomenes sexmaculata Fabricius (Coccinellidae)</i> OP-22: 15 min Janhiphula Kanhar Title: <i>Circadian Patterns in Pendent Cocoon Construction and FESEM-Based Surface Analysis of Bagworm Silk</i> OP-23: 15 min Tamal Das Title: <i>Assessment of rearing performance in the multivoltine Nistari race of the mulberry silkworm, Bombyx mori L. under thermal stress conditions</i> OP-24: 15 min Neelima Tiwari Title: <i>Phytopesticidal Efficacy of p-Coumaric acid derived from Blumea eriantha (L) extract purified fraction BE-1 against stored grain pest Rice Weevil Sitophilus oryzae (L)</i>	OP-25: 15 min Divya Jyoti Title: <i>Beyond Bioaccumulation: PET Micro-Fragments Drive Liver Dysfunction via Gut–Liver Axis Signaling</i> OP-26: 15 min Siddharth Rajput Title: <i>MC-LR-induced alterations in the unfolded protein response pathway in mice and the ameliorative effects of coenzyme Q10</i> OP-27: 15 min Bhupendra Singh Title: <i>Tinospora cordifolia (Giloy) downregulates D-Galactose induced aging via AMPK- SIRT1 pathway in liver and testes of a mouse model</i>	OP-28: 15 min Praddum Kumar Namdev Title: <i>Systems-Level Insights into Agrochemical Impacts on Earthworms: Evidence from Metabolomic Meta-Analysis</i> OP-29: 15 min Shikha Upadhyay Title: <i>Integrated Multi-Biomarker Responses in Earthworm Coelomocytes: A comprehensive Meta-analysis</i> OP-30: 15 min Brijesh Prajapat Title: <i>Melatonin-Loaded Nanoparticles: A Preclinical Review for Better Osteoporosis Treatment</i>
Chair: Prof. N. G. Prasad, IISER, Mohali Co-Chair: Dr. V.P. Semwal, Govt. PG. College Tehri Garhwal Rapporteur: Dr. Pooja Kumari, DS College, Aligarh	Chair: Dr. C.P. Upadhyay, DHSGVV Co-Chair: Dr. Deoprasad Chaturvedi, DBT Rapporteur: Dr. Dikshi Angira, DHSGVV	Chair: Dr. Raj Kumar Koiri, DHSGVV Co-Chair: Dr. A. Wani, Jammu University Rapporteur: Dr. Sumit Hira, University of Burdwan

DAY 3 -February 6, 2025 (Friday)
Student Oral Presentations

Oral Session IV

Session 10 Women in Science	Session 11 Biodiversity Conservation and Management
HALL A (Abhimanch)	HALL C (MMTTC)
Time-1:15–2:15 PM	Time-1:15–2:15 PM
OP-31: 15 min Kainat Usmani Title: <i>Eugenol loaded Chitosan Nanoparticles in Allergic Airway Inflammation: Metabolomic Profiling and Pathway Regulation of NF-κB p65 and HDAC1 through In Vivo and In Silico Approaches</i> OP-32: 15 min Surbhi Chaurasia Title: <i>Thyro-Reproductive Dysfunction Induced by Cypermethrin: Assessing the Therapeutic Potential of Bacopa monnieri Extract in Swiss Albino Mice</i> OP-33: 15 min Anuradha Yadav Title: <i>Dia-Thor Assessment of Diatom Communities: Evaluating Ecological Health of Ken-Betwa River Linkage</i> OP-34: 15 min Preeti Tirkey Title: <i>Evaluation of the Therapeutic Potential of Thymoquinone (Nigella sativa) against Malathion-Induced Toxicity in the Freshwater Fish Labeo rohita (Hamilton, 1822)</i>	OP-35: 15 min Anupam Kumar Title: <i>Predicting the Invasion Potential of the Brazilian Earthworm Pontoscolex corethrurus Across India Through Species Distribution Modelling</i> OP-36: 15 min Aditya Kumar Chauhan Title: <i>Academic Campuses as Refuges for Urban Avian Diversity in Aligarh, India</i> OP-37: 15 min Jagriti Rai Title: <i>Diatom Diversity and Bioindication in Extremophile Hot Springs of Garhwal Himalaya</i> OP-38: 15 min Ekta Kumari Title: <i>Thermal regimes govern development and reproductive output in a biocontrol agent, ladybird beetles</i>
Chair: Prof. Asmita Gajbiye, DHSGVV Co-Chair: Dr. Deepali Jat, DHGVV Rapporteur: Dr. Jyoti Verma, University of Allahabad	Chair: Prof. Himender Bharti, Punjabi University Patiala Co-Chair: Dr. Tunira Bhadauria, Babu J.S. Gaya Prasad P.G College, (CSJM University Kanpur) Sumerpur, Unnao, Uttar Pradesh Rapporteur: Dr. Vinay Kumar Singh, CMP Degree College, University of Allahabad

STUDENTS POSTER PRESENTATION SCHEDULE
International Conference on Integrated Biological Research (ICIBR-2026)
Organized by: Department of Zoology, School of Biological Sciences
Venue: Doctor Harisingh Gour Vishwavidyalaya (A Central University), Sagar, M.P., India
Dates: February 4–6, 2026

DAY 1- February 4, 2026 (Wednesday)
Student Poster Presentations

S. No.	Presenter Name	Title
1)	Akhilesh Kumar Yadav	<i>Strengthening Adaptive Capacities of Fish-Farming Communities through Climate-Resilient Models.</i>
2)	Ankush Verma	<i>Isolation and Characterisation of Probiotic Lactic Acid Bacteria from Indigenous Cavity Nesting Honeybee, Apis cerana</i>
3)	Arif Patel	<i>Eco-Printing with Marigold Flowers: A Sustainable Approach to Natural Textile Printing</i>
4)	Ansh Pathak	<i>Lepidopteran Diversity and Behavioural Responses in a Restoring Urban Wetland of Delhi</i>
5)	Anuj Singh	<i>Assessment of Antioxidant Enzyme Alterations Induced by Metabolites of Paramyrothecium and Volutella in Rat Liver Tissue</i>
6)	Ashish Kumar Sahu	<i>Exploring Oscillatory Gene Expression in Euglena gracilis Using Integrated Bioinformatics and Experimental Analysis</i>
7)	Asutosh Kumar Nahak	<i>Zebrafish- A Vertebrate Paradigm in Neuroscience Research</i>
8)	Bhavya	<i>A Systematic Review on Helminthes Fauna of Fishes of Ganga River</i>
9)	Davinder	<i>Emerging Micropollutants in Aquatic Environment: Occurrence, Environmental Fate, Toxicity, and Mitigation Approaches</i>
10)	Deeksha Jattan	<i>Cue Driven Mating Dynamics in Ladybird Beetle, Cheilomenes sexmaculata (Fabricius)</i>
11)	Harshpreet Kaur	<i>Breast Cancer and the Immune System</i>
12)	Hemant Ahirwal	<i>Nattokinase as a Neuroprotective Representative in Brain Disorders</i>
13)	Janvi	<i>Pathogenesis of Human Papillomavirus (HPV) in Cervical Cancer and the Preventive Role of Vaccination</i>

DAY 2- February 5, 2026 (Thursday)
Student Poster Presentations

S. No.	Presenter Name	Title
14)	Kanika sharma	<i>Genetic enhancement of plant-based phytoremediation for lead contaminated soil</i>
15)	Khushi Sharma	<i>Endometriosis and Menstrual Dis7ltress: A synoptic study of Sagar city, Madhya Pradesh</i>
16)	Lalit Prajapati	<i>Prey species modulates the oviposition decision in the aphidophagous ladybird beetle, Menochilus sexmaculatus</i>
17)	Lata Verma	<i>A Step Towards Breaking Seasonal Barriers: Artificial Diet Based Rearing of Cheilomenes sexmaculata and Propylea dissecta</i>
18)	Mantu Meher	<i>Influence of Circadian Rhythms on Cognitive Performance in Urban and Rural Settings</i>
19)	Mohnish Singh	<i>Density-dependent selection in Drosophila: Amelioration of grandparental effects in hatching time</i>
20)	Neeraj Kapoor	<i>Genetic Polymorphism and Diversity in Earthworm Populations: A Molecular Marker-Based Study</i>
21)	Neeraj Kol	<i>Effects of Vibrational and Acoustic Stimuli on Earthworm Behavior</i>
22)	Pawan Kumar	<i>Is Lakha Banjara Lake in Sagar Ecologically Managed? A Review and Its Implications for Integrated Lake Management</i>
23)	Prakhar Kumar	<i>Density Estimates of Indian Leopards (Panthera pardus fusca) using Spatial Capture–Recapture Models in Gir Wildlife Sanctuary, Gujarat.</i>
24)	Princi Gupta	<i>Whispers of green: plant acoustics from perception to communication</i>
25)	Pritam Sharma	<i>Environmental and Ecological Assessment of Different Solids and Dissolved Oxygen in Shivganga Pond, Deoghar, Jharkhand, India</i>
26)	Priyadarsani Mishra	<i>Bioactive compounds from Earthworms: Diversity, Mechanisms of action, and pharmaceutical potential</i>
27)	Priyanshi Patel	<i>Comparative Bioinformatics Analysis of Melatonin Receptor in Human, Rat, and Fish</i>
28)	Raghuveer Kumar Gupta	<i>Study on Inflammatory Response, Biochemical Profiling and Histopathological Alteration in Asian stinging catfish Heteropneustes fossilis Infested with Nematode parasites</i>
29)	Rajat Bhatia	<i>Characterisation and Probiotic Dynamics of Selected Lactic Acid Bacteria Isolates from Honey Bee Gut</i>

DAY 3-February 6, 2025 (Friday)
Student Poster Presentations

S. No.	Presenter Name	Title
30)	Kajal Kuchiya	<i>A Systematic Review on the Natural antioxidant and Nutritional Profile of Vigna radiata (Mung Bean)</i>
31)	Raksha Khangar	<i>Present status of ecosystem health of the central Indian waters: A systematic review and implication for conservation framework</i>
32)	Sambid Sunamajhi	<i>Variations of chronotype in tribal society: A comparison of urban and rural population in relation to sleep and health</i>
33)	Shanta Kumari Panda	<i>CRISPR for Conservation: Risks and Rewards</i>
34)	Shikha Kumari	<i>Early-Life Environmental Optimization Improves Zebrafish Developmental Outcomes</i>
35)	Sumit Raj	<i>Integrated farming system as a tool for sustainable agriculture and rural livelihood</i>
36)	Swati Maurya	<i>AI-Designed Synthetic Symbionts for Human Health</i>
37)	Umang Verma	<i>Comparative Bioinformatics Study of Fish and Human Melatonin Receptors and Pineal Peptides</i>
38)	Vivek kr Shrivastava	<i>Strengthening Adaptive Capacities of Fish-Farming Communities through Climate-Resilient Models.</i>
39)	Yuvraj Singh	<i>Ecology of insect-plant interaction in response to nitrogen fertilizer plasticity: A case study in Zygogramma bicolorata</i>
40)	Sonmati	<i>Helminth diversity and host interaction dynamics in Indian catfishes (Heteropneustes fossilis and Clarius batrachus)</i>
41)	Vindu	<i>Spatial Variation of Benthic Diatoms as Indicators of Anthropogenic Stress in Varuna River</i>
42)	Aditi Lal	<i>Cyanotoxins induced endocrine, immune disruption and Mammalian health implications</i>
43)	Anita Ahirwar	<i>Biodiversity of lepidoptera in Sagar Madhya Pradesh</i>
44)	Ayushi Singh	<i>Melatonin receptors and pineal peptide interaction in rats and fish: an in-silico study</i>
45)	Ruchika Singh	<i>Bridging the adaptation gap between climate stressed crop- livestock system for sustainable agriculture</i>
46)	Chandani Kumari	<i>Assessment of Physico-Chemical Water Quality of Ganga River During Kumbh Mela at Prayagraj</i>



MESSAGE

I am happy to know that the **Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya, Sagar, Madhya Pradesh** is going to organise an "International Conference on Integrated Biological Research (ICIBR - 2026)" during 4-6 February, 2026 and to mark this occasion, a Souvenir is being brought out.

I am sure, the Conference will present an excellent platform to distinguished scientists, scholars, researchers, policy makers and students from different parts of the country and abroad, to exchange their ideas and experience on this theme of profound significance.

I wish the ICIBR - 2026 all success.

(Dharmendra Pradhan)

डॉ. वीरेन्द्र कुमार
DR. VIRENDRA KUMAR

सामाजिक न्याय और अधिकारिता मंत्री
भारत सरकार

MINISTER OF
SOCIAL JUSTICE AND EMPOWERMENT
GOVERNMENT OF INDIA



कार्यालय : 202, सी विंग, शास्त्री भवन,
नई दिल्ली-110115

Office : 202, 'C' Wing, Shastri Bhawan,
New Delhi-110115

Tel. : 011-23381001, 23381390, Fax : 011-23381902

E-mail : min-sje@nic.in

दूरभाष : 011-23381001, 23381390, फ़ैक्स : 011-23381902

ई-मेल : min-sje@nic.in

शुभकामना संदेश

मुझे अत्यंत प्रसन्नता है कि डॉ. हरि सिंह गौर विश्वविद्यालय सागर, एकीकृत जैविक अनुसंधान पर अंतर्राष्ट्रीय सम्मेलन करने जा रहा है। यह अंतर्राष्ट्रीय सम्मेलन कृषि क्षेत्र में नवाचार, सहयोग और सतत विकास को बढ़ावा देने की दिशा में एक महत्वपूर्ण पहल है।

कृषि न केवल हमारी अर्थव्यवस्था की रीढ़ है, बल्कि यह खाद्य सुरक्षा, ग्रामीण आजीविका और पर्यावरणीय संतुलन का आधार भी है। आज जलवायु परिवर्तन, प्राकृतिक संसाधनों के संरक्षण, और बढ़ती जनसंख्या की खाद्य आवश्यकताओं जैसी वैश्विक चुनौतियों के समाधान के लिए हमें आधुनिक तकनीक, अनुसंधान और अंतर्राष्ट्रीय सहयोग की अत्यंत आवश्यकता है।

मुझे विश्वास है कि यह सम्मेलन ज्ञान के आदान-प्रदान, श्रेष्ठ कृषि पद्धतियों को साझा करने तथा नवाचार आधारित समाधानों को अपनाने के लिए एक सशक्त मंच प्रदान करेगा। भारत सतत कृषि, डिजिटल तकनीकों, किसान सशक्तिकरण और जलवायु-संवेदनशील कृषि को बढ़ावा देने के लिए प्रतिबद्ध है।

मैं इस सम्मेलन के सफल आयोजन के लिए आयोजकों को हार्दिक बधाई देता हूँ और आशा करता हूँ कि यहां होने वाले विचार-विमर्श वैश्विक कृषि विकास में सार्थक योगदान देंगे।

आप सभी को मेरी शुभकामनाएँ।

(डॉ. वीरेन्द्र कुमार)

ডঃ সুকান্ত মজুমদার
ডॉ. सुकान्त मजुमदार
DR. SUKANTA MAJUMDAR



राज्य मंत्री
शिक्षा; एवं उत्तर पूर्वी क्षेत्र विकास
भारत सरकार
MINISTER OF STATE FOR EDUCATION; AND
DEVELOPMENT OF NORTH EASTERN REGION
GOVERNMENT OF INDIA

Date: 21.01.2026

MESSAGE

It is my great pleasure to welcome you to the International Conference on Integrated Biological Research 2026, organized by Dr. Harisingh Gour Vishwavidyalaya (A Central University), Sagar, MP. This conference represents a collective effort of researchers, academicians, and professionals who are committed to advancing knowledge across the diverse and dynamic fields of biological sciences.

The abstracts compiled herein reflect the breadth, depth, and innovation of contemporary biological research from fundamental discoveries to applied studies addressing global challenges in health, environment, agriculture, and biotechnology. Each contribution highlights the importance of interdisciplinary collaboration and scientific rigor in shaping the future of biological research.

In alignment with the national vision of "Viksit Bharat @2047," this conference serves as a vital platform for fostering the "Anusandhan" (Research) spirit required to transform India into a developed nation. By pushing the boundaries of biotechnology and life sciences, our scientific community plays a pivotal role in ensuring sustainable development, health security, and technological self-reliance -the very pillars of a developed India.

I extend my sincere appreciation to all authors for sharing their valuable work, and to the reviewers and scientific committee for their dedication in ensuring the quality of this publication. I also acknowledge the efforts of the organizing team whose commitment has made this conference and abstract compilation possible.

I hope this conference serves not only as a record of the proceedings but also as a source of inspiration, dialogue, and future collaboration among the global scientific community. I wish all participants a stimulating and rewarding conference experience.

(Dr. SUKANTA MAJUMDAR)

धृति बैनर्जी

(पीएच.डी., डी.एससी.)

निदेशक

Dhriti Banerjee

Ph.D., D.Sc.

Director



भारत सरकार

भारतीय प्राणि सर्वेक्षण

पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय

Government of India

Zoological Survey of India

Ministry of Environment, Forest and Climate Change



Message

It gives me immense pleasure to extend my warm greetings to the organizers, participants, and delegates of the *International Conference on Integrated Biological Research*. This conference comes at a critical juncture when the world is facing unprecedented challenges related to biodiversity loss, climate change, emerging diseases, and sustainable use of biological resources.

Integrated biological research, which brings together taxonomy, ecology, molecular biology, conservation science, bioinformatics, and allied disciplines, is essential for developing holistic solutions to these complex issues. The Zoological Survey of India (ZSI), as the apex national organization for faunal exploration, taxonomy, and conservation, has always emphasized the importance of interdisciplinary approaches in understanding and safeguarding India's rich and diverse animal life.

I am confident that this conference will serve as a vibrant platform for scientists, researchers, academicians, and young scholars to share innovative ideas, exchange knowledge, and foster meaningful collaborations across disciplines and borders. Such interactions are vital for translating scientific research into effective conservation strategies and evidence-based policy-making.

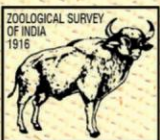
I commend the organizers for their initiative in bringing together experts from diverse fields and wish the conference every success. I also hope that the deliberations and outcomes of this conference will contribute significantly to the advancement of biological sciences and to the sustainable management of our natural heritage.

With best wishes for a fruitful and inspiring conference.

(Dr. Dhriti Banerjee)

Date: 14-01-26

Place : Kolkata



प्राणि विज्ञान भवन, 535, एम. ब्लॉक, न्यू अलीपुर, कोलकाता - 700 053, दूरभाष : +91 33 2400 6893, टेलीफैक्स : +91 33 2400 8595

Prani Vigyan Bhawan, 535, M-Block, New Alipore, Kolkata - 700 053, Phone : +91 33 2400 6893, Telefax : +91 33 2400 8595

E-mail : director@zsi.gov.in, dhritibanerjee@gmail.com, Website : zsi.gov.in



:: Message ::

*It gives me immense pleasure to extend my warm greetings to all the delegates, researchers, academicians, scientists, and students participating in the **International Conference on Integrated Biological Research**. This conference provides a distinguished platform for the exchange of knowledge, ideas, and innovations across diverse domains of biological sciences.*

Integrated biological research has emerged as a cornerstone for addressing some of the most pressing global challenges, including human health, environmental sustainability, food security, and biotechnology-driven innovation. By fostering interdisciplinary collaboration and bridging fundamental research with applied sciences, this conference plays a vital role in advancing scientific understanding and societal well-being.

I am confident that the deliberations, keynote addresses, technical sessions, and interactive discussions will stimulate meaningful dialogue, inspire novel research directions, and strengthen international academic and research partnerships. Such scholarly gatherings not only enrich intellectual perspectives but also encourage young researchers to pursue excellence and innovation.

I commend the organizing committee for their dedicated efforts in bringing together eminent experts and participants from across the globe. I wish the conference every success and hope it proves to be a rewarding and intellectually enriching experience for all involved.

With best wishes for fruitful deliberations and continued academic excellence.

Sagar
27th January, 2026

YS Thakur
(Prof. Y. S. Thakur)

Prof. Versha Sharma
Dean
School of Biological Sciences
Dr. Harisingh Gour Vishwavidyalaya
(A Central University)
Sagar-470 003 (M.P.) India



Message

It is with great pleasure that I extend a warm welcome to all delegates, researchers, academicians, and students to the *International Conference on Integrated Biology*. This conference provides a valuable platform for bringing together diverse disciplines within the biological sciences to foster collaboration, innovation, and the exchange of cutting-edge knowledge.

Integrated Biology plays a pivotal role in addressing complex global challenges, ranging from human health and environmental sustainability to biotechnology and agricultural advancement. By uniting perspectives from molecular biology, ecology, genetics, bioinformatics, and allied fields, this conference aims to promote holistic understanding and interdisciplinary solutions.

The conference program has been carefully designed to include keynote lectures, technical sessions, and interactive discussions that encourage scientific dialogue and inspire new research directions. I hope this forum will facilitate meaningful networking, strengthen international collaborations, and contribute to the advancement of biological sciences.

I sincerely thank all speakers, participants, organizers, and sponsors for their valuable contributions and support. We wish you a stimulating, productive, and memorable conference experience.


Prof. Versha Sharma

Patron

Prof. Shweta Yadav
Director, Research & Development
Head, Department of Zoology
Dr. Harisingh Gour Vishwavidyalaya
(A Central University)
Sagar, 470003, Madhya Pradesh, India



Message

It gives me immense pleasure to present the Book of Abstracts of the *International Conference on Integrated Biological Research (ICIBR-2026)* being organized by the Department of Zoology, School of Biological Sciences, Dr. Harisingh Gour Vishwavidyalaya (A Central University), Sagar, Madhya Pradesh, during February 4-6, 2026.

The enthusiastic participation of researchers, academicians, and students from India and abroad reflects the growing importance of integrated and multidisciplinary approaches in biological research. The abstracts compiled in this volume cover a wide spectrum of contemporary research areas, including ecology and behaviour, taxonomy and systematics, biodiversity and conservation, molecular and cellular biology, neuroscience, insect science and pest management, bioinformatics, environmental sciences, and human health. Collectively, these contributions highlight scientific rigor, innovation, and a shared commitment to addressing global biological and ecological challenges. Such forums are especially beneficial for research scholars and M.Sc. students, inspiring them to develop critical thinking and research aptitude.

I take this opportunity to express my sincere gratitude to the **Hon'ble Vice-Chancellor, Prof. Y. S. Thakur**, for his visionary leadership, constant encouragement, and unwavering support, which have been a great source of inspiration for organizing ICIBR-2026. I am equally thankful to the **Dean, School of Biological Sciences, Prof. Versha Sharma**, for her valuable guidance, academic support, and continuous motivation throughout the planning and execution of this conference.

I place on record my deep appreciation for the sincere efforts and commendable coordination of the **Co-Convener, Dr. Shashwat Singh**, and the **Organizing Secretaries, Dr. Smita Shukla and Dr. Sandeep Kumar**, along with the significant contribution of the **Co-Organizing Secretaries, Dr. Somenath Ghosh and Dr. Priyoneel Basu**, whose dedication and academic commitment have played a pivotal role in the successful planning and execution of the conference and in the compilation of this Book of Abstracts. I also gratefully acknowledge the valuable contributions of the **Treasurers, Dr. Kashmeera N. A. and Dr. Brajesh Kumar Maurya**, whose meticulous efforts have strengthened the organizational and management of the event.

I express my heartfelt gratitude to other faculty members of the Department, namely **Dr. Malabika Sikdar, Dr. Payal Mahobiya, Dr. Deepali Jat, and Dr. Raj Kumar Koiri**, whose collective support, teamwork, and wholehearted involvement have been instrumental in making ICIBR-2026 a reality.

This **Book of Abstracts** serves as a permanent academic record of ICIBR-2026 and is expected to foster meaningful scientific dialogue, inspire young researchers, and promote future collaborations. I am confident that the deliberations during the conference will contribute significantly to advancing biological research in alignment with the vision of **sustainable development and Viksit Bharat 2047**.

I congratulate all contributing authors for their valuable scholarly submissions and thank the reviewers for maintaining high academic standards. I wish ICIBR-2026 great success and hope that the conference leaves a lasting impact on the scientific community.

Shweta Yadav
23/1/26
Prof. Shweta Yadav

Dr. Shashwat Singh

Assistant Professor

Department of Zoology

School of Biological Sciences

Dr. Harisingh Gour Vishwavidyalaya

(A Central University), Sagar, M.P., India



Message

The *International Conference on Integrated Biological Research (ICIBR-2026)* has been envisioned as a global academic platform to bring together scientists, academicians, researchers, and young scholars working across diverse areas of biological and allied sciences. ICIBR-2026 comprises **11 thematic scientific sessions** that cover a wide spectrum of emerging and classical domains of biological research. The conference has received an overwhelming response from across the globe. The participation from India spans all regions, from North to South and East to West, making ICIBR-2026 a truly international and inclusive scientific congregation.

The successful organization of ICIBR-2026 was made possible through the generous support from ANRF, CSIR, NASI Local Chapter Bhopal, DRDO, and Mahakoshal Vigyan Parishad. I also gratefully acknowledge the financial support provided by the University's Research and Development Cell and extend sincere thanks to the Internal Quality Assurance Cell (IQAC) for their continuous support.

I express my deepest gratitude to our **Chief Patron**, *Hon'ble Vice-Chancellor Prof. Y. S. Thakur*, for his visionary leadership and constant encouragement. I am equally thankful to our **Patron**, *Prof. Versha Sharma, Dean, School of Biological Sciences*, for her guidance and academic support throughout the planning and execution of this conference. My sincere appreciation goes to the **Chairperson & Convenor**, *Prof. Shweta Yadav, Head, Department of Zoology & Biotechnology*, for her inspiring leadership and tireless efforts in shaping ICIBR-2026. I also acknowledge the dedicated contributions of the **Organizing Secretaries**, *Dr. Smita Shukla* and *Dr. Sandeep Kumar*, and the **Co-Organizing Secretaries**, *Dr. Priyoneel Basu* and *Dr. Somenath Ghosh*, whose commitment and coordination were central to the success of this event.

I extend my heartfelt thanks to the **Treasurers**, *Dr. Kashmeera N. A.* and *Dr. Brajesh Kumar Maurya*, for their kind cooperation, and to the **Department's Senior Faculty Members**, *Dr. Malabika Sikdar*, *Dr. Payal Mahobiya*, *Dr. Deepali Jat*, and *Dr. Raj Kumar Koiri*, for their invaluable support at every stage of the conference.

I also sincerely thank all the non-teaching staff, research scholars, and student volunteers of the **Department of Zoology**, whose collective teamwork ensured the smooth and successful conduct of ICIBR-2026.

I extend my best wishes to all participants for a rewarding and intellectually enriching conference and am confident that ICIBR-2026 will foster meaningful collaborations and contribute significantly to the advancement of integrated biological research.

Shashwat Singh
Co-Convenor, ICIBR-2026

Dr. Smita Shukla
Assistant Professor
Department of Zoology
School of Biological Sciences
Dr. Harisingh Gour Vishwavidyalaya
Sagar



Message

“The future of biology lies not in isolation, but in integration”

The contemporary world is witnessing unprecedented transformations driven by emerging diseases, environmental degradation, and rapid technological innovations. Addressing these multifaceted challenges requires holistic biological approaches that integrate entomology, taxonomy, molecular biology, genetics, ecology, biotechnology, bioinformatics, and environmental sciences. ICIBR 2026 is envisioned as a global forum for scientific deliberation, knowledge exchange, and collaborative engagement, aimed at fostering sustainable, science-driven solutions for the future. In this context, ICIBR 2026 aspires to bring together scientists, researchers, academicians, and young scholars from diverse backgrounds to share their recent research findings, innovative ideas, and interdisciplinary perspectives. The conference is expected to foster meaningful academic interactions, stimulate critical discussions, and act as a catalyst for future research collaborations that contribute to scientific growth, resilience, and sustainability.

I humbly express my heartfelt gratitude to the Almighty for His guidance and blessings, which have enabled the successful planning and organization of this academic event. I extend my sincere thanks to the Hon’ble Vice-Chancellor, Prof. Y. S. Thakur, for his visionary leadership and constant encouragement. I am also deeply grateful to Dean Prof. Varsha Sharma for her support and academic guidance.

I sincerely acknowledge the invaluable support of the Head of the Department, Prof. Shweta Yadav, and the dedicated faculty members Dr. Malabika Sikdar, Dr. Payal Mahobiya, Dr. Deepali Jat, and Dr. Raj Kumar Koiri, whose academic contributions and cooperation have been instrumental in shaping ICIBR 2026.

My heartfelt appreciation is extended to the organizing team—Dr. Shashwat Singh, Dr. Priyoneel Basu, Dr. Sandeep Kumar, Dr. Somenath Ghosh, Dr. Kashmeera, and Dr. Brajesh k Maurya for their tireless efforts, commitment, and efficient coordination throughout the planning and execution of the conference.

ICIBR 2026 will be highly beneficial for research scholars, students, and academicians by providing exposure to contemporary developments and emerging trends in integrated biological sciences. I invite all participants to actively engage in the scientific deliberations and collectively work towards making ICIBR 2026 a successful, intellectually enriching, and memorable academic event.

With regards

Dr Smita Shukla

(Organizing secretary)

Dr. Sandeep Kumar
Assistant Professor
Department of Zoology
Dr Harisingh Gour Vishwavidyalaya
(A Central University)
Sagar, 470003, Madhya Pradesh, India



Message

It is my privilege to welcome all delegates and participants to the International Conference on Integrated Biology Research–2026. At the heart of every scientific breakthrough lies the spark of curiosity and the strength of collaboration. When inquisitive minds come together, science does not merely advance, it flourishes. This Integrated Conference on Biological Research embodies that spirit, serving as a dynamic platform where diverse disciplines converge, ideas are exchanged, and innovation is born. I am sure that through the sessions, discussions, and interactions, the conference creates an environment where curiosity is nurtured and collaboration is celebrated. By engaging with experts and peers, participants gain the confidence to ask bold questions, share innovative ideas, and explore new perspectives. This synergy of inquisitiveness and teamwork is what drives science forward, making such gatherings vital for shaping the future of research. I gratefully acknowledge the generous support of the funding agencies, whose assistance has been instrumental in making this conference possible. Congratulations to the organizing team, whose cooperation, dedication, and tireless efforts have ensured the successful realization of this scientific event. With great enthusiasm, I wish this conference success in achieving its vision.



Dr. Somenath Ghosh
Assistant Professor
Department of Zoology
School of Biological Sciences
Dr. Harisingh Gour Vishwavidyalaya
(A Central University), Sagar, M.P., India



Dr. Priyoneel Basu
Assistant Professor
Department of Zoology
School of Biological Sciences
Dr. Harisingh Gour Vishwavidyalaya
(A Central University), Sagar, M.P., India

Message

It gives me immense pleasure to welcome you to the **International Conference on Integrated Biology** being organized by the **Department of Zoology, Dr. Harisingh Gour Central University, Sagar from 04/02/2026 to 06/02/2026**.

The primary objective of this conference is to provide a global platform for academicians, researchers, industry professionals, and students to exchange ideas, share research findings, and discuss emerging trends and challenges in the field of **Integrated and Interdisciplinary Research**. In today's rapidly evolving world, such scholarly interactions play a vital role in fostering innovation, interdisciplinary collaboration, and sustainable development.

The conference features keynote addresses by distinguished experts, technical sessions, and interactive discussions that are carefully designed to stimulate intellectual curiosity and promote meaningful dialogue. I am confident that the deliberations during this conference will contribute significantly to knowledge enrichment and open new avenues for future research and collaboration.

I sincerely thank the keynote speakers, session chairs, authors, reviewers, sponsors, organizing committee members, and volunteers for their invaluable support and commitment in making this conference a success. I also extend a warm welcome to all the participants and hope that your association with this conference will be both professionally rewarding and personally enriching.

I wish the conference every success and hope it proves to be a memorable and fruitful experience for all.

With best wishes,

Somenath Ghosh
Co-Convenor, ICIBR-2026

Priyoneel Basu
Co-Convenor, ICIBR-2026



Dr. Kashmeera N.A.

Assistant Professor
Department of Zoology
School of Biological Sciences
Dr. Harisingh Gour Vishwavidyalaya
(A Central University), Sagar, M.P., India



Dr. Brajesh Kumar Maurya

Assistant Professor
Department of Zoology
School of Biological Sciences
Dr. Harisingh Gour Vishwavidyalaya
(A Central University), Sagar, M.P., India

Message

It is my privilege to welcome all delegates to the International Conference on Integrated Biology Research–2026. This gathering reflects our shared commitment to advancing integrated biological sciences. We gratefully acknowledge the generous financial support of the Anusandhan National Research Foundation (ANRF), Council of Scientific & Industrial Research (CSIR), National Academy of Science, India (NASI, Bhopal Chapter), Defence Research and Development Organization (DRDO) and Dr. Harisingh Gour Vishwavidyalaya. Their encouragement has enabled us to convene leading scientists, academicians, and young researchers from across the globe. The abstracts compiled here showcase the diversity and depth of contemporary biological research, and as Treasurer, I assure that resources have been utilized responsibly to foster meaningful dialogue. We hope this conference inspires collaboration, innovation, and solutions to global challenges, and I extend my best wishes for fruitful deliberations and lasting scientific partnerships.

Kashmeera N.A.

Co-Convenor, ICIBR-2026

Brajesh Kumar Maurya

Co-Convenor, ICIBR-2026

डॉ. श्रीमति मीना पिम्पलापुरे
श्री बाबुराव पिम्पलापुरे मार्ग
1, सिविल लाइन्स, सागर (म.प्र.)
पिन- ४७०००१
मो. नं ९४२५१७१४४३, ९८१००४०३६७
ईमेल : meenapimpalapur@yahoo.co.in.

Dr. Smt. Meena Pimpalapur
Shri Baburao Pimpalapur Marg,
1, Civil lines, sagar (M.P.)
Pin Code: 470001
Mob. 9425171443 & 9810040367
Email : meenapimpalapur@yahoo.co.in

Message

Distinguished delegates, respected colleagues, and friends from around the world,

It is a privilege to be part of this International Conference, which brings together voices committed to dignity, equity, and social justice. As a social worker, I stand here representing not only a profession, but a practice rooted in empathy, evidence, and action.

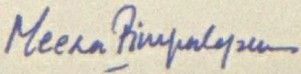
Across cultures and borders, we witness shared challenges poverty, inequality, displacement, mental health concerns, and the impact of climate and conflict on vulnerable communities. While these challenges may differ in context, the core human need for safety, inclusion, and opportunity remains universal.

Social work reminds us that sustainable development is not possible without social justice, and that policy must be grounded in lived experience. Our role is to bridge systems and communities, to amplify marginalized voices, and to translate compassion into meaningful change.

This conference is an opportunity to learn from one another, to strengthen international Collaboration, and to reaffirm our collective responsibility to uphold human rights and social well-being. Let us use this platform not only to share knowledge, but to inspire action that extends far beyond these sessions.

Together, through solidarity, innovation, and ethical practice, we can build more just, inclusive, and resilient societies.

We wish all participants a productive, engaging, and memorable conference.



Dr. Smt. Meena Pimpalapur



Behaviour and conservation management of wildlife in altered habitats: Lessons from studies on Indian primates

Mewa Singh

University of Mysore
mewasinghltm@gmail.com

ABSTRACT

Whereas some species of animals remain obligatory forest-dwellers, and some others have become totally commensal with humans, several species still are found in the forest habitats as well in the human-dominated areas sharing habitats, and often food resources, with people. The urban environment exposes animals to very different selection pressures than the forest habitat. I will discuss how exposure to encased and hidden food resources in the case of the urban monkeys requires, and leads to, the emergence of new foraging skills for food extraction and food processing not often observed in their forest counterparts. Such new skills will be demonstrated from studies on the Nicobar long-tailed macaques and the south Indian bonnet macaques. The urban living, however, also exposes them to risky and highly unstable environments threatening their very existence. In the second part of my talk, I will discuss various conservation management strategies that are suitable for forest-dwelling and commensal primates. I will report these strategies from our long-term conservation work on the endangered and obligatory forest-dweller lion-tailed macaques, occasionally forest dweller but largely commensal bonnet macaques, and the nocturnal and elusive slender loris, all requiring different management practices.



Microbiome and “one health”

Appa Rao Podile

Dept of Plant Sciences
University of Hyderabad, Hyderabad, Telangana, India
podilerao@gmail.com

Microbiome research has enhanced our understanding of the complex interactions between humans/plants and microorganisms. Researchers have intensively studied, the structure and functions of human gut/plant-associated microorganisms, as well as the genetic, biochemical, physical and metabolic factors that influence the beneficial traits of gut/plant microbiota. Healthy plants host diverse but taxonomically structured communities of microorganisms, the plant microbiota, that colonize every accessible plant tissue. Plant-associated microbiomes confer fitness advantages to the plant host, including growth promotion, nutrient uptake, stress tolerance and resistance to pathogens. The application of microbiome-based approaches aligns with regenerative agricultural practices, promoting sustainable land management, carbon sequestration, and ecosystem restoration. Research in my lab for the past decade explored the potential of microbiome-based solutions across multiple crops. In pigeon pea, root microbiomes showed a strong association with soil edaphic factors, and nodule microbiomes are impacted by macro- and micronutrients. Synthetic communities derived from pigeonpea root endophytes enhanced plant survival under abiotic stress, and rhizosphere studies highlight the dominant influence of fungal communities over bacteria. A comparative study of wild and cultivated microbiomes revealed significant variations in microbiome composition, with distinct microbial taxa associated with specific origins. These findings highlight the influence of biogeography on seed microbiomes and their potential applications in sustainable agriculture and crop improvement. Also, as a part of global consortium on wild relatives of major crops, wild ancestors of little millet were identified and their rhizosphere microbiomes from India were analyzed. Our studies, highlight the role of ancestral microbiome in shaping early agricultural systems and its adaptation to diverse environmental conditions. The lecture will focus on the significance of microbiome in one health with an overview of our own findings in different plants.



Conservation and Sustainable Management of Fish Genetic Resources(FGR) of India in changing climate: Issues and Way Forward

Uttam Kumar Sarkar

ICAR-National Bureau of Fish Genetic Resources (NBFGR), Lucknow – 226002, India
uksarkar1@gmail.com

ABSTRACT

The global fisheries and aquaculture sector is fundamental to food security and livelihoods, supporting about 61.8 million people and providing over 20% of the animal protein consumed by 3.2 billion individuals. However, with 34% of global fish stocks overexploited and the ocean absorbing 90% of excess heat from climate change, conserving fish genetic resources (FGRs) has become crucial for sustaining biodiversity, ecosystem resilience, and socio-economic stability. India, with over 3218 native finfish species and rich diversity of molluscs, crustaceans, and corals, plays a pivotal role in global aquatic genetic conservation. Identifying optimal climatic conditions for natural recruitment, creating climate-resilient adaptation strategies, modeling the distribution and abundance of fish under anticipated climatic changes, and engaging the community to prepare stakeholders for extreme events are important. Innovative conservation strategies integrating advanced genomic tools, nature-based solutions, and adaptive management practices are also vital. Molecular technologies such as DNA barcoding, whole-genome sequencing, transcriptomics, and environmental DNA (eDNA) enable accurate species identification and genetic monitoring. *Ex-situ* measures like cryopreservation, live gene banks, and fish cell repositories strengthen genetic conservation. Complementary innovations—artificial intelligence, remote sensing, GIS, and blockchain—enhance biodiversity monitoring, traceability, and data-driven management. Significant contribution has been made on cataloguing fish diversity, developing genomic databases, establishing live gene banks, cryopreservation protocols, and promoting the “State Fish” initiative for stakeholder-driven conservation through RandD efforts. Further studies are needed to evaluate ecological conditions, prioritize conservation efforts, and formulate climate-resilient adaptation strategies. It also underscores the necessity for granular analysis across various spatial scales to guide targeted interventions and increase the adaptive capacity of fisheries and aquaculture sector. Integrating indigenous knowledge, community participation, and advanced technological interventions within a robust governance framework will be essential to build resilience, ensure sustainable fisheries, and achieve Sustainable Development Goals (SDGs) 2, 12, and 14, promoting biodiversity conservation and blue economy growth.



CRISPR-Based Pest and Pathogen Detection

Gur Pines

University of Colorado Boulder

United States of America

gurpines@gmail.com

ABSTRACT

The CRISPR/Cas system is best known for its versatility in genome editing across diverse organisms, but its utility extends beyond genetic modification. In particular, CRISPR-based detection has emerged as a powerful tool for identifying specific DNA and RNA sequences. Here, we apply this approach to the rapid and sensitive identification of invasive insect pests and plant viruses. Additionally, we assembled a portable, field-deployable detection kit prototype and evaluated this technology's detection performance under microgravity conditions.



The Brand “Melatonin”

Chandana Haldar

Department of Zoology
Banaras Hindu University, Varanasi
Chaldar2001@yahoo.com

ABSTRACT

Melatonin is the most important and one of the strongest neurohormone ever found. This hormone is being released from the Pineal Gland exerting its effects in a paracrine, endocrine and juxtacrine manner. There are many extra pineal sources of melatonin e.g. the cornea of eye, Harderian gland, Gastro-Intestinal Tract etc. Thus it can be said that the melatonin is cosmopolitan in tissue distribution. The function(s) of melatonin is much more than it was expected previously and it is popping on the door of almost all biological function(s), and bio-mechanisms thus showing something new and interesting phenomenon. Melatonin, being lipophilic reaches all parts of an organism and has now infiltrated into all aspects of physiology i.e from the area of reproduction to the spectrum of immunity, from the arena of neurobiology to the field some neurodegenerative disorders (like Parkinson's Disease). From the time unknown it was believed and later was established – melatonin as “Universal regulator of biological rhythm” and was described as the only “Chronobiotic Substance” to perform its role successfully hence called as “Chemical code of Darkness”. This hormone is acting in improving condition of Jet-lag. It acts as a bolster of immune function with some specific oncostatic/antitumor effect. Moreover, it acts as a buffer hormone to ensure the level of other vital hormone to stay within normal range and act to be a geroprotective (antiaging) agent by protecting against free radical loads. In summary the functions of melatonin are as a Chronobiotic, Geroprotective, Immunoregulatory agent having potentials to perform the role of Chemoprevention /Free radical scavenger and reproductive agent (pro- and anti-). It restores health/sleep pattern in insomniac condition. At present it could be considered as the best candidate for *Universal Panacea* and has been proposed as the treatment of choice for an enormous range of diseases. So, never the less undoubtedly it is an “Omnipotent” hormone. Astonishingly this hormone has been discovered in a number of plants, performing almost the same actions as in vertebrates (like regulation of photoperiodic information (duration of light/dark cycle and thereby germ cell development in seasonal breeder, performing photo - preservation etc.). This hormone can be further used for benefit of mankind (as a Chrono-medicine) to modulate the different body function as it has a unique position among the hormones of the diffused neuroendocrine system. Being extremely potent with remarkable range of physiological properties but its utility as a pharmacological agent is limited because of its poor bioavailability and rapid metabolism. Melatonin is a natural compound hence, cannot be patented. There is also an absence of knowledge of long term toxicity and drug safety surveillance for this hormone. Multi-potent effect of melatonin does not help the choice of Companies for its Pharmaceutical development (i.e. single disease target vs single chemical formula). Presumably the day is coming when this hormone (may be in different pharmacological form) will make its place on the prescription of a physician and this “Hand of Darkness” will enlighten the path of mankind.



Transgenerational effects of parental infection in *Drosophila*

N. G. Prasad

Indian Institute of Science Education and Research Mohali

Email: prasad@iisermohali.ac.in

ABSTRACT

Parental experience with pathogens and parasites can shape offspring susceptibility to infections, and thereby can influence the evolution of host immune traits and pathogen virulence. Empirical studies addressing this phenomenon commonly focus on non-pathogenic infections of parents. We tested if exposing parents to pathogenic bacterial infections affects offspring susceptibility to homologous (same pathogen as the one used to infect the parents) and heterologous (different pathogen than the one used to infect the parents) infection challenges in *Drosophila melanogaster*. We found that parental infection increases offspring survival following a homologous challenge. Similar effects were seen in the case of certain heterologous challenges, but the breadth of cross-reactivity was dependent on the pathogen used to infect the parents. Parental infection also improves offspring capacity to restrict systemic pathogen proliferation following a homologous challenge, suggesting increased disease resistance. Parental infection has no effect on offspring reproduction, either in presence or absence of infection, suggesting an absence of associated costs and that the benefits of parental effects are limited to pathogen resistance. Overall, we demonstrated that parental infection helps offspring better counter infection challenges in *D. melanogaster* without incurring any measurable costs.



Ecoremediation of religious waste by versatile native microbial consortia

Ragini Gothalwal

Department of Biotechnology, Barkatullah University, Bhopal

ragini_gothalwal@yahoo.com

ABSTRACT

One of the major contributors to an increased level of water and soil pollution is the dumping of religious and agricultural pollutant waste every year. Idol immersion plays a significant role in polluting the water bodies every year, decorated with non –biodegradable and biodegradable materials such as plastic, thermocols, cloth, paint, jewellery, plaster, plaster of Paris, flowers, etc. (Joshi et al. 2017). The intricacy of these contaminants stems from their diverse interactions with the aquatic environment, which include their potential to persist, bioaccumulate, and upset ecological equilibrium. The complex and far-reaching effects of pollutants (plastics, dyes, and heavy metals) on aquatic systems, particularly those introduced during idol immersion, present significant problems to water quality management. Considering the desire for an alternative sustainable, green, and more cost-effective method for contaminant elimination, biological methods have surfaced as a promising solution (Hadiani et al., 2019). Microbes play a crucial role in the removal of contaminants from the water by employing mechanism such as mobilization and immobilization, providing eco-friendly solutions to the challenges of water contamination (Ndeddy Aka and Babalola, 2016; Verma and Kuila, 2019). The Potential of native microbial communities for the degradation of plastic, decolourisation of paint, and removal of heavy metal. Molecular techniques like plasmid profile analysis and DNA sequencing were employed to identify and characterize bacterial species having pollutant remediation capabilities, enabling a more precise evaluation of microbial diversity and community structure. The advantage of employing indigenous microorganism's bioremediation technique is that they are less likely to necessitate additional measures to flourish in their native surroundings thereby minimizing the ecological impacts of introducing alien species. Microbial natural qualities make them indispensable for long-term bioremediation and aquatic ecosystem restoration. The development of an efficient biofilter utilizing a tailored bacterial consortium capable of degrading plastics, decolourising paints, and removing heavy metals from polluted water. Future studies should focus on scaling up the biofilter for field applications in order to assess its long-term performance under a variety of environmental circumstances.



Eukaryotic Microbial Communities-Non-Celebrated Rulers in Freshwater and Terrestrial Ecosystems

Jasmine Purushothaman

Zoological Survey of India
'M' Block, New Alipore, Kolkata-700053
pjasmine@zsi.gov.in

ABSTRACT

Eukaryotic protozoans and metazoans are essential constituents in freshwater and terrestrial ecosystems. Among these organisms, testate amoeba, ciliates and freshwater planktons play a fundamental role in the structure, function and stability across freshwater, soil and peat land ecosystems. Testate amoeba are unicellular protists with protective shells widely distributed in mosses, wetlands and peatlands. They are important contributors to organic matter decomposition, nutrient mineralization and act as key predators in the microbial food chain. Testate amoeba also influence carbon dynamics in peatlands, with some mixotrophic species capable of photosynthesis impacting carbon storage and are also considered as effective bioindicators. Due to their sensitivity to pH, water table fluctuations, temperature, and soil and atmospheric pollutants, making them essential for monitoring environmental changes, studying peatland hydrology and applying in paleoclimatic reconstruction. Ciliates are essential eukaryotes found in aquatic ecosystem where they occupy a central position in the microbial food web regulating bacterial and algal populations, acting as prey for higher trophic levels and facilitating nutrient cycling and energy flow. They are highly sensitive to changes in environmental pollutants hence serve as valuable bioindicator for monitoring water quality. Both these groups are widely studied to evaluate anthropogenic activities on aquatic ecosystems. In freshwater ecosystems, phytoplankton act as primary producers, driving photosynthesis and oxygen production. Zooplankton on the other hand, act as primary consumers, linking the trophic levels and facilitating nutrient recycling. Planktonic communities are highly sensitive to change in water temperature, nutrient levels, light availability and pollutants hence play an important role in indicating ecological disruption. Given the importance of the above eukaryotic groups in environmental monitoring and ecosystem management, further research is essential. Integrating molecular techniques, long-term monitoring, ecological mapping and climate change modelling will enhance our understanding of ecosystem health and functioning.



Evolution of Circadian Rhythm, Role of Melatonin in the Development of Metabolic Syndrome: Is There a Link We Are Missing?

Madhav Prabu

Jawahar Lal Nehru Medical College and Hospital
Belgaum Belagavi, Karnataka
madhavprabhukle@gmail.com

ABSTRACT

Melatonin, a phylogenetically ancient molecule, has evolved from a primordial antioxidant in unicellular organisms to a pivotal regulator of circadian rhythms in humans, offering a compelling link to the pathogenesis of metabolic syndrome (MetS). Circadian disruptions, often reflected by diminished melatonin secretion, heighten MetS risks—including type 2 diabetes (T2D), dyslipidemia, hypertension, and obesity—through intertwined inflammatory, glucoregulatory, and sleep dysregulation pathways. This review synthesizes melatonin's evolutionary trajectory, mechanistic ties to MetS, and emerging therapeutic potential, questioning overlooked connections in chronobiology and metabolic health. Melatonin's biosynthesis from tryptophan via arylalkylamine N-acetyltransferase (AANAT) emerged over 3.5 billion years ago in oxygen-scarce primordial soups, shielding early prokaryotes like cyanobacteria from reactive oxygen species (ROS). In unicellular eukaryotes and algae, it maintained redox homeostasis, a role conserved in plants for abiotic stress resilience. Metazoan transition repurposed melatonin for intercellular signaling: in invertebrates, it modulated reproduction; in vertebrates, pineal-derived nocturnal surges synchronized peripheral clocks via MT1/MT2 G-protein-coupled receptors. This dual antioxidant-circadian functionality persists, with human SCN entraining ~24-hour oscillations in PER/CRY feedback loops. Modern disruptors—artificial light, shift work—erode this heritage, blunting amplitude by 50-80% and fostering "circadian syndrome. Misalignment desynchronizes the SCN from nutrient-sensing clocks in pancreas, liver, and adipocytes, precipitating MetS clustering. Nighttime light exposure suppresses melatonin, elevating sympathetic tone, cortisol, and orexin, impairing beta-cell insulin secretion (reduced by 30% in shift workers). Longitudinal cohorts link <6-hour sleep to 2.5-fold T2D risk, with chronodisruption accelerating NLRP3 inflammasome priming and IL-1 β surges. Low melatonin (<8 pg/mL peak) predicts MetS odds ratio (OR) 3.2, independent of BMI, via impaired leptin-melatonin interplay favoring visceral adiposity. Epidemiological shifts—40% global population exposed to chronodisruption—underscore melatonin as a biomarker for "missing" evolutionary mismatches in urban lifestyles. Melatonin's pleiotropy targets MetS nexus: anti-inflammatory via NF- κ B p65 nuclear blockade (IC₅₀ ~1 μ M), TNF- α /IL-6 suppression (40-60%), and Nrf2 induction boosting SOD/GSH by



2-fold. In hyperglycemia, it restores sirtuin-1/AMPK axis, enhancing GLUT4 translocation and curbing gluconeogenic PEPCK. Circadian realignment optimizes CLOCK/BMAL1 heterodimers, mitigating nocturnal glucose peaks (20-30% reduction in models). Sleep mediation amplifies: phase-advancing slow-wave sleep lowers HOMA-IR by 25%, dampens HPA-axis hyperactivity, and curbs gut dysbiosis-driven endotoxemia fueling low-grade inflammation. Synergy with adiponectin upregulation counters resistin-driven endothelial dysfunction, a MetS hallmark. Preclinical paradigms affirm: 10 mg/kg melatonin attenuates streptozotocin-diabetic nephropathy (eGFR +35%), neuropathy (pain thresholds normalized), and steatohepatitis via PGC-1 α -mediated mitophagy. Clinically, a 2025 meta-analysis (13 RCTs, n=1,056; 3-6 mg/12 weeks) yielded HbA1c $\downarrow$ 0.52% (95% CI -0.78 to -0.26), FPG $\downarrow$ 15 mg/dL, CRP $\downarrow$ 1.5 mg/L, and triglycerides $\downarrow$ 18 mg/dL ($p<0.001$), sans adverse events. Contrarian findings: 10 mg/3 months worsened HOMA-IR in long-duration T2D (n=20), likely from MT1 downregulation or advanced glycation. Benefits extend adjunctively—periodontal pocket depth $\downarrow$ 2 mm, MoCA scores $\uparrow$ 4 points in T2D. NCT03859934 (3 mg/6 months) boosted QUICKI by 0.12 in obese prediabetes. Physiological mimicry favors 0.5-5 mg 1-2 hours pre-bedtime, maximizing SCN phase response curves (PRC Type 1). Chronopharmacokinetics—salivary LC-MS/MS-guided—personalizes via CYP1A2 polymorphisms (fast metabolizers need 2x dose). Ultra-low (0.3 mg) suffices for rhythm without sedation; 10 mg risks hypothermia/daytime drowsiness in elderly. Superior to metformin in ROS scavenging (no lactate risk), it synergizes with GLP-1RAs for beta-cell clocks. Gaps demand: multi-ethnic Phase III trials (n>500/arm), melatonin-GLP1 combos, and AI-driven chronophenotyping. Is the link missed? Melatonin's evolutionary scaffold—antioxidant to chronobiotic—positions it as antidote to MetS, urging paradigm shift from siloed symptomatics to holistic rhythm restoration.



Thymic Ecology and Glandular Protection of Fish, *Anabas Testudineus* (Bloch, 1792): A Climbing Perch of South East Asia

Subrata Kumar De^{1*}, S. K. Samim Hossin², Rajkumar Mandi¹ and Gour Maity¹

¹ Department of Zoology

Vidyasagar University, Midnapore (West)-721102, West-Bengal

² Center for Life Sciences

Vidyasagar University, Midnapore (West)- 721102, West-Bengal

skdvu@yahoo.co.in

ABSTRACT

The thymus gland of *Anabas testudineus* (Bloch, 1792) is a bilateral, elongated, basollipto- antireo triangular structure at the base of the 3rd to 4th gill arches on either side of the opercular cavity. For microanatomical preparation, the thymus gland was fixed in 2.5% glutaraldehyde and 1% osmium tetroxide (for secondary fixation), using 0.1 M phosphate buffer, pH 7.2 at 4°C for 2 hrs./ and 1 hr. (for secondary fixation), respectively, and followed by embedding, staining andamp; viewed under transmission electron microscope [HR-TEM:TALOS, THERMO SCIENTIFIC at 200 kV] at AIIMS, New Delhi. The cortex and medulla region of the thymus gland is not well demarcated under the light microscope [Carl Zeiss Vision, GmbH, Germany]. The thymus gland of the experimental species is a well-integrated cellular structure having the lymphoid and non-lymphoid elements. Thymic trabeculae are well scattered within the thymus gland. The blood-thymic networking system is well organised and composed of endothelial cells, fibroblast cells, reticulo-endothelial elements, connective tissues, etc. Thymic goblet cells, rodlet cells, mast cells, plasm cells, and morphs of macrophage are well scattered within the thymic stroma. Developing and developed thymocytes, different kinds of epithelial elements, secretory granulocytes, cystic elements, are also identified within the thymus gland of *Anabas testudineus*. This specialised lympho- haemopoietic tissue and its diverse cellular identity show an apparent interaction (/?) when the animals survive in a hostile habitat for a particular time.



Blue transformation: Aquaculture beyond production and marketing

Mohammad Iqbal Khan

Department of Zoology
Bundelkhand University, Jhansi -284128
iqbaljhansi@gmail.com

ABSTRACT

Fisheries and aquaculture contribute significantly to the food and nutrition security, livelihood generation, trade promotion, export earnings and sustainable development of the blue economy. Fisheries and aquaculture have achieved new horizon during recent years. Global aquaculture production reached 130.9 million tonnes in 2022 and aquaculture production of aquatic animals trailed behind the capture fisheries for the first time in the history in 2024 whereas global consumption of aquatic animal food reached 162.5 million tonnes, with global per capita annual consumption of 20.7 kg. Aquaculture growth indicates its capacity to further contribute to meet the rising global demand for aquatic foods. At present almost 90 per cent of aquaculture production is contributed by China, Indonesia, India, Vietnam, Bangladesh, Philippines, South Korea, Norway, Egypt and Chile. India stands second in the world aquaculture production ranking. Aquaculture has become one of the most vibrant driving force in the growth of rural economy of India. Small freshwater ponds and technically advanced Biofloc, RAS, scampi culture, cage culture in reservoirs in inland tropical areas and raceways in temperate areas and shrimp farming in coastal areas have been established. Millions of the farmers including non-fisher communities depend on fish and shrimp farming for their livelihood with increasing adoption of scientific practices which include stocking of certified seed, use of formulated feed, aeration systems, use of medicines and probiotics. Productivity and incomes have risen steadily with the support of many government schemes. Despite all these achievements much more has to be done which is beyond the production and marketing. Blue transformation is a vision that is committed to building sustainability and resilience, reducing environmental impacts, improving bio-security and disease control with the support of technology and innovation. It also encompasses capacity building to ensure long term, sustainable and optimum outcomes that further develop the human, socio-cultural and economic dimensions of the aquaculture.



Addressing the maxim “there is no health without mental health

Ishan Patro

School of Studies in Zoology
Jiwaji University, Gwalior 474 011
ishanpatro@gmail.com

ABSTRACT

Mental health is one of the top global burdens of disease. Every seventh Indian suffers mentally that approximates to 200 million people. Mental health is also a major concern in public health issues affecting the aged that demands policies to mitigate later life cognitive vulnerabilities. In addition, rapid urbanization, demographic growth and associated environmental challenges including sedentary life style, social and work stress, infections, etc. make Indian population vulnerable to mental health. Over the years we have realized that poor child-health associated with intragenerational challenges of under- and mal- nutrition, and adverse exposures contribute substantially to the mental health burden of the nation. We need to concentrate on prediction of the consequences, prevalence and policies targeting long-life challenges. While we aim at a Vikasit Bharat by 2047, we must address the mental health issues and set a plan to develop, implement, monitor and strengthen mental health services in Bharat today.



Eco-Behavioral Study of Highly Provisioned Focal Troops of Rhesus Macaque in Chitrakoot (M.P.)

Shivesh Pratap Singh

Department of Zoology
PMCOE, Govt. Autonomous P.G. College, Satna (M.P.)
drshiveshsingh2004@yahoo.co.in

ABSTRACT

The rhesus macaque (*Macaca mulatta*) are one of the well known non-human primate species of old world monkeys. Chitrakoot is a pilgrimage place of Satna district of Madhya Pradesh, which is industrial place with a number of cement industries. The Chitrakoot is also ancient, religious and spiritual place of India with much of its historical background. Field observations were carried on some focal troops of rhesus macaque living in Chitrakoot area which having hill area with forest habitat. The artificial feeding of Rhesus macaque in these areas usually leads to change in behavioural strategies, individual activity and physical growth rate etc. The variability in the frequency of provisioning directly affects the ranging of particular troop. Troops showed a well marked home range with certain degree of defence mechanism. During the present investigation data on group size, sex ratio and home ranges were obtained and correlated with each other. Food poisoning and accidental deaths of monkeys were common at temple area of Chitrakoot. The present paper suggests recommendations to improve the present situation of rhesus macaque with their eco-behavioural and conservation in different location of Chitrakoot area.



From Linnaeus to Phylogenetics: The Evolution of Systematic Biology

Himender Bharti

Department of Zoology and Environmental Sciences,
Punjabi University Patiala, 147002, India.

himenderbharti@gmail.com

ABSTRACT

Traditional taxonomy is founded on the framework established by Carolus Linnaeus in the mid-eighteenth century, predating the formulation of the concept of common descent. Early systems of classification were based primarily on overall similarity in observable traits. The subsequent acceptance of evolutionary theory profoundly transformed taxonomic thought. A major conceptual shift occurred with the emergence of the New Systematics during the Modern Evolutionary Synthesis, leading to a reformulation of the species concept in which species came to be viewed as populations or population lineages. This was followed by the rise of phylogenetic systematics, or cladistics, which is explicitly grounded in the principle of common descent and recognises higher taxa as clades, or monophyletic groups, while rejecting paraphyletic and polyphyletic assemblages. These developments generated enduring debates concerning the definition and delimitation of higher taxa. Yet the most persistent and contentious issue remains the delimitation of species. The advent and widespread adoption of molecular techniques have profoundly influenced modern taxonomic practice, at times creating a perceived divide between traditional, morphology-based approaches and classifications derived primarily from molecular data, often reflecting differences in conceptual understanding and methodological emphasis. At this critical juncture, there is a pressing need to reassess the foundations of taxonomy, clarify its methodological frameworks, and emphasise the importance of integrative approaches that combine morphological, molecular, ecological, and evolutionary evidence in order to achieve a more robust and coherent systematics.



Soil Nematode: Useful Tool for The Biological Monitoring of Soil Ecosystems

Anjum Nasreen Rizvi

Zoological Survey of India,
'M' Block, New Alipore, Kolkata-700053
anrizvi@gmail.com

ABSTRACT

Nematodes are biologically diverse and versatile, occupying diverse habitats and constitute nearly 90% of all metazoans in number. Soil nematodes are represented at more than one trophic level in soil-food webs as they act as primary consumers (herbivores), secondary consumers (bacterivores and fungivores) and tertiary consumers (omnivores and predaceous). They are known to be harmful causing economic losses to agriculture on one hand and beneficial as nutrient mineralizers, maintaining soil health and also utilized as biological control agents on the other hand. Soil Nematode community structure and function are known to change in response to land- management practices such as nutrient enrichment through organic and inorganic nitrogen fertilizers, cultivation, liming, drainage, plant community composition, age and polycyclic aromatic hydrocarbons, soil moisture content and temperature. When attributes of soil nematode communities are quantified through measures such as diversity indices or maturity indices, an indication of relative soil biological health is obtained, which can be used as one measure to address issues of change in ecological condition of soils and the effects of climate changes. These indices can be instrumental in monitoring soil quality as well as assessing ecosystem sustainability and biodiversity. Therefore, analysis of nematode fauna appears to be useful tool for the biological monitoring of soil ecosystems



The regeneration puzzle: What ladybird beetles teach us about it?

Geetanjali Mishra

Ladybird Research Laboratory
Department of Zoology
University of Lucknow, Lucknow 226007
geetanjalmishra@gmail.com

ABSTRACT

Regeneration, the ability to restore lost body parts, is a complex biological process varying across taxa and across variable developmental stages. Ladybird beetles (Coccinellidae) hold significant potential as a model system for studying limb regeneration in insects, owing to their diverse regenerative abilities and ecological importance. Our findings revealed that these beetles regenerate limbs via blastema formation, with evolutionary dynamics driven by sexual selection. Regenerative potency is highest during the first larval instar and progressively declines in later stages, indicating developmental constraints on regeneration. While regeneration achieves 100% restoration of the limb, its extent is significantly modulated by environmental factors such as temperature and diet, revealing complex interactions between abiotic/biotic stressors and regenerative capacity. Interestingly, regeneration incurs a cost for parents but provides adaptive benefits for progeny, suggesting a transgenerational advantage against injury. These findings demonstrate how regeneration in ladybird beetles is shaped by ecological and evolutionary pressures, underscoring their potential as a regenerative model. Advancing from behavioural to molecular insights, transcriptomic analysis revealed the upregulation of genes including *wnt*, *hh*, and *JAK/STAT*, involved in key signalling pathways, underscoring their role in regenerative processes. Functional validation using RNA interference (RNAi) highlighted critical genes: the suppression of *engrailed* inhibited tissue regrowth entirely, while silencing *cubitus interruptus* and *casein kinase* (Hh pathway components) resulted in shorter regenerated legs, confirming their importance in regenerative growth. These findings position ladybird beetles as a robust model for regeneration studies, offering a unique platform to investigate the interplay of genetic, environmental, and transgenerational factors.



Biological Control: Past, Present, and Future

Roy Kaspi

Department of Entomology

Institute of Plant Protection

Agricultural Research Organization - Volcani Institute, Rishon LeZion 7505101, Israel

roy.kaspi@gmail.com

ABSTRACT

Biological control has been a cornerstone of pest management for more than a century, evolving from early classical introductions of natural enemies to today's integrated pest management (IPM) systems. This keynote lecture reviews the development of biological control from three complementary perspectives: past, present, and future. The first part highlights the major approaches to biological control and key historical milestones, from the pioneering successes of classical biological control to the important lessons learned from ecological mismatches and unintended effects, experiences that have shaped today's more cautious, risk-aware, and science-based practices. The second part focuses on the current role of biological control within modern IPM frameworks, emphasizing its integration with selective chemical, biotechnological, and behavioural tools. These concepts are illustrated through well-documented case studies, including classical biological control programs in Israel, such as the introduction of parasitoids against the false codling moth (FCM), as well as applied efforts in the biological control of aphids and scales using predatory lady beetles. Finally, future directions in biological control are explored, with special attention given to the growing importance of selective breeding and improvement of natural enemies, alongside habitat management strategies aimed at enhancing ecosystem services in agricultural landscapes.



A Marriage between Nutritional Adaptation Theory and Dogma of Biogeogens, is the Solution of Holistic Care of Human Health

Niraj Kumar

The Institute of Applied Sciences
Balrampur House Locality, Katra Road, Prayagraj -211002, India
iasc.drnirajkumar@gmail.com

ABSTRACT

Nutritional adaptation refers to the physiological, genetic, and cultural changes that allow organisms, including humans, to survive and thrive on available food sources in diverse environments, while Biogeogens are related to the biological and environmental factors influencing human health, referring to biogenic elements and environmental stressors. Nutritional adaptations involve modifications to diet, metabolism, and even morphology to achieve metabolic balance and utilize local food sources efficiently. These nutritional adaptations can be- Physiological and Genetic: Different populations process nutrients differently due to genetic variations; Lactose Tolerance: A well-documented example is the ability of some adults (particularly in Northern Europe and parts of Africa/Middle East with a history of dairy farming) to digest lactose, the sugar in milk, due to the persistent production of the lactase enzyme. In many other populations, lactase production stops after childhood, leading to lactose intolerance; Fat Metabolism: The Inuit people traditionally consumed very high-fat diets, and their bodies appear more efficient at breaking down fats; Thrifty Genes: Some populations, like certain Native American groups, may have evolved "thrifty genes" that allow their bodies to efficiently store calories to survive periods of feast and famine, which can contribute to obesity and diabetes when food is abundant; Amylase Gene Copy Number: Variations in the number of amylase gene copies across populations reflect adaptations to diets high in starch. The Dogma of Biogeogens explains the mechanism of action of different factors which play pivotal role in determining the nutritional adaptation and overall health, as Behavioral and Cultural: Humans also adapt through cultural practices, such as food habit, cooking food (which increases nutrient absorption) or developing specific food taboos and culinary traditions; Environmental Responses: The body adjusts to extreme environments, such as high altitudes where appetite is reduced and more carbohydrates are beneficial, or hot climates where sodium requirements increase due to sweating, etc. Therefore, a clear understanding and coherent utilization of both these concepts give us a three dimensional picture about our nutritional adaptability, intricate mechanism of biogeogens in determining nutritional and health issues, and overall and above the solution of several dreaded diseases which can be cured with the meaningful approach and institutionalized health care strategies.



Pigmentation at the Interface of Genetics and Adaptation

Subhash Rajpurohit

Division of Biological and Life Sciences
School of Arts of Sciences
Ahmedabad University, Ahmedabad 380009, Gujarat
subhash.rajpurohit@ahduni.edu.in

ABSTRACT

Pigmentation in *Drosophila* has long served as a powerful model for elucidating the genetic and evolutionary basis of adaptation. Across species and populations, body coloration exhibits pronounced variations, suggesting that temperature is a dominant selective force. Empirical studies demonstrate that pigmentation is shaped by both genetic variation and thermal plasticity, with developmental temperature having a strong influence on melanization. Complementing these patterns, artificial selection experiments show that pigmentation responds rapidly and predictably to selection. At the genomic scale, analyses using the *Drosophila* Genetic Reference Panel (DGRP) and population-level datasets uncover a modular genetic architecture underlying pigmentation, involving both large-effect loci and polygenic contributions. Together, these studies establish *Drosophila* pigmentation as a tractable framework for understanding how thermal plasticity, standing genetic variation, and selection jointly shape adaptive evolution across thermal environments.



Plant Phytochemicals in Redox Homeostasis: Mechanistic Insights into Protection Against Food Additive Induced Oxidative Stress

Veena Batra Kushwaha

Department of Zoology
Deen Dayal Upadhyay Gorakhpur University
Gorakhpur 273009, Uttar Pradesh, India
veenabatrakushwaha@gmail.com

ABSTRACT

Redox homeostasis is fundamental for cellular integrity and normal physiological function, and its disturbance leads to oxidative stress, a central factor in the etiology of numerous chronic and degenerative disorders. Emerging evidence indicates that widely used food additives can disrupt redox balance by enhancing reactive oxygen species (ROS) generation, weakening endogenous antioxidant defence systems, impairing mitochondrial bioenergetics, and promoting oxidative damage to lipids, proteins, and nucleic acids. These molecular events underscore the urgent need for effective, safe, and naturally derived antioxidant strategies. Plant-derived products represent a rich reservoir of bioactive phytochemicals, including polyphenols, flavonoids, alkaloids, and phenolic acids, which exert multifaceted protective effects against oxidative stress. Mechanistic studies demonstrate that these compounds modulate cellular redox status through direct scavenging of free radicals, chelation of redox-active metal ions, enhancement of endogenous antioxidant enzymes such as superoxide dismutase, catalase, and glutathione peroxidase, and regulation of redox-sensitive signalling pathways involved in oxidative stress responses. The present perspective integrates mechanistic evidence from our studies and related research highlighting the protective potential of plant extracts from *Oxalis corniculata*, *Achyranthes aspera*, and *Sida cordifolia* against food additive-induced oxidative stress. The findings indicate that these plant products effectively attenuate ROS production, suppress lipid peroxidation and restore antioxidant enzyme activities, thereby maintaining cellular and mitochondrial redox homeostasis. The observed protective effects are largely attributed to the synergistic interactions among diverse phytoconstituents and their ability to modulate key molecular pathways governing oxidative stress. Overall, the findings collectively highlight the protective role of medicinal plant products in mitigating oxidative stress associated with dietary toxicants. Emphasis on mechanistic insights supports the rationale for integrating plant-based antioxidants into preventive and therapeutic approaches aimed at combating redox imbalance and oxidative damage.



Benthic macroinvertebrate community in the rivers of Vindhyan region

Asheesh Shivam Mishra

Benthic Ecology Lab

Department of Zoology

Nehru Gram Bharati (Deemed to be University), Prayagraj-221505, Uttar Pradesh, India

shivam_a2000@yahoo.co.in

ABSTRACT

Vindhyan region, is a range of hills in Central India that encompasses the Vindhya Range, a chain of hills and plateaus. This range separates the Indian subcontinent into northern and southern parts with significant geographical, historical and cultural importance. Many rivers like Chambal, Betwa, Dhasan, Ken, Pausini and Tons are north flowing rivers join Yamuna and Ganga basin. The present study was conducted to determine the distributional patterns of benthic communities in the four rivers of Vindhyan hills i. e Dhasan, Ken, Paisuni, Tons (west to east). The benthic macroinvertebrates fauna was collected at four different stations from each river from headwater to mouth from Ken, Paisuni, Tons and Dhasan. Standard methods were used in identification and analysis. The taxonomic richness (family level) increased from west to east direction from Dhasan (14) to Ken (21), Paisuni (21) and Tons (23). Leptophlebiidae and Chironomidae were most 1st and 2nd most abundant taxa in the river Paisuni but in the Ken, Neoephemeridae and Leptophlebiidae were dominated from upper to lower section, while Thiaridae at mouth section. However, in the Tons river, Thiaridae was dominant taxa throughout the river length except mouth section (Neoephemeridae). Similarly, in the Dhasan river, gastropoda exhibited dominance along the river length (except headwater section Caenidae). Canonical correspondence analysis revealed that landuse and substratum were most important variables in Ken and Tons river, while current velocity in the Paisuni and Dhasan river for distribution of benthic macroinvertebrate community. The abundance of gastropods in Tons and Dhasan river was attributed to dominance of soft substratum (sand-silt-clay) and agriculture landuse from the headwater to mouth. The abundance of stony substratum and forest landuse in upper and middle section in Ken and Paisuni support abundance of insect community.



Is cannibalism a survival strategy or an evolutionarily stable behaviour?

Tripti Yadav

Department of Zoology, University of Lucknow

yadav_tripti@lkouniv.ac.in

ABSTRACT

Cannibalism, an act of consuming conspecifics, is more than a mere survival tactic in the animal kingdom. In insects like ladybird beetles, where conspecific eggs can be both kin and meal, it raises compelling questions about fitness, evolution, and population dynamics. What makes a ladybird beetle turn on its own kind? Can they recognise their kin? And does stress, such as hunger or fear, tip the balance toward brutality? Is cannibalism a desperate response or a behavioural trait passed down through generations? These questions guided our investigation into the secret cannibalistic lives of *Cheilomenes sexmaculata*. Known for their beneficial role in pest control, these beetles also display intense cannibalism, particularly toward conspecific eggs. But what drives this behaviour, and how is it shaped? To unravel this, we conducted a series of behavioural and generational experiments. We found that ecological stressors such as starvation and predatory cues significantly increased the likelihood of cannibalism, especially in individuals with a prior history of the behaviour. Kin discrimination was evident in early developmental stages but diminished in later instars and adults. While mating behaviour and egg viability remained unaffected, fecundity was consistently lower in cannibalistic individuals. Offspring of cannibalistic mothers exhibited stronger cannibalistic tendencies, prey preferences aligned with maternal diet, prolonged development, and reduced body weight. Our findings reveal that cannibalism in *C. sexmaculata* is not simply a reaction to stress, but a flexible, inheritable behaviour shaped by kinship, ecological pressures, and parental experience.



Cyanobacterization- a potential technique to enhance the yield of medicinal herbs

Shashi Uniya and Rahul Kunwar Singh*

Cyano Biotech Lab,
Department of Microbiology
HNB Garhwal University, Srinagar (Garhwal), Uttarakhand- 2414, India
rksingh.hnb@gmail.com

ABSTRACT

Cyanobacterization refers to the deliberate introduction of cyanobacteria into soil as biofertilizers to improve soil fertility and crop productivity. Owing to their unique physiological traits—including oxygenic photosynthesis, minimal nutritional requirements, wide ecological adaptability, and resilience to extreme environmental conditions—cyanobacteria represent highly promising agents for sustainable agricultural applications. Cyanobacterization has been extensively adopted in paddy ecosystems, where environmental conditions favour the proliferation of native cyanobacterial populations. However, its application beyond paddy cultivation remains relatively underexplored, with only a few crops such as wheat, pea, tomato, and cotton being investigated to date. The present study evaluates the potential of cyanobacterization for enhancing growth performance, yield, and bioactive compound accumulation in two economically and medicinally important herbs of Uttarakhand, *Allium sativum* and *Zingiber officinale*. Cyanobacterial strains were isolated from medicinal plant cultivation fields and cultured in BG11 and BG11° media. Three isolates—*Nostoc* sp. HNBGU 006 (NS-TGS), *Pseudanabaena biceps* (PaS-TGiS), and *Chroococcus turgidus* (CS-TTS)—were selected for subsequent in vitro and in vivo investigations. Initial seedling growth bioassays were conducted using *Allium sativum* and *Raphanus sativus* seeds primed with aqueous extracts of the selected cyanobacterial isolates at varying concentrations. Among the treatments, the 1% aqueous extract of NS-TGS consistently produced the highest enhancement in all measured growth parameters relative to untreated controls, thereby identifying NS-TGS as the most effective strain. Subsequently, the biofertilizer potential of NS-TGS was evaluated under pot culture conditions using live cyanobacterial inoculation. Inoculation was performed at three different stages: before sowing (BSI), after sowing (ASI), and a combined treatment (BSI+ASI), for both *A. sativum* cloves and *Z. officinale* rhizomes. In *A. sativum*, NS-TGS inoculation resulted in significant increases in root length, shoot



length, dry biomass and yield compared to control plants. Notably, significant enhancement in allicin content in garlic cloves in treated soil. Additionally, soil fertility indicators, including potassium content, as well as leaf and soil chlorophyll levels, were significantly enhanced, with maximum values recorded under the BSI+ASI treatment. In *Z. officinale*, cyanobacterial inoculation at different growth stages led to significant improvements in multiple growth and yield attributes. To identify the optimal inoculation strategy, a multicriteria decision-making (MCDM) analysis was performed using the PROMETHEE–GAIA approach. GAIA plane analysis revealed differential enhancement of growth parameters across treatments, with some parameters responding preferentially to BSI or ASI, while others were maximally enhanced under the combined BSI+ASI treatment. The PROMETHEE diamond plot ranked BSI+ASI as the most effective treatment, resulting in considerable increase in yield and gingerol content. Phylogenetic analysis based on 16S rRNA gene sequencing confirmed that the most effective isolate, NS-TGS, clustered within the same clade as *Nostoc* sp. NIES 4103, thereby validating its identification as *Nostoc* sp. HN BGU 006. Collectively, this study demonstrates that soil cyanobacterization using *Nostoc* sp. HN BGU 006 significantly enhances plant growth, yield, soil fertility, and accumulation of key bioactive compounds in *Allium sativum* and *Zingiber officinale*. The findings underscore the potential of cyanobacterization as an eco-friendly, low-input, and sustainable alternative to chemical fertilizers, particularly for the cultivation of high-value medicinal crops. Adoption of such biofertilization strategies could contribute meaningfully to sustainable agricultural systems and reduced environmental footprints.



Integrative Functional Medicine Strategies for Modulating Oxidative Stress, Inflammation, and Cellular Senescence in Autoimmune and Age-Related Disorders

Divya Bartaria,

Corporate and Industry Relations
United Group of Institutions, Prayagraj

ABSTRACT

Functional medicine adopts a patient-centered and systems-oriented approach aimed at identifying and addressing the root causes of disease rather than merely alleviating symptoms. This paradigm integrates genetic, lifestyle, and environmental factors to achieve personalized and sustainable holistic healthcare outcomes. The efficacy of bioactive compounds such as polyphenols, adaptogens, omega-3 fatty acids, and Nicotinamide Adenine Dinucleotide (NAD⁺) precursors demonstrates significant potential in mitigating oxidative stress, chronic inflammation, and cellular degeneration associated with autoimmune and age-related disorders. Integrating these nutritional and biochemical interventions with lifestyle practices such as yoga, pranayama, and mindfulness provides a comprehensive strategy for strengthening immune resilience and delaying degenerative conditions. This talk will throw light on the current literature, underlying mechanisms, and therapeutic potential of these compounds within an integrative functional medicine framework.



Molecular Pathways Linking Obstructive Sleep Apnea and Coronary Artery Disease: Focus on HIF1A, CLOCK, and ADIPOQ

Suchit Swaroop^{1*}, Chandra Narain Saxena², Shashwat Singh¹

¹Department of Zoology

University of Lucknow, 226007, India

²Department of Zoology

Sri JNMPG (KKC) College, Lucknow, 226004, India

drsswaroop@gmail.com

ABSTRACT

Obstructive sleep apnea (OSA) has emerged as an important and independent contributor to the development and progression of coronary artery disease (CAD), acting through mechanisms that extend beyond conventional cardiovascular risk factors. Recurrent episodes of intermittent hypoxia and sleep fragmentation characteristic of OSA initiate a cascade of molecular and metabolic disturbances that promote endothelial dysfunction, systemic inflammation, and atherosclerosis. In recent years, increasing attention has been directed toward gene regulatory pathways that may mediate the cardiovascular consequences of OSA. This study critically examines current evidence on the molecular interplay between OSA and CAD, with particular emphasis on hypoxia-inducible factor 1 alpha (HIF1A), circadian locomotor output cycles kaput (CLOCK), and adiponectin (ADIPOQ). HIF1A plays a central role in hypoxia-driven transcriptional responses and has been implicated in oxidative stress, vascular remodeling, and plaque instability in OSA-associated CAD. Alterations in CLOCK gene expression reflect circadian rhythm disruption in OSA and are linked to abnormal blood pressure patterns, dysregulated lipid metabolism, and heightened inflammatory signaling. ADIPOQ, a key cardioprotective adipokine, is frequently downregulated in OSA, contributing to insulin resistance, endothelial dysfunction, and accelerated atherogenesis. The converging effects of hypoxic signaling, circadian dysregulation, and impaired adipokine homeostasis provide a coherent molecular framework connecting OSA to CAD. Elucidating these gene-mediated mechanisms may enhance risk stratification, facilitate early identification of high-risk CAD patients with OSA, and support the development of targeted preventive and therapeutic strategies. Integrating molecular biomarkers with clinical evaluation may be particularly valuable in advancing precision approaches to cardiovascular risk management in OSA-associated CAD.



Tuberculosis a major risk to global health, Study and Knowledge in district Doda along with Challenges and Status with special reference to Jammu and Kashmir

Ajaz Ahmed Wani

Department of Zoology
Govt. PG College Bhaderwah
University of Jammu
aahilajaz@gmail.com

ABSTRACT

Tuberculosis (TB) is one of the most ancient disease of mankind and is one the ten major cause of mortality worldwide particularly in developing countries .It is an infectious disease caused by bacteria *Mycobacterium tuberculosis* . It usually affect the lungs but can also affect other organs of body .Inspite of various measures taken to eliminate the TB by Govt .of India by 2025 .The trend of TB cases and drug resistant cases in India is very disturbing .The study presents survey, knowledge ,challenges and status of tuberculosis in Jammu and kashmir with special reference to District Doda where it was observed that still stigma regarding tuberculosis is prevalent in the society.



Harnessing Dendritic Cell–NK–T Cell Crosstalk and Metabolic Reprogramming to Overcome Immunotherapy Resistance in Colorectal Cancer

Sumit Kumar Hira

Cellular Immunology Laboratory

Department of Zoology

University of Burdwan, Purba Bardhaman-713104,

sumit.hira2008@gmail.com

ABSTRACT

Colorectal cancer (CRC) remains a major global health burden, with microsatellite- stable (MSS) tumors displaying profound resistance to immune checkpoint blockade and dendritic cell (DC)–based vaccines. This talk presents a dual immunotherapeutic framework that integrates innate immune activation with reversal of tumor-driven adaptive immune suppression. We identify a previously unappreciated metabolic signaling pathway in monocyte- derived DCs, wherein activation of Toll-like receptor 7 induces mitochondrial reactive oxygen species (mROS) generation that licenses robust IL-12 production. This TLR7–mROS–IL-12 axis is essential for effective NK cell activation, IFN- γ secretion, and tumor cell killing. In murine CRC models, adoptive transfer of TLR7-stimulated DCs significantly suppresses tumor growth and prolongs survival, effects that are abrogated by NK cell depletion or mROS scavenging, establishing DC metabolism as a critical immune checkpoint. Complementing this innate axis, we demonstrate that tumor-derived thymidine phosphorylase (TYMP) drives CD8⁺ T-cell exhaustion and an immunosuppressive microenvironment in CRC. Pharmacological inhibition of TYMP induces immunogenic cell death and converts “cold” tumors into immune-responsive lesions. Combining TYMP inhibition with TLR7-pulsed DC vaccination synergistically remodels the tumor microenvironment, enhances cytotoxic T-cell infiltration, and achieves durable tumor control in vivo.



Expression and localization of Nitric Oxide Synthase in the ovary of catfish and its putative role in steroid production

V.K. Singh* and B. Lal[#]

* Department of Zoology

CMP Degree College, University of Allahabad Prayagraj, India-211001

[#] Department of Zoology

BHU, Varanasi, India- 221005

vks041982@gmail.com

ABSTRACT

Nitric oxide is a gaseous signaling molecule, its role in various reproductive processes is well known in mammalian species. But, its role in fish steroidogenesis is still less explored. Therefore, in this study, the different NOS isoforms, i.e., eNOS, iNOS and nNOS were immunolocalized in the ovary of catfish, *Clarias batrachus*, during different months of reproductive cycle and noticed that the localization of eNOS and iNOS were limited to theca and granulosa layer and its express only during recrudescence, pre-spawning and spawning phases and expression of both the NOSs were intense during late recrudescence phases. While expression of nNOS is noticed in the nucleus and cytoplasm of oocytes during quiescence phases, as the phase advances, the expression shifts in theca and granulosa cells in recrudescence and spawning phases. The serum and ovarian steroids and nitric oxide increased with increasing ovarian activity and having a strong correlation. Later on, to explore the putative role of NO in steroidogenesis, the ovarian fragments were incubated invitro condition and treated with NOS inhibitor (L-NAME) and NO donor (SNP). NOS inhibitor reduced the ovarian steroid production and activities of steroidogenic enzymes i.e., 3 β -HSD and 17 β -HSD. While NO donor enhances the steroid level and activities of 3 β -HSD and 17 β -HSD on moderate doses only. Too low doses of NO donor have no effect on steroid production. And too high doses of NO donor reduced the steroid production.



Harnessing R Studio package for Ecological Insights: Monitoring Diatoms with DiaThor

Jyoti Verma and Arpita Srivastava

Aquatic Ecology Lab
Department of Zoology
C.M.P Degree College, University of Allahabad, Prayagraj, U.P – 211001, India
diatombuster@gmail.com

ABSTRACT

This study aims to integrate open-source computational tools with ecological biomonitoring by harnessing the capabilities of RStudio and the DiaThor package. The goal is to simplify the calculation of diatom-based indices and generate insightful visualizations for water quality assessment. Using RStudio as the platform and the DiaThor package as the computational engine, a case study was conducted on water quality datasets. Various ecological indices were computed, including IPS, TDI, SLA, and others. The manuscript provides an end-to-end demonstration of data formatting, function usage, and graphical outputs for visual interpretation. The study successfully generated multiple plots, including bar plots, heatmaps, and radar diagrams, each representing the variation in diatom-based indices across multiple sample sites. The visualization outputs made it easier to detect ecological gradients and interpret water quality conditions efficiently. DiaThor in RStudio offers an efficient and reproducible method for ecological data processing. Its integration with R's visualization ecosystem enhances data clarity and enables automation in environmental monitoring workflows. This paper underscores the potential of open-source packages to revolutionize diatom-based assessment practices.



Maternal protein malnutrition and neurodevelopmental disorders

Nisha Patro^{1,2} and Ishan K. Patro^{1,3}

¹School of Studies in Neuroscience
Jiwaji University, Gwalior, India, 474011

²NeuVak, Garden Homes, Gwalior

³School of Studies in Zoology, Jiwaji University, Gwalior, India, 474011

nishapatro@gmail.com

ABSTRACT

Insults during early brain development are crucial causatives for aberrant and abnormal development increasing the risk for later life neurological dysfunctions. Neurodevelopment is a highly complex process, vulnerable to nutrient deficiency with certain nutrients having greater effects than do others. Maternal protein malnutrition (PMN), a major variable for neurodevelopment has been variously reported to induce detrimental changes in normal brain development. Recent advances focussing the elusive roles of glial cells in the pathophysiology of several neurodevelopmental disorders have raised momentum in glial cell research. The temporal genesis of astrocytes and oligodendrocytes was found to be greatly affected in an intra-generational PMN rat model as studied through standard immunohistochemical procedures for various glial lineage markers along with qRT-PCR studies. Drastically reduced density of differentiated astrocytes and oligodendrocyte precursor (OPC) population and significantly reduced expression of myelin protein genes resulted in myelin deficits during adolescence and adulthood. Such anomalies were clearly correlated with the behavioural and cognitive impairments recorded. Dysfunctional glial cells along with reduced densities of astrocytes and oligodendrocytes are typical changes seen in schizophrenia and many of the neurodegenerative disorders. Thus, the drastic changes observed in the gliogenesis and associated behavioural and cognitive dysfunctions following PMN could be a potential threat for major neurological disorders.



Beyond Sunlight: A Protective Crosstalk between Melatonin and UV Radiation

Soumik Goswami*

Sunbeam Women's College Varuna

soumik@sunbeamwcv.com

ABSTRACT

Ultraviolet radiation (UVR), an inevitable component of solar radiation reaching the Earth's surface, poses significant threats to living organisms. UVR is a well-established mutagen and a primary etiological factor in the development of skin carcinomas. Exposure to UVR induces acute oxidative stress through excessive generation of reactive oxygen species (ROS), which disrupts cellular redox homeostasis and impairs normal physiological functions. This oxidative burden further initiates and amplifies inflammatory responses by elevating pro-inflammatory mediators, creating a vicious cycle in which inflammation and oxidative stress act synergistically to exacerbate tissue damage and compromise cellular integrity. Beyond localized cutaneous injury, UVR has been implicated in systemic effects, including the suppression of both skin-associated and systemic immune functions. Photoimmunological studies suggest that UVR-mediated oxidative and inflammatory cascades extend beyond the site of exposure, perturbing immune organs and leading to impaired immune responsiveness. In this context, various antioxidants have been explored for their protective potential against UVR-induced damage. Among them, melatonin has emerged as a promising candidate due to its potent antioxidant properties and multifaceted protective actions. Melatonin not only scavenges free radicals directly but also enhances the activity of endogenous antioxidant systems. Additionally, its metabolites contribute further to detoxification of reactive species, while its anti-apoptotic and anti-inflammatory properties offer added cellular protection. The present findings indicate that UVR-induced cutaneous damage is primarily driven by oxidative stress resulting from free radical generation, which subsequently provokes inflammatory responses. These locally generated free radicals also disrupt systemic redox balance, leading to secondary damage in immune-related organs such as the spleen and resulting in immune suppression. Pre-treatment with melatonin was found to significantly ameliorate UVR-induced oxidative stress, inflammation, and associated systemic immune alterations. Although further extensive investigations are required before melatonin can be advocated as a definitive clinical antidote to UVR, the current evidence supports its potential integration into dermal formulations or oral supplements. Such strategies may offer a preventive approach against the rising incidence of UVR-associated skin damage and carcinogenesis in an era of increasing environmental UV exposure.



Habitat Degradation and Land Use Change Impacts on Earthworm Biogeography and Functional Diversity in Raebareli, Uttar Pradesh, India

Tuneera Bhadauria

Babu J.S. Gaya Prasad P.G ,College, (CSJM University Kanpur) Sumerpur, Unnao, Uttar Pradesh

tunira@gmail.com

ABSTRACT

Anthropogenic activities in Central Uttar Pradesh have led to the conversion of forests into agricultural land, resulting in soil degradation due to overgrazing and loss of plant cover. However, biological restoration efforts have created sustainable agroecosystems, with earthworms serving as indicators of soil health changes influenced by land management. Earthworm species richness varied with soil fertility; however, exotic species performed poorly in fallows after conversion, while indigenous species thrived and contributed to ecosystem resilience. Shifts in earthworm communities from anecic to endogeic dominance occurred during recovery phases, influenced by seasonal changes in soil conditions. Agricultural practices affected earthworm distribution and abundance, with preserved forests and reclaimed agroecosystems showcasing higher biodiversity and stability compared to fallow lands, which were more prone to environmental stress.



Glycoprotein Composition and Salinity-Induced Changes in Gill Mucous Cells of Channid Fishes

Pooja Kumari

Department of Zoology

Dharma Samaj College

Raja Mahendra Pratap Singh University, Aligarh (U.P) 202002, India.

pooja.lifescience@gmail.com

ABSTRACT

The present study aimed to localize and characterize mucous cells (MCs), their glycoprotein (GP) moieties, and lectin binding patterns in the gills of two freshwater channid fishes, *Channa punctatus* and *Channa gachua*, maintained under native freshwater (FW) conditions, and to evaluate salinity-induced alterations following transfer to different grades of salinity. Additionally, the upper salinity tolerance limit (USTL) of both species was determined to assess their osmoregulatory capacity. USTL was evaluated by recording mortality after direct and gradual transfer from FW to increasing dilutions of artificial seawater (SW). In direct transfer experiments, fishes were exposed to 10–100% SW for seven days, while in gradual transfer, fishes were acclimated sequentially to sub-lethal salinities (10–45% SW), each for seven days. Since mortality data alone are insufficient to assess physiological status, plasma osmolality was estimated and gill tissues were examined for MCs and chloride cells. Results revealed that *C. punctatus* exhibited a USTL of 30% SW (292 mOsmol L⁻¹), whereas *C. gachua* showed a higher tolerance of 40% SW (388 mOsmol L⁻¹). Pre-adaptation to sub-lethal salinities did not enhance USTL in either species. Based on established classifications, *C. punctatus* belongs to the second category of stenohaline fishes (30–35% SW), while *C. gachua* lies between the second and third categories. Histochemical characterization of MCs was performed using conventional stains including Alcian blue (pH 2.5 and 1.0), PAS, PAS/AB combinations, and active methylation protocols to identify neutral, acidic, sulphated, and carboxylated GP moieties. The study highlights species-specific differences in mucus composition and salinity tolerance, emphasizing the functional role of gill mucus in ion regulation and environmental adaptation.



Temperature-Driven Survival Strategies in Parthenium Beetles

Bhupendra Kumar

Department of Zoology

Banaras Hindu University, Varanasi, 221005, Uttar Pradesh, India

bhupendrakumar@bhu.ac.in

ABSTRACT

Temperature is essential for all organisms because it governs biochemical reactions, metabolic rates, growth, development, and survival. The present study examined feeding efficiency, nutrient assimilation, larval development, stress biomarkers, gut microbiota, and body metabolites in the Parthenium beetle *Zygogramma bicolorata* Pallister (Coleoptera: Chrysomelidae), a biological control agent of the invasive Parthenium weed, under fluctuating temperature regimes. We hypothesized that departures from the optimal temperature (25°C) would induce thermal stress in larvae and adults, impairing feeding performance and nutrient utilization. Larval consumption and growth declined at both low (15°C) and high (30°C) temperatures compared with the optimum (25°C), while food conversion efficiency increased with temperature. Protein assimilation decreased across the temperature gradient, whereas glucose assimilation increased. Triglyceride assimilation declined from 15°C to 25°C but increased at 30°C. Increasing temperature reduced larval body size and shortened developmental duration. Antioxidant enzyme activities, viz. superoxide dismutase (SOD), catalase (CAT), and lipid peroxidase (LPO) were elevated under thermal stress at 15°C and 35°C in both life stages. SOD activity peaked at 35°C in larvae and at 15°C in adults, while CAT and LPO activities were highest at 35°C in both stages. Temperature significantly altered gut microbiota diversity, revealing 11 bacterial phyla and 149 genera, dominated by Firmicutes, Proteobacteria, and Cyanobacteria. PICRUST2 analysis associated the microbiota with amino acid and carbohydrate transport, inorganic ion metabolism, and cellular processes. Metabolomic profiling identified 1,277 metabolites with distinct profiles under control (27°C), heat stress (35°C), and cold stress (15°C) conditions, indicating temperature-specific metabolic responses. Control beetles primarily relied on glutathione and carbohydrate metabolism, heat stress enhanced nitrogen metabolism and amino acid catabolism, and cold stress uniquely affected nucleotide and vitamin B6 pathways. Overall, *Z. bicolorata* exhibits stage-specific and temperature-dependent physiological strategies that enable thermal adaptation through extensive metabolic reprogramming and maintenance of cellular homeostasis.



Sustainable Management Strategies for Invasive Weeds with Emphasis on Biological Control

Archana Anokhe and Sushil Kumar

ICAR- Directorate of weed Research
anokhearchana12@gmail.com

ABSTRACT

Weeds constitute one of the most serious biotic constraints to agricultural productivity, accounting for nearly one-third of the total losses caused by agricultural pests, with an estimated annual economic loss of about US\$ 11 billion (DWR, 2015; Singh et al., 2018). Yield losses due to weeds vary widely across production systems, ranging from about 5% in commercial agriculture to 10% in semi-commercial systems, 20% in subsistence farming, and as high as 37–79% in dryland agriculture (Choudhury and Singh, 2015). Even a conservative estimate of 10% yield loss translates to nearly 25 million tonnes of food grains, valued at approximately US\$ 13 billion annually (Yaduraju, 2012). In India, about 826 weed species belonging to 61 families have been reported to cause yield losses, of which 80 are considered very serious and 198 serious weeds; among them, at least 62 are invasive alien plant species (Choudhury and Singh, 2015; Reddy, 2008). Alien or invasive species, introduced intentionally or accidentally through human activities, have increased rapidly due to globalization, international trade, and transport networks. Conservative estimates suggest that around 173 invasive plant species have been introduced into India (Reddy, 2008). Although mechanical, chemical, cultural, and integrated methods are widely used for weed management, biological control has emerged as a sustainable and environmentally sound approach, particularly for long-term suppression of invasive weeds. Biological control reduces reliance on herbicides, minimizes environmental pollution, and restores ecological balance through the use of natural enemies. This paper focuses on the biological control of three invasive weeds of national importance—*Parthenium hysterophorus*, *Salvinia molesta*, and *Pontederia (Eichhornia) crassipes*—using host-specific insect bioagents: *Zygogramma bicolorata*, *Cyrtobagous salviniae*, and *Neochetina* spp., respectively. The biology, mode of action, field establishment, and impact of these agents are discussed, highlighting their effectiveness as cost-effective and long-term weed management tools



***Spiroplasma* induced Cytoplasmic Incompatibility in the parasitoid *Lariophagus distinguendus*: Effects of symbiont density, wasp development and reintroduction**

Animesha Rath¹, Gali Sasson¹, Keren Kohav¹ and Yuval Gottlieb^{1*}

¹Koret School of Veterinary Medicine
The Robert H. Smith Faculty of Agriculture, Food and Environment,
The Hebrew University of Jerusalem.
animesha.rath@mail.huji.ac.il

ABSTRACT

Cytoplasmic incompatibility (CI) is a symbiont-induced reproductive manipulation in which sperm from infected males causes embryonic death unless rescued by an infected female. CI is widespread in arthropods and can be induced by several symbionts, including *Wolbachia* and *Spiroplasma*. Although the molecular and cellular mechanisms of CI induction by *Wolbachia* are well studied, they remain largely unknown for other symbionts. To investigate the mechanism of *Spiroplasma*-induced CI, we examined whether CI expression is influenced by male host age dependent changes in symbiont titre and by the duration of the pupal stage, when spermatogenesis and symbiont-mediated sperm modification occurs. We also exploited the extracellular lifestyle of *Spiroplasma* to establish an *in-vitro* culture of the symbiont (strain *sDis*), which was reintroduced into symbiont-free hosts to test whether cultured bacteria retain the capacity to induce CI. CI strength did not differ among males of different ages, nor was correlated with symbiont density, demonstrating that bacterial load does not explain variation in incompatibility. Extending male pupal development at 18 °C increased CI induction compared to males developing in 25°C consistent with enhanced sperm modification. Reintroduction of cultured *sDis* into symbiont-free hosts induced CI at levels comparable to natural infections, demonstrating that cultured bacteria are sufficient to trigger incompatibility. Together, these results demonstrate that *sDis*-induced CI strength is determined by the efficiency of sperm modification rather than by symbiont density. The establishment of a culturable *sDis* system provides a critical experimental framework to uncover the mechanistic basis of *Spiroplasma*-induced cytoplasmic incompatibility.



Deoxylimonin derived from *Clitoria ternatea* (L) extract's fraction CT-3 reduces LTC-4, COX-2 and IL-6 in inflammatory models of *Wistar* albino rats *Rattus norvegicus*

Kapil K. Soni

Pharmacogenomics Lab

Bioscience Department, Barkatullah University, Bhopal, M.P., India

kapilsoni14@gmail.com

ABSTRACT

The study is carried out to isolate compound from plant extract for reducing LTC-4, COX-2 and IL-6 in albino rats *Rattus norvegicus*. Plants *Clitoria ternatea* (L.) after identification and authentication shade dried and pulverized to isolate extract through Soxhlation in methanol and water with percentage yield 15.02% and 07.60%, and fractionated by thin layer (RF0.78) using toluene: ethyl acetate (70:30) and column chromatography using petroleum ether: toluene: ethyl acetate (50:30:20) to get purified fraction CT-3, which was tested orally in albino rats and histopathology of lung tissues was performed. ELISA for LTC4, COX-2 and IL-6 analysis of BAL fluid was performed. Spectral analysis of CT-3 fraction was also performed and deoxylimonin was isolated. *Clitoria ternatea* CT-3 fraction reduces LTC-4 i.e. 667.33 ± 11.82 and 417.33 ± 09.10 pg/ml at 50 and 100 mg/kg b.w. dosage in albino rats, respectively. Moreover, fraction CT-3 reduces COX-2 i.e. 360.33 ± 05.83 and 279.55 ± 09.01 at 50 and 100 mg/kg. b.w. in albino rats, respectively and also reduces IL-6 i.e. 5.400 ± 0.01 and 3.543 ± 0.12 pg/ml in albino rats. Histopathology of lung tissues shows reduction in lung inflammation in albino rats. Fraction CT-3 was analyzed spectroscopically and deoxylimonin was elucidated.



Olfml3 and Tmem119 could be new players in the regulation of neuroinflammation

Himanshi Yadav, Shweta, Shashank Kumar Maurya¹

¹Biochemistry and Molecular Biology Laboratory
Department of Zoology, Faculty of Science, University of Delhi, Delhi-110007, India
smaurya1@zoology.du.ac.in

ABSTRACT

Neuroinflammation is a hallmark of many neurological disorders characterised by microglia activation and infiltration of blood-borne macrophages. Microglia play a crucial role in regulating neuroinflammation-driven neurological disorders. Olfml3 and Tmem119 have been identified as microglia markers whose expression has been shown to alter during neurodegenerative diseases. However, the possible role of Olfml3 and Tmem119, as well as their possible involvement in neuroinflammation, remains unclear. Interacting partners of Olfml3 and Tmem119 were found to be microglia-specific proteins, including Iba1, Fcrls, P2RY12, Sall1 and Siglec-H. Molecular docking and MD simulation revealed stable physical interaction of Olfml3 and Tmem119 with Iba1. Levels of Olfml3, Tmem119 and Iba1 were observed to increase during neuroinflammation. Silencing *Olfml3* and *Tmem119* using siRNA led to a decrease in *Iba1* expression. Inhibiting microglial activation significantly increased expression of Tmem119, whereas it downregulated the expression of both Olfml3 and Iba1 and improved behavioural deficits in neuroinflammatory mice. Overall, these findings highlight the importance of microglia signature genes in regulating microglia functions in the management of neuroinflammation.



A Bifunctional Antibody Conjugate for Marking the Location of DNA Binding Proteins on DNA Fibers

Althaf Shaik and Michael M. Seidman

NIH, Maryland
United States of America
althaf.shaik.phd@gmail.com

ABSTRACT

The cellular response to DNA damage can be marked by the appearance of immunofluorescent foci of DNA Damage Response (DDR) proteins. These serve as surrogates for DNA damage and are frequently interpreted as denoting specific lesions. For example, double-strand breaks (DSBs) are potent inducers of the DDR, whose best known factor is the phosphorylated histone variant H2AX (γ -H2AX). The association with DSBs is so well established that the reverse interpretation that γ -H2AX invariably implies DSBs is routine. However, this conclusion is inferential and has been challenged. The resolution of this question has been hampered by the lack of methods for distinguishing the location of DDR proteins relative to DSBs caused by sequence indifferent agents. Here, we describe an approach for marking the location of DDR factors in relation to DSBs on DNA fibers, illustrated by γ -H2AX. We synthesized a two-arm “Y” conjugate containing biotin and trimethylpsoralen (TMP) coupled to a secondary antibody. After exposure to ionizing radiation, which introduces multiple lesions, including DSBs, cells were fixed, permeabilized, and incubated with a primary antibody against γ -H2AX followed by binding of the conjugated secondary antibody to the primary antibody. Exposure to long-wave UV light covalently linked psoralen to the DNA. DNA fibers were spread, and the immunofluorescence of the biotin tag indicated the location of the target protein. This technique denotes the location of γ -H2AX along DNA fibers following ionizing irradiation of the cells and the relationship between DSBs and γ -H2AX. Our results demonstrate that, after radiation, most γ -H2AX signals detected on DNA fibers are located at internal sites rather than at ends.



Nature-Inspired Algorithms in Healthcare: AI-Driven Approaches for Intelligent Decision-Making

Amrita Yadav[#]

Rashtriya Raksha University, Lucknow

ap8.up@rru.ac.in

ABSTRACT

Biological systems demonstrate extraordinary capabilities such as adaptability, robustness, self-organization, and learning under uncertainty. These characteristics have inspired a class of computational techniques known as nature-inspired algorithms, which now play a significant role in artificial intelligence driven healthcare solutions. This paper explores how nature-inspired algorithms such as genetic algorithms, swarm intelligence, artificial immune systems are being applied to healthcare and bioinformatics for intelligent decision-making. Applications including disease diagnosis, medical image analysis, treatment optimization, drug discovery, and personalized healthcare will be discussed to illustrate their effectiveness in handling complex, high-dimensional biomedical data. The paper further highlights how these biologically motivated AI approaches enhance interpretability, resilience, and adaptability in healthcare systems. Finally, challenges related to data quality, ethical considerations, and trustworthy deployment of AI in clinical environments are examined, along with future directions for integrating bio-inspired intelligence into next-generation healthcare ecosystems.



Harnessing Phytochemicals for CRC Chemoprevention: Mechanistic Insights into Gut Microbiota Modulation

Akhilendra Kumar Maurya

Biochemistry and Molecular Biology Lab
Department of Zoology
Institute of Science, Banaras Hindu University, Varanasi-221005 (India)
akhilendrakumar@bhu.ac.in

ABSTRACT

Colorectal cancer (CRC) remains a global health priority, ranking as the second leading cause of cancer-related mortality. Its pathogenesis is driven by a multifaceted interplay between gut microbiota, host mucosal signaling, dietary intake, and inflammation. Recent research highlights the role of microbial dysbiosis in creating a pro-inflammatory environment that facilitates DNA mutations and carcinogenesis. Additionally, it has increased risks combined with ulcerative colitis. Food composition affects colonic health and cancer risk via gut microbiota fermenting complex dietary residues. Though dietary intervention has been shown to reduce disease recurrence and mortality, the elevated intake of whole grains evidences specific attention for modulation of gut microbial communities that diminish multiple hallmark of cancer. Rice bran, a wastage agricultural byproduct of white rice milling, has shown efficacy for the control and suppression of carcinogen-induced animal model of CRC. Findings from the study show that rice bran modified gut microbiota from humans confers protection suggesting integrated dietary-FMT intervention from colon carcinogenesis in mice. Results indicated both microbiota dependent and independent mechanisms for rice bran deliberated protective efficacy against CRC, further associated with reduced neoplastic lesion size and local mucosal and systemic inflammation and maintenance of colonic epithelial integrity. Gender specific functional variables could differentially control CRC growth and progression. Additionally, a longitudinal analysis of fecal microbiota and metabolite changes between diet treatments identified novel mechanisms for rice bran oriented anti-cancer activity. Overall findings from the study provide convincing support for rice bran to develop translational dietary biomarkers and to explore the mechanisms behind the microbial metabolite effects, which could be modified by diet to achieve the objective of CRC prevention and control.



Engineering LNPs for Vaccines: Lipid Design Drives Immune Activation

Sharma P¹, Elia U², Sprecher U¹, Naidu GS¹, Goldsmith M¹, Halevy I¹,
Samaridou Eleni³

Beck-Broichsitter Moritz³, Peer D^{1*}

¹Shmunis School of Biomedicine and Cancer Research, Tel Aviv University

²Department of Biochemistry and Molecular Genetics, Israel Institute for Biological Research

³Merck KGaA, Frankfurter Str. 250, 64293 Darmstadt, Germany

preeti@tauex.tau.ac.il

ABSTRACT

Lipid nanoparticles (LNPs) have revolutionized vaccine science, particularly through the success of mRNA-LNP vaccines during the COVID-19 pandemic. Efficient mRNA delivery and expression in antigen-presenting cells (APCs)—together with finely tuned innate immune activation—are essential for the success of mRNA-LNP vaccines. Ionizable lipids play a dual role in this process, acting not only as delivery vehicles but also as intrinsic adjuvants that shape the quality and magnitude of the immune response. In this talk, I will present our systematic design and evaluation of a hydroxylamine-linked ionizable lipid library with diverse tail chemistries. From this screen, we identified a lead candidate, Lip45, which achieved markedly improved APC transfection and activation relative to the clinical benchmark SM-102. Mechanistically, Lip45 promoted enhanced lysosomal and cathepsin B activity, mitochondrial ROS generation, and heightened MHC-I antigen presentation—hallmarks of strong intrinsic adjuvanticity. In vivo, Lip45-formulated mRNA vaccines drove superior antigen expression, robust CD8⁺ T-cell expansion, and enhanced antibody responses. These immune effects translated into potent protection against *Yersinia pestis* infection and suppression of B16F10-OVA tumour growth. Collectively, this work introduces Lip45 as an intrinsically adjuvant mRNA nanovaccine platform with broad translational potential for use in infectious disease and cancer immunotherapy.



Conservation Beyond Borders: A Cross-Continental Perspective

Shivangi Mishra

Arctic Institute of North America
University of Calgary, AB, Canada
mishrashivangi11@gmail.com

ABSTRACT

Conservation challenges today extend beyond borders, requiring cross-continental perspectives that link biodiversity research across ecosystems, cultures, and scientific disciplines. As biodiversity loss and climate change intensify globally, effective conservation depends on integrative approaches that connect ecological research, emerging tools, and diverse knowledge systems across regions. This research draws on field-based conservation research conducted in India and genomics-informed biodiversity co-management in the Arctic, offering a cross-continental lens on conservation research. It highlights the foundation of community-based and landscape-level conservation approaches that extend beyond species-specific boundaries. By connecting conservation experience across continents, this research demonstrates how conservation beyond borders can generate transferable insights for biodiversity co-management. This research also highlights the need of integrative biological approach that moves across scales, from species to ecosystems, and across knowledge systems to support ethical, resilient, and inclusive conservation strategies in a rapidly changing world. This will be effective in informing conservation priorities and decision-making for global biodiversity co-management.



Emerging Contaminants: Microplastics and PCPs Risks in Freshwater Systems

Reshma Sinha

Department of Animal Sciences
Central University of Himachal Pradesh, Kangra, India
sinhareshma89@gmail.com

ABSTRACT

The pervasive infiltration of emerging contaminants (ECs) into freshwater ecosystems poses a pressing global environmental threat. Microplastics (MPs)—defined as plastic particles smaller than 5 mm—and personal care products (PPCPs), encompassing diverse chemicals from cosmetics, toothpaste, and hygiene items, stand out due to their persistence, bioavailability, and propensity for bioaccumulation. These pollutants infiltrate diverse freshwater habitats, from urban rivers to pristine alpine lakes, functioning as both sinks and pathways for broader dissemination. Investigations must target multiple toxicological endpoints to evaluate impacts on non-target freshwater organisms, such as algae, invertebrates, and fish. In natural settings, their toxicity manifests synergistically with physicochemical variables like temperature, pH, and salinity, compounded by co-occurring toxicants including pesticides and heavy metals. Such multifaceted assessments reveal risks like oxidative stress, reproductive impairment, and disrupted microbial communities. Integrated research should be conducted and must prioritize field validations alongside laboratory simulations to inform adaptive regulations, policy formulations and ecosystem restoration strategies.



Time, Task, and Tiredness: Sleep Health in Police Personnel

Arjita Yadav, Zeenat Afreen, Nidhi Mishra, Shalie Malik and Sangeeta Rani

Department of Zoology
University of Lucknow, Lucknow
arjita.yadav01@gmail.com

ABSTRACT

Policing is a very stressful job. It needs 24*7 alertness and vigilance. Police officers are exposed to high levels of environmental pollution and faces, many physical and mental challenges in their duty schedule. Their shift schedules, extended work hours, irregular duty schedules, unplanned duty roster and unforeseen demand not only affect the professional but personal aspect also. Policing requires sustained alertness around the day which often contradicts with individual chronotype and biological timing. Such misalignment may contribute to reduced sleep duration, poor sleep quality, and persistent tiredness, often leading to the behavioral changes. Therefore, the aim of the study was first, to know the impact of air and noise pollution on the circadian rhythm which include various sleep characteristics (sleep latency, sleep quality, sleep inertia), social jetlag, fatigue, daytime sleepiness and other physiological parameters of traffic police in comparison to a control group with minimal pollution exposure and then second, to know the impact of chronotype to improve their sleep health. For this we recruited police officers from two different departments for two different studies. In first study, 200 subjects (100 on road duty as a proxy of higher pollution level and 100 controls) personnel from the traffic department participated. In the second study from the women power helpline (WPL) which has shift schedules for the personnel. We asked the subjects to fill various questionnaires such as, morningness-eveningness questionnaire, Munich chronotype questionnaire and sleep related questionnaires. We also recorded their sleep profile with the help of actiwatch in different shift schedule to know the effect of chronotype on their sleep in different study condition (In-phase and out of phase). Results indicate that traffic police personnel experience significantly poorer sleep quality, with higher prevalence of sleep disturbances, more sleep inertia, more sleep latency, increased social jetlag and poor appetite while police officers from WPL showed improved sleep health when they are allocated their duty schedule according to their chronotype. Overall, these results suggest that the need for targeted interventions, such as improved protective measures, shift scheduling reforms, and environmental modifications, to mitigate the adverse effects of pollution on sleep health in high-risk occupational groups.



Functional characterization of the *RbWRKY70* promoter regulating rose petal abscission

Laxmi Priya Pradhan^a and Aniruddha P. Sane^b

^aB.C.S. Govt. PG College Dhamtari (C.G.), 493773, India

^bPlant Gene Expression Lab, CSIR-National Botanical Research Institute (CSIR), Lucknow, 226001, India

ABSTRACT

Rose is an economically important ornamental plant belonging to the family *Rosaceae*. Fragrant rose varieties such as *R. bourboniana* are highly valued for their floral scent and are extensively cultivated for use in the perfume industry. However, in contrast to hybrid roses (*R. hybrida*), fragrant roses exhibit a markedly shorter floral longevity due to rapid petal abscission occurring within 24–48 h after anthesis. To identify molecular regulators of petal abscission in rose, transcriptomic analysis of cDNA derived from the petal abscission zone was performed, leading to the identification of the WRKY transcription factor *RbWRKY70*. The spatial expression pattern of *RbWRKY70* was analyzed in rose and *Arabidopsis thaliana* using promoter–GUS fusion assays. The *RbWRKY70* promoter directed GUS expression specifically to the floral abscission zone in transgenic *Arabidopsis* and to the petal abscission zone in rose following agro-infiltration. Promoter activity of *RbWRKY70* was abolished in the *ein2*, *ida2*, and *haehsl2* mutant backgrounds indicating that *RbWRKY70* expression is ethylene-dependent. Given that the closest *Arabidopsis* homolog, *AtWRKY70*, is implicated in salicylic acid (SA)–mediated signaling, the role of SA in petal abscission was examined in *R. bourboniana*. Exogenous application of SA at millimolar concentrations, similar to ethylene treatment, triggered rapid petal abscission within 24–30 h. These results suggest that WRKY70, a conserved transcription factor across plant species, may regulate petal abscission through cross-talk between salicylic acid and ethylene signaling pathways and represents a potential target for the manipulation of floral longevity in roses.



Aquatic Biodiversity Conservation in the Himalayan River System in Uttarakhand

Vijay Prakash Semwal[#] and Jitendra

Department of Zoology
Govt. Post Graduate College, New Tehri, Uttarakhand
vpsemwal75@gmail.com

ABSTRACT

The Himalayan river systems of Uttarakhand support exceptionally rich aquatic biodiversity due to their steep altitudinal gradients, diverse hydrological regimes, and varied habitat types ranging from glacier-fed headwaters to alluvial foothill stretches. The present study synthesizes field-based data and published records to assess the status of aquatic biodiversity and conservation challenges in major Himalayan rivers of Uttarakhand, including the Bhagirathi, Alaknanda, Mandakini, and their tributaries. Quantitative surveys conducted across representative sites from headwaters to downstream reaches recorded 145–180 taxa of aquatic organisms, comprising phytoplankton (38–52 species), zooplankton (24–31 species), benthic macroinvertebrates (62–78 taxa), and fishes (21–29 species). Benthic macroinvertebrate assemblages were dominated by Ephemeroptera, Plecoptera, and Trichoptera (EPT), contributing 48–62% of total taxa in upper and middle reaches, indicating generally good ecological conditions in less disturbed segments. Fish diversity showed a clear longitudinal pattern, with cold-water species such as *Schizothorax* spp. and *Glyptothorax* spp. prevalent in high-altitude reaches, while cyprinids and silurids dominated lower reaches. Physico-chemical data revealed water temperatures ranging from 4.2–9.8 °C in headwaters to 18.5–26.7 °C in foothills, dissolved oxygen levels of 7.2–11.4 mg L⁻¹, and increasing total dissolved solids downstream, reflecting cumulative anthropogenic influences. Biodiversity indices (Shannon–Wiener $H' = 2.1–3.6$) declined significantly near hydropower projects, urban settlements, and regulated river stretches. Major threats identified include hydropower development, flow regulation, habitat fragmentation, sediment alteration, and climate-driven glacier retreat. The study highlights the urgent need for integrated conservation strategies emphasizing environmental flows, protection of biodiversity hotspots, long-term biomonitoring using macroinvertebrates, and basin-scale management to sustain aquatic biodiversity in the Himalayan rivers of Uttarakhand.



Scaphognathite Oscillation Variability as a Predictor of Stress and Mortality in Aquatic Crustaceans

Ravi Shanker Verma

Department of Zoology, Chandra Bhanu Gupta Agricultural Post Graduate College,
Bakshi Ka Talab, Lucknow 226201.

ABSTRACT

Scaphognathite oscillations, the rhythmic ventilatory movements of the gill bailer in decapod crustaceans, are fundamental to maintaining respiratory efficiency and physiological homeostasis. These oscillations regulate gill ventilation and oxygen uptake, ensuring stable internal conditions under normal circumstances. Variability in oscillation frequency and amplitude has increasingly been recognized as a sensitive physiological marker of stress, with significant potential for predicting mortality risk in aquatic crustaceans. Under stable environmental conditions, scaphognathite oscillations remain relatively constant, reflecting effective respiratory control. However, exposure to toxicants such as heavy metals, pesticides, and other pollutants induces pronounced alterations in oscillatory patterns. These changes often manifest as either elevated or suppressed oscillation rates, depending on the nature and intensity of the stressor, and are closely associated with respiratory distress and reduced survival. The predictive value of oscillation variability lies in its ability to integrate multiple stress pathways. Elevated variability frequently precedes visible signs of morbidity, making it a reliable, non-invasive biomarker for early detection of sublethal stress. In aquaculture systems, continuous monitoring of scaphognathite oscillations could provide real-time insights into water quality and animal health, thereby enabling timely interventions to minimize stock losses. Furthermore, oscillation changes have been linked to endocrine fluctuations, particularly variations in testosterone and stress hormones, highlighting the connection between respiratory drive, reproductive performance, and overall health.



Multimodal Communication in Ants

Pawan Kumar Yadav^{a,b}, Omkar^a and Geetanjali Mishra^a

^aDepartment of Zoology, University of Lucknow, Lucknow

^bDepartment of Zoology, Government Degree College, Hansaur, Barabanki

ABSTRACT

Ants are social insects of the Order Hymenoptera. With about 14000 species worldwide, they are one of the most successful taxon on the planet. A large share of its success is due to its eusocial structure, adaptability and communication. Communication in ants is fundamentals to its maintenance of colony physiology and behaviour. The modes of communication in ants are extremely diverse and range from pheromonal broadcasts to more targeted tactile communication. The chemical mode of communication is most common and is widespread across various phylogenetic groups of ants. Ants harbour a bunch of exocrine glands which vary greatly in their anatomy and function. Ants rely primarily on secretions of these glands to coordinate colony level functions such as recruitment during foraging, nest defense, task allocation and nestmate recognition. These chemical signals are often combined with tactile interactions, vibrational or acoustic signals. Communication in ants operates largely through local interactions among individuals, yet it can generate coordinated colony-level responses without a centralized control. Understanding the mechanisms and functions of ant communication provides insight into the evolution of social behavior and the processes by which simple signaling systems give rise to complex collective organization in eusocial insects.



A Convenient and effective Atropine Sulphate Nasal Formulations against Organophosphate Toxicity

Rohit Chand Kabidayal, Hemant Nagpal and Neeti Jain

Defence Research Development Establishment,
Gwalior 474002.

rohitchk23@gmail.com

ABSTRACT

Phosphate esters, or organophosphate (OP) compounds, widely used as pesticides and chemical warfare agents, cause immediate deaths due to excessive cholinergic stimulation and respiratory failure, if not promptly treated. Current medication demand trained personnel for injection-based antidote Atropine Sulphate administration. Study aimed formulations design, development and protective efficacy evaluation using biochemical and neurobehavioral marker against OP, and pharmacokinetic profiling of two delivery routes. Different formulations were designed using various excipients. Murine model further used to evaluate protective efficacy and antioxidant assays against sub to supra lethal doses of VX (Potent OP). Trackezi Any Maze used for behavior tracking and PK Solver used for pharmacokinetic studies comparing intraperitoneal (IP) versus intranasal (IN) administration routes. Intranasal formulations F2.2 and F1.2 showed similar protection to IP-A.S i.e. 90% at 4 LD₅₀ and 100% at 2 LD₅₀. IN-AS lessen the Catalase (45.56% ±2.4) and Lipid peroxidation (65.6% ±5.9) whereas, it elevated GSH level (225% ±15) post 24 hours compared to VX exposed. The anxiety and cognitive behavior were found to be significantly improved in IN-AS compared to IP-AS. The IN-AS showed distinct blood pharmacokinetic profiles compared to IP-AS: IN route achieved C_{max} of 17,931.397 ng/ml at T_{max} of 5.16 minutes versus IP route C_{max} of 15,630.232 ng/ml at 0.66 minutes. Atropine was found 26% in systemic circulation which directs the study to assume remaining drug reached into brain tissues. The developed intranasal atropine sulphate formulations (IN-AS) showed good protection against high doses of OP exposure. In future developed IN-AS formulation installed in metered devices may replace autoinjectors for treatment for OP poisoning in case of emergency mass casualties.



The Hidden Costs of Regeneration in Ladybird Beetles

Sanjeev Kumar, Geetanjali Mishra and Omkar

Ladybird Research Laboratory
Department of Zoology
University of Lucknow, Lucknow, Uttar Pradesh – 226007
sanjeev.lbrl@gmail.com

ABSTRACT

Insects respond to injury through physiological processes such as wound repair, immune activation, and tissue regeneration, all of which require substantial energetic investment. Although regeneration enhances survival, it can impose considerable costs on development and reproduction. This study examines the developmental and reproductive trade-offs associated with limb regeneration in the ladybird beetle *Cheilomenes sexmaculata* (Fabricius). Third-instar larvae were subjected to leg amputation and monitored through pupation into adulthood. Regenerated individuals were compared with uninjured controls for multiple traits, including body mass, developmental time, leg length, gonadal morphology, gonadosomatic index (GSI), and reproductive performance. Larval injury resulted in prolonged development and reduced adult body weight. While complete leg regeneration occurred in all injured individuals, both regenerated and contralateral legs were significantly shorter than those of controls, indicating organism-wide growth constraints. Injured beetles also exhibited reduced gonad mass, lower GSI values, and diminished gonadal size, characterized by fewer and shorter testicular lobules or ovarioles. These effects persisted into early adulthood, differed between sexes and ages, and were associated with decreased mating success and reproductive output. Overall, the results suggest a reallocation of resources toward somatic maintenance at the expense of reproduction during regeneration. Reduced reproductive investment under injury stress underscores the importance of considering internal anatomical and developmental consequences, in addition to external morphology, when evaluating regeneration. These findings clarify injury-mediated shifts in life-history traits and highlight the relevance of sublethal injury and environmental stress in assessing natural enemies used in biological control programs.



Evaluation of the Therapeutic Potential of Thymoquinone (*Nigella sativa*) against Malathion-Induced Toxicity in the Freshwater Fish *Labeo rohita* (Hamilton, 1822)

Preeti Tirkey[#] and Malabika Sikdar
Dr. Harisingh Gour Central University Sagar (M.P)
preetirkey33@gmail.com

ABSTRACT

The indiscriminate use of pesticides has significantly increased the risk of unintended toxicity in aquatic ecosystems, largely through agricultural runoff and vector control applications. Malathion (M), a widely used organophosphorus pesticide, poses serious physiological threats to aquatic organisms, particularly freshwater aquatic organisms although its toxic effects remains insufficiently documented. Pesticide toxicity also cause endocrine dysfunction, multiple organ failure as well as negatively affected in entire aquatic ecosystem. This present study evaluates the protective potential of Thymoquinone (TQ), a bioactive compound derived from *Nigella sativa*, against malathion-induced toxicity. Hematological alterations RBCs and WBCs count was observed treating with malathion toxicity. Biochemical assessments also documented elevated (Lipid peroxidation, Nitrite oxide accompanied by antioxidant enzyme activities, such as Sodium dismutase, Catalase, Glutathione peroxidase and Glutathione Reductase in both gills and liver tissues. Histopathological and ultrastructural examinations demonstrated severe tissue damage, characterized by excessive mucus secretion, lamellar disorganization, pillar cell disruption, hyperplasia in gills, and cellular degeneration in the hepatocytes was observed. Conversely, Thymoquinone treatment significantly ameliorated malathion-induced damage, restoring gill architecture and promoting hepatic cell regeneration, as confirmed by scanning electron microscopy (SEM). Moreover, TQ supplementation markedly enhanced antioxidant defenses, thereby reducing oxidative stress. These findings indicate that Malathion induces oxidative stress-mediated toxicity in *L. rohita*.



Cigarette Smoke Extract Accelerates Neurodegenerative Changes via Oxidative Stress: Neuroprotective Effects of Hesperetin in Adult Zebrafish

Ankita Dwivedi[#] and Deepali Jat

Department of Zoology

Dr. Harisingh Gour Vishwavidyalaya (A Central University), Sagar (MP)

E-mail: ankitadwivedi7997@gmail.com

ABSTRACT

Neurodegeneration is marked by progressive neuronal loss and cognitive decline. Cigarette smoking is detrimental to health and continues to be a global health concern. Cigarette smoke contains a complex of about 7,000 chemicals- 69 of which, including arsenic, chromium, nitrosamines, nicotine, and formaldehyde, are particularly harmful. It is already well recognized that smoking cigarettes has negative effects on human health, including cancer, heart disease, and COPD. However, its effect on the brain, leading to neurotoxicity and accelerating the risk of neurodegenerative diseases, remains less explored and unclear. Cigarette smoke toxicants produce free radicals that lead to oxidative stress, inflammatory reactions, and ultimately neuronal death. Here, flavonoids derived from plants are particularly interesting due to their anti-inflammatory and antioxidant qualities, which may provide neuroprotection against cigarette smoke-induced damage. The current study investigates the behavioural, biochemical, and histopathological alterations in adult zebrafish exposed to cigarette smoke extract (CSE). Zebrafish, due to their genetic homology with human genes, serve as an excellent model in neurodegenerative research. In this study, adult zebrafish were acclimatized under optimum conditions and divided into groups, following CSE and Hesperetin exposure. Behavioural assessments were conducted on the final day of the experiment. Biochemical analysis was performed to evaluate oxidative stress markers, while histological examinations of the brain assessed structural integrity and alterations across various brain regions. The findings from the study highlight the neurotoxic effect of CSE on the brain and may accelerate neurodegeneration, while flavonoids such as Hesperetin exhibit neuroprotective effects against cognitive impairment and neurodegenerative disorders.



Evaluation of therapeutic potential of extracellular vesicles derived from probiotic *Lactobacillus* strain

Diksha Sharma and Ashok Kumar Yadav*

Department of Zoology

School of Life Sciences

Central University of Jammu, Samba, Jammu 181143, India

di24pzoo02@cuajammu.ac.in

ABSTRACT

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by impaired insulin signalling, hyperglycaemia, and chronic low-grade systemic inflammation, contributing significantly to global morbidity and mortality. Worldwide, hundreds of millions of adults are affected, and the prevalence continues to rise due to sedentary lifestyles and dietary changes. India alone bears one in four people with diabetes, with rapidly increasing incidence linked to urbanization and lifestyle transitions. Despite advances in pharmacotherapy and lifestyle interventions, there is no permanent cure for T2DM and long-term disease management remains challenging. Currently a major focus in diabetes management involves dietary/probiotic interventions, as probiotics possess immense potential as biotherapeutics due to their ability to exert a wide range of physiological functions, including anti-diabetic effects. Emerging evidence shows that gut microbes communicate with the host through their metabolites and extracellular vesicles (nanosized carriers of proteins, metabolites and small RNAs) that directly modulate metabolic pathways. Therefore, *Lactobacillus* derived extracellular vesicles would potentially contribute as stable, cell-free postbiotic candidates with therapeutic potential for insulin resistance and type 2 diabetes.



Neurodevelopmental Consequences and Behavioural Dysregulation Following TBBPA-DHEE Exposure in Zebrafish

Vineet Kumar, Ankita Dwivedi and Deepali Jat

Department of Zoology,

Dr. Harisingh Gour Vishwavidyalaya (A Central University) Sagar, Madhya Pradesh.

vineet.mourya450@gmail.com

ABSTRACT

Environmental contaminants are increasingly recognized as key contributors to the development and progression of both neurodegenerative and neurodevelopmental disorders. Among brominated flame retardants, tetrabromobisphenol A (TBBPA) is extensively manufactured and widely applied in products such as electronic devices, household furnishings, textiles, and plastic-based materials. TBBPA has several chemical analogues, of which tetrabromobisphenol A-bis (2-hydroxyethyl) ether (TBBPA-DHEE) has attracted increasing attention due to its enhanced toxicity and potential threat to human health. This study was designed to examine the concentration-dependent neurotoxic and developmental impacts of TBBPA-DHEE using zebrafish (*Danio rerio*) at both adult and larval stages as a model system. Adult zebrafish were subjected to varying doses of TBBPA-DHEE, followed by assessments of biometric parameters and behavioural performance over an extended exposure period. Behavioural endpoints included measurements of locomotor performance, anxiety-related responses, and social behavioural across multiple days of exposure. Higher levels of TBBPA-DHEE exposure led to pronounced reductions in locomotor activity, elevated anxiety-like responses indicated by delayed exploration of the lower zones in a novel tank test, and significant impairments in social interactions. To evaluate developmental toxicity, embryos derived from exposed adult zebrafish will be examined for morphological and developmental defects. Overall, the results indicate that TBBPA-DHEE elicits substantial dose-dependent neurobehavioural alterations and developmental toxicity in zebrafish, highlighting its potential neurocognitive risks and raising important concerns regarding its relevance to human environmental exposure.



Lifestyle Behaviours and Clinical Characteristics of Coronary Artery Disease Patients in a North India

Shashwat Singh¹, Chandra Narain Saxena², Suchit Swaroop^{1*}

¹ Experimental and Public Health Laboratory

Department of Zoology, University of Lucknow, Lucknow, 226007

² Department of Zoology, Sri JNMPG (KKC) College, Lucknow, 226004

singhshashwat94@gmail.com

ABSTRACT

India is experiencing a steady rise in coronary artery disease (CAD), influenced by rapid socioeconomic changes, sedentary lifestyles, and increasing metabolic risk factors. Evaluating patient-level characteristics can help identify key contributors to disease burden. The present study aimed to describe the sociodemographic profile, lifestyle behaviours, and clinical features of CAD patients in North India and to explore their relationship with diabetes mellitus and other risk factors. This cross-sectional study included 142 diagnosed CAD patients aged 15–80 years, enrolled from two hospitals in Uttar Pradesh between September 2024 and March 2025. Information on demographics, anthropometry, physical activity, sleep patterns, and clinical history was collected using a standardized questionnaire. Descriptive statistical methods summarized participant characteristics, while independent t-tests were used to assess associations between variables such as sex and BMI. A high prevalence of unhealthy lifestyle practices was observed, particularly low physical activity levels and disturbed sleep patterns. Diabetes mellitus was a common comorbidity among participants. Statistically significant differences in BMI were noted between male and female patients. Furthermore, individuals with a family history of CAD showed higher rates of diabetes. This study underscores the significant contribution of lifestyle and metabolic factors to CAD in North India. The findings support the need for region-specific preventive and intervention strategies aimed at reducing modifiable risk factors and improving cardiovascular outcomes.



Human Health and Welfare: A Key to Sustainable Development

Anurag Namdev

Maa Kankeshwari Devi Government College, Indore, M.P.

anuragnamdev349@gmail.com

ABSTRACT

Human health and welfare are fundamental to the overall development and well-being of individuals and society. Good health enables people to lead productive lives, contribute to economic growth, and maintain social harmony. Human welfare goes beyond the absence of disease and includes physical, mental, social, and emotional well-being. Factors such as nutrition, sanitation, clean drinking water, education, healthcare services, and a healthy environment play a crucial role in maintaining human health. In recent years, challenges such as lifestyle diseases, mental health issues, environmental pollution, poverty, and unequal access to healthcare have significantly affected human welfare. Public health programs, awareness campaigns, vaccination, maternal and child healthcare, and community participation are essential for improving health outcomes. Sustainable development and welfare policies should focus on preventive healthcare, health education, and social support systems to ensure equity and accessibility for all.



Pathological, Hematological, and Ultrastructural Alterations Induced by *Senga* sp. (Cestoda) in *Mastacembelus armatus*

Raghvendra Nirnanjan[#] and Malabika Sikdar

Department of Zoology
Dr. Harisingh Gour University, SAGAR-470003 (M.P.) INDIA
raghvendranirnanjan9556@gmail.com

ABSTRACT

Cestode infections represent a major constraint to freshwater fish health and aquaculture productivity. The present study investigates the pathological, hematological, and ultrastructural alterations induced by *Senga* sp. (Cestode) in the *Mastacembelus armatus*. Infected fish were collected from local water bodies, of Sagar and the isolated parasites were identified morphologically. Comprehensive analyses were performed to evaluate the impact of infection on host tissues and physiology. Histopathological examination of the intestine and liver revealed severe tissue damage, including villi erosion, epithelial damage, inflammatory cell infiltration, necrosis, vacuolization, and disruption of hepatic cords. Ultrastructural assessment using Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS) demonstrated marked alterations in tissue surface architecture, such as degeneration of microvilli, erosion of mucosal lining, and changes in elemental composition associated with parasitic attachment sites. Hematological and biochemical analyses showed significant deviations including reduced hemoglobin, RBC count, and MCV, suggesting anemia and physiological stress. Elevated WBCs, glucose, liver enzymes, and altered protein profiles indicated enhanced immune response and impaired metabolic function in infected fish. Overall, the study provides a comprehensive evaluation of the adverse effects of *Senga* sp. infection on the structural and physiological integrity of *Mastacembelus armatus*. These findings contribute valuable insights into cestode pathogenicity and highlight the need for improved parasite monitoring and management strategies in freshwater ecosystems.



Investigating the Developmental, Behavioural and Molecular Response of the sea urchin larvae to Food Availability

Aman Prakash[#], Tsvia Gildor, Smadar Ben Tabou de Leon^{*}

Department of Marine Biology
Leon H. Charney School of Marine Sciences, University of Haifa, Israel
prakashaman717@gmail.com

ABSTRACT

Food quality and quantity influence animal growth, health, and survival throughout life, particularly during sensitive embryonic and larval stages. Marine larvae experience strong fluctuations in food availability, and their capacity to adjust developmentally and behaviourally to these changes is critical for survival. In diverse organisms, from the basal cnidarians to humans, food availability and consumption activate dopamine signalling that leads to behavioural and neural changes. In sea urchin larvae, food availability in the pre-feeding stage have been shown to alter the size of the feeding structure through dopamine-dependent signalling. However, little is known about how larvae respond to food levels after feeding begins. Here, we used the Mediterranean sea urchin *Paracentrotus lividus* to investigate how food availability affects developmental and behavioural responses during both the pre- and post-feeding stages. Sea urchin larvae were grown in three different food concentrations and the size of the feeding structure was quantified. In the post-feeding stage, larvae grown in high-food conditions showed a significant reduction in feeding-structure size compared to those in low- and moderate-food environments, with this effect diminishing as feeding continued. Pharmacological manipulation of dopamine signalling revealed that dopamine activation led to pronounced shortening of the feeding structure, whereas dopamine inhibition caused its elongation. We also developed an assay to examine larval behavioural responses to food stimuli but did not detect preferential swimming toward food sources. Together, these findings demonstrate that dopamine signalling mediates the plastic response of sea urchin larvae to food availability even after feeding begins, linking environmental cues to the regulation of feeding structure growth and potentially to the emergence of adaptive feeding behaviours.



Do Sacred River Sections Safeguard Ichthyofauna? A systematic review from Selected Central Indian Rivers

Hitendra Kumar Sahu[#] and Sandeep Kumar

Department of Zoology

Dr. Harisingh Gour Viswavidyalaya, Sagar, Madhya Pradesh

hksahu0902@gmail.com

ABSTRACT

Rivers originating and flowing across the Central Indian Plateau region are shaped by the oldest geomorphological setup, the Vindhyan and Bundelkhand plateaus. These ecoregions support rich freshwater fish fauna. However, the increasing anthropogenic stressors have been reported to pose serious threats to the ichthyofauna. Sacred waters, including river stretches conserved through historical socio-religious traditions, are recognised as localised centres of aquatic biodiversity conservation, particularly fish fauna. The scientific exploration of such sacred waters is scarcely carried out in the Central Indian waters. Limited existing information pertains to the conventional community structure and composition analysis. The current work attempts to integrate seasonal dynamics, fish guilds, habitat heterogeneity, fish environment, and the level of threat in the selected sacred stretches of the Ken, Betwa and upper Narmada rivers. The identification of the sacred section will be carried out through a desktop survey followed by physical visits. The study is designed to answer the research question that sacred places play an important role in the preservation of the fish resources. The study aims to generate insights into the role of sacred river stretches as biodiversity refugia and to contribute baseline information for effective management and sustainable fish conservation.



Social Isolation Reorganizes Motivational Hierarchies Through Oxytocin-Dependent Frontal Theta Oscillations in Corticostriatal Circuits in rats

Rishika Tiwari[#], Shai Netser and Shlomo Wagner

Sagol Department of Neurobiology
University of Haifa, Israel, 3498838
rishikatiwari1998@gmail.com

ABSTRACT

We investigated how acute social isolation alters the balance between social and food-seeking motivation and identified the underlying neural mechanisms in the frontal corticostriatal circuits. Adult male rats underwent either group-housing or 7-day social isolation after multi-site electrode implantation targeting prelimbic cortex, infralimbic cortex, ventral orbitofrontal cortex, nucleus accumbens (core and shell), and lateral septum. Animals performed a social versus food choice task under satiety, 24-hour, and 48-hour food deprivation conditions. Local field potential recordings captured theta (4-12 Hz) and gamma (30-80 Hz) oscillations. A subset of isolated rats received oxytocin receptor antagonist (L-368,899) to assess causal mechanisms. Re-grouping experiments tested behavioral reversibility. Group-housed rats shifted from social to food preference under food deprivation, while isolated rats maintained robust social preference even after 24-hour deprivation. Isolated animals exhibited significantly elevated theta and gamma power across all recorded regions, with enhanced corticostriatal network coherence that intensified with food deprivation. Canonical correlation analysis revealed distinct dimensions encoding metabolic state versus housing condition. Re-socialization for 7 days failed to reverse these changes. Critically, oxytocin receptor antagonist treatment restored normal food preference in isolated rats and selectively reduced theta power in frontal regions without affecting gamma oscillations. Social isolation fundamentally reorganizes motivational hierarchies through persistent neural plasticity. Oxytocin signaling causally regulates these changes by modulating frontal theta oscillations, establishing a mechanistic link between social experience and reward circuit dynamics.



Soy Isoflavone Genistein Mitigates Phthalate-Induced Neurodegeneration in Zebrafish Models

Sneha Bibyan[#] and Deepali Jat

Department of Zoology,

Dr. Harisingh Gour Vishwavidyalaya (A Central University),

Sagar, Madhya Pradesh.

snehabibyan96@gmail.com

ABSTRACT

Neurons serve as the fundamental units for signal transmission from the central nervous system (CNS) to the peripheral nervous system. Environmental and endogenous stressors, however, disrupt synaptic transmission of electrical impulses and chemical neurotransmitters, progressively eroding neuronal architecture—a hallmark of neurodegeneration. This disruption underlies debilitating disorders such as Alzheimer's disease, Parkinson's disease, and amyotrophic lateral sclerosis (ALS). Recent studies implicate diethyl phthalate (DEP), a ubiquitous plasticiser in cosmetics and personal care products, as a contributor to neurotoxic damage. In zebrafish (*Danio rerio*), an established vertebrate model for neurotoxicity, acclimatised adult zebrafish exposed to DEP exhibit elevated reactive oxygen species (ROS) levels. This oxidative stress disrupts biochemical pathways and compromises mitochondrial membrane integrity. Concomitantly, DEP elicits neurobehavioral deficits, including reduced exploratory locomotion, thigmotaxis, and heightened anxiety-like responses in light/dark preference or novel tank diving assays. To counteract DEP-induced effects, genistein, a soy-derived isoflavone, was co-administered. Genistein scavenges ROS, bolsters antioxidant enzyme activity, stabilises mitochondrial membranes, and attenuates pro-inflammatory cascades; hence, it attributes a position for genistein as a promising ameliorative agent against phthalate-induced toxicity. These findings elucidate DEP's neurotoxic mechanisms and underscore genistein's therapeutic potential against environmental phthalate toxicity. Nonetheless, further investigations are warranted to delineate molecular pathways and extrapolate implications to human health.



Synbiotic-Induced Immuno-Endocrine Regulation of Testicular Function in Adult Male Japanese Quail

Aamir Khan[#], Malabika Sikdar and Rashmi Srivastava

Department of Zoology

Dr. Harisingh Gour Vishwavidyalaya (A Central University), Sagar, Madhya Pradesh

aamirk1293@gmail.com

ABSTRACT

Infertility and compromised reproductive health pose significant biological and economic challenges, particularly in avian production systems. The present study evaluated the combined and individual effects of dietary probiotics and prebiotics (synbiotics) on immune regulation and reproductive performance in adult male Japanese quail (*Coturnix coturnix japonica*). Mature males were orally supplemented for four weeks with a standard diet containing 1% *Lactobacillus rhamnosus*, *Bifidobacterium longum*, or mannan-oligosaccharides, administered either individually or in combination across distinct treatment groups. To elucidate the physiological impact of these supplements, oxidative stress markers (MDA, H_2O_2 , AOPPs), antioxidant defenses (SOD, catalase, GSH), immune-related cytokines (IL-1 β , IL-10), semen quality indices, reproductive hormones (LH, FSH, testosterone) and testicular immunolocalization of key reproductive regulators (ER α , ER β and 3 β HSD) were assessed. Synbiotic as well as single probiotic or prebiotic supplementation markedly attenuated oxidative stress while enhancing antioxidant capacity. These effects were accompanied by improved testicular morphology, enhanced sperm characteristics and elevated plasma steroid hormone concentrations. Moreover, improved testicular expression patterns of ER α and ER β , along with modulation of cytokine profiles, suggest mechanistic pathways through which probiotics and prebiotics may ameliorate male infertility. Overall, the findings demonstrate that dietary supplementation with probiotics and prebiotics promotes immune competence and reproductive efficiency in Japanese quail, highlighting their potential as nutritional strategies for improving poultry reproductive health and productivity.



Discovery of Endemic Earthworm Genus *Perionyx* Perrier, 1872 (Oligochaeta: Megascolecidae) Species Reveals Sikkim as a Natural Hub within Indian Organic Farming Systems

Avnish Kumar[#] and Shweta Yadav

Department of Zoology,
Dr. Harisingh Gour Vishwavidyalaya (A Central University),
Sagar 470003, Madhya Pradesh, India
avnish.gmr@gmail.com

ABSTRACT

The earthworm genus *Perionyx* Perrier, 1872 (Megascolecidae) is endemic to the Indian subcontinent and Southeast Asia, with the eastern Himalaya serving as a major diversification center. Certain *Perionyx* species, including *P. excavatus* and *P. ceylanensis*, are ecologically important as efficient vermicomposting agents that enhance soil organic carbon and support sustainable agriculture. Recent field surveys in Sikkim yielded *Perionyx* specimens with unique morpho-anatomical characters distinct from all known species. Comprehensive taxonomic analysis examined key diagnostic features: external morphology (body dimensions, segmentation, setae, prostomium, dorsal pores, clitellum, reproductive pore arrangement, male field, penial setae) and internal anatomy (gizzard, spermathecae, seminal vesicles, hearts, prostates, intestine, caeca, nephridia). These specimens represent potentially novel taxa, establishing Sikkim as a significant hub of *Perionyx* diversity. The discovery highlights the region's potential for harboring endemic earthworm species with unique functional traits applicable to organic farming systems. These findings underscore the urgent need for systematic taxonomic surveys in the eastern Himalayan biodiversity hotspot to document earthworm diversity and evaluate its agronomic applications.



Assessing Soil Fauna Response to Polyurethane Microplastics using Earthworm as Bioindicator

Garima Stephen[#] and Shweta Yadav

Department of Zoology, School of Biological Sciences,
Dr Harisingh Gour Vishwavidyalaya (A Central University), Sagar- 470003,
Madhya Pradesh, India

garimastephan@gmail.com

ABSTRACT

Microplastics (MPs) have emerged as an escalating threat to global ecological stability, bridging both marine and terrestrial domains. Accelerated plastic production driven by anthropogenic pressure and systemic waste management failures has facilitated the extensive sequestration of these pollutants within soil matrices, jeopardizing both human health and the functionality of soil mesofauna. These ubiquitous, heterogeneous particles (typically <0.5 mm) necessitate rigorous scientific inquiry and strategic mitigation to preserve pedospheric integrity. MPs exert deleterious effects on soil biota by disrupting fundamental biological pillars, including nutritional acquisition, reproductive success, and metabolic homeostasis. Among these pollutants, polyurethane (PU) microplastics prevalent in industrial foams, coatings, and adhesives, present a significant yet under-researched risk to soil health. This study evaluates the ecotoxicological implications of PU MPs on the African nightcrawler (*Eudrilus eugeniae*), a sentinel earthworm species valued in soil health assessment and vermicomposting for its prolific reproduction and robust organic matter degradation. In a 56-day chronic exposure assay, *E. eugeniae* were subjected to a concentration gradient of PU MPs (0, 200, 400, 600, and 800 mg/kg). While no significant mortality was observed, results revealed a dose-dependent reduction in biomass. Ingestion was confirmed as the primary exposure pathway, leading to a comprehensive histopathological analysis of the gastrointestinal tract. Oxidative stress was quantified through the measurement of Catalase (CAT), Lipid Peroxidation (LPO), Superoxide Dismutase (SOD), and Reduced Glutathione (GSH), while neurotoxicity was assessed via Acetylcholinesterase (AChE) inhibition. Our findings indicate that *E. eugeniae* exhibits a lack of selective avoidance, readily ingesting microplastics instead of soil particles. Consequently, this species demonstrates high efficacy as a bioindicator for monitoring microplastic contamination and its subsequent physiological burdens in terrestrial ecosystems.



Integrated Multi-Biomarker Responses in Earthworm Coelomocytes: A comprehensive Meta-analysis

Shikha Upadhyay[#], Kiran Singh and Shweta Yadav*

Department of Zoology

School of Biological Sciences

Dr. Harisingh Gour, Vishwavidyalaya, Sagar (Madhya Pradesh), India

kmschweta@gmail.com

ABSTRACT

Agricultural soil is a major sink for pollutants like microplastics, which accumulate as a consequence of plastic mulching, wastewater irrigation, and the application of organic materials containing plastic residues as soil amendments. Soil organisms like earthworms are sensitive to microplastic exposure. Earthworm functions as an ecological engineer to mitigate the toxic effect of microplastic and it help to keep soil healthy because they have a strong immune and detoxification system. The most important cells in this system are coelomocytes, which float freely in the body fluid of earthworms. These cells help in defence, metabolism, and removal of toxic substances. Coelomocytes are of different types based on their structure and function. Amoebocytes protect the earthworm by engulfing pathogens and foreign particles and also help in wound healing. Eleocytes (or chloragocytes) store nutrients and play a major role in detoxification, metal accumulation, and control of oxidative stress. Granulocytes support immunity by releasing antimicrobial substances, while hyaline cells help in transport and regulation of body fluids. Recent research shows that coelomocytes, especially chloragocytes, can act as scavengers of environmental pollutants, including nanoparticles. These cells can take in different pollutants like metal nanoparticles like zinc oxide (ZnO NPs), pesticides, and microplastics trap them inside, and reduce their harmful effects. Because of this ability, earthworms are considered natural cleaners of contaminated soil. In short, coelomocytes perform many functions such as immunity, detoxification, and pollutant removal, making earthworms useful bioindicators for soil health and toxicity assessment studies.



How Costly Is Losing a Leg for a Predator: *Cheilomenes sexmaculata* Fabricius (Coccinellidae)

Shriza Rai^{#1,2}, Saumya Rawat¹, Tripti Yadav¹ and Geetanjali Mishra¹

¹Ladybird Research Laboratory

Department of Zoology, University of Lucknow, 226007, India.

²Shri Jai Narain Misra Post Graduate College, Lucknow, Uttar Pradesh 226004

shrizarai@gmail.com

ABSTRACT

Sub-lethal injuries such as leg loss is common in mass-rearing conditions of ladybird beetles due to intense intraspecific interactions and extensive cannibalism, yet their consequences for predatory performance remain poorly understood. This study evaluated the effect of larval leg amputation and subsequent adult regeneration on predatory parameters in the ladybird beetle, *Cheilomenes sexmaculata*. Predation was assessed in amputated and control larvae, and in regenerated and control adults, using prey consumption, body weight gain, consumption rate, and conversion efficiency as indicators. Larval amputation did not result in significant differences in any of the predatory parameters compared to control larvae. Although amputated larvae showed a marginally higher overall prey consumption, they exhibited lower body weight gain, consumption rate, and conversion efficiency, suggesting diversion of energy toward limb regeneration rather than somatic growth. Similarly, regenerated adults showed no significant differences in overall prey consumption, consumption rate, body weight gain, or conversion efficiency when compared to control adults. Furthermore, regenerated adults consumed slightly more prey but gained less body weight, indicating possible internal physiological costs associated with regeneration without compromising predatory ability. Overall, the results demonstrated that the *C. sexmaculata* exhibited strong functional resilience to sub-lethal injury, supporting its effectiveness as a biological control agent despite regenerative energy costs.



Circadian Patterns in Pendent Cocoon Construction and FESEM-Based Surface Analysis of Bagworm Silk

Janhiphula Kanhar^{1#}, Priyoneel Basu² and *Sweta Arora^{1*}

¹Kalinga Institute of Social Sciences -Deemed University, Bhubaneswar-751024, Odisha, India

²Dr. Harisingh Gour Vishwavidyalaya (A central university) Sagar, Madhya Pradesh-470003, India

janhiphulakanhar@gmail.com

ABSTRACT

Bagworm moths are well-known pests of palm trees and various other plant species. Their larvae construct protective cases using natural materials such as leaves and bark, which are firmly attached to host plant branches with strong and resilient silk. During the pupation stage, the larvae display a distinctive behaviour in which they retract into their cases and spin cocoons while suspended from branches, moving rhythmically upward and downward. The present study demonstrates that bagworm larvae exhibit a clear diurnal rhythm in this pendulous cocoon-reeling behaviour. Observations conducted over seven consecutive days, and independently verified by volunteers, revealed a consistent rhythmic pattern in cocoon reeling and spinning activity, as confirmed by COSINOR analysis ($T = 12.30$ hours). A biphasic activity pattern was observed, likely associated with a dawn–dusk oscillator. In addition, the morphology of bagworm silk fibres was examined using Field Emission Scanning Electron Microscopy (FESEM) as part of an ongoing effort to elucidate their ecological functions and potential applications. Collectively, the behavioural observations and silk fibre analysis highlight the remarkable diurnal adaptations of bagworm moth larvae and underscore their ecological significance.



Assessment of rearing performance in the multivoltine Nistari race of the mulberry silkworm, *Bombyx mori* L. under thermal stress conditions

Tamal Das*[#] and Bhupendra Kumar

Department of Zoology
Banaras Hindu University, Varanasi-221005, India
dastamal9882@gmail.com

ABSTRACT

The Indian silk industry, especially in the eastern region, is largely based on multivoltine silkworms, and only indigenous multivoltine races, such as the Nistari race and its hybrids, are reared for commercial silk production. The mulberry silkworm (*Bombyx mori* L.) is a delicate insect that is highly sensitive to environmental fluctuations and experiences variable temperature conditions in its natural environment, making constant temperature conditions in experimental studies unrealistic. Therefore, we evaluated the rearing performance of the multivoltine Nistari race of the mulberry silkworm, *Bombyx mori* L., under repeated short-duration thermal stress conditions. In this experiment, larvae were exposed daily to short-duration heat and cold stress from hatching until the pre-spinning period, while the control group was reared under optimal environmental conditions. All data were statistically analyzed at the 5% significance level. The results indicated that repeated short-duration thermal stress reduced rearing performance, with significantly decreased larval length and weight, cocoon length, breadth, and weight, pupal length, breadth, and weight, as well as shell and silk gland weights compared to the control group. These findings suggest that repeated short-duration thermal stress adversely affects growth and biomass accumulation. Therefore, it is important to develop improved Nistari lines to enhance silk productivity under fluctuating climatic conditions.



Phytopesticidal Efficacy of p-Coumaric acid derived from *Blumea eriantha* (L) extract purified fraction BE-1 against stored grain pest Rice Weevil *Sitophilus oryzae* (L)

Neelima Tiwari¹, Pratima Khare¹ and Kapil K. Soni²

¹Sarojini Naidu Govt. Girls PG college, Bhopal

²Pharmacogenomics Lab.

Bioscience Department, Barkatullah University, Bhopal, M.P., India

ntmp007.nt@gmail.com

ABSTRACT

To isolate compound from plant extract for the management of stored grain pest Rice Weevil *Sitophilus oryzae*. Plants *Blumea eriantha* (L.) after identification and authentication shade dried and pulverized to isolate extract through Soxhlation in methanol and water (1:1) with percentage yield 9.88% and 12.64% and fractionated by thin layer (RF 0.42) methanol : water (50:50) as solvent system and column chromatography using same solvent system to get purified fraction BE-1, which was tested on pest *Sitophilus oryzae* orally for observing phytopesticidal efficacy by following probit analysis (Finney 1971). Fraction BE-1 was analyzed spectroscopically for the detection of bioactive compound p-Coumaric acid. *Blumea eriantha* BE-1 fraction was found more effective than synthetic drug available in market and shows mortality i.e. 5.33 ± 0.57 and 8.66 ± 0.57 at 50% and 100% concentration dosage in Rice Weevil respectively. Fraction BE-1 was analyzed spectroscopically and p-Coumaric acid was elucidated. The goodness of fit of all samples for the plant *Blumea eriantha* was assessed by Chi-square value, Cox andamp; Snell R² regression and Nagelkerke R² regression which is 16.507, 0.1285 and 0.1714 respectively, indicates the significant effect of extract concentration on mortality of insects.



Beyond Bioaccumulation: PET Micro-Fragments Drive Liver Dysfunction via Gut–Liver Axis Signaling

Divya Jyoti¹ and Reshma Sinha^{2*}

¹School of Bioengineering and Biosciences, Lovely Professional University, Phagwara (144411), Punjab, India

^{2*}Department of Animal Sciences, School of Life Sciences, Central University of Himachal Pradesh, Kangra (176206) India
sinhareshma89@gmail.com

ABSTRACT

Plastics micro-fragments dominate in the environment as evidenced by recent studies. Present study evaluates the impact of polyethylene (PET)- microplastic fragments (MF) on *Danio rerio* after oral exposure of 6 MPF per fish per day. Although FTIR analysis confirmed non-accumulation of micro-fragment in the liver tissue, alterations were evidenced through other endpoints. Fish liver still exhibited altered activity of superoxide dismutase (SOD), catalase (CAT), reduced glutathione (GSH) and glutathione-S-transferase (GST) in addition to elevated lipid peroxidation (LPO) at the end of 15 and 30 days. Histopathological alterations such as nuclear and cytoplasmic degeneration were observed after 15 days exposure period. These changes became more prominent by the end of 30 days including increased cytoplasmic degeneration and nuclear abnormalities such as pyknosis, karyolysis, and karyorrhexis. The gene expression analysis revealed downregulation of *sod1* and *cat*, while *p53* was found to be upregulated, indicating the activation of stress and apoptotic pathways. The analysis of gene expression suggested progressive cellular stress and liver dysfunction over time. Thus, the study demonstrates duration-dependent impact of PET- MF leading to increased oxidative stress and liver damage despite the absence of direct microplastic accumulation in liver tissues which may be attributed to gut-liver axis theory.



MC-LR-induced alterations in the unfolded protein response pathway in mice and the ameliorative effects of coenzyme Q10

Siddharth Rajput[#] and Raj Kumar Koiri^{*}

Biochemistry lab
Department of Zoology
Dr Harisingh Gour Vishwavidyalaya, Sagar [MP]
siddharth10may@gmail.com

ABSTRACT

Microcystin-LR (MC-LR), a potent hepatotoxin produced by cyanobacteria, is primarily associated with endoplasmic reticulum (ER) stress, leading to cellular dysfunction and toxicity. In this study, Swiss albino male mice were administered MC-LR at 10 µg/kg body weight (bw)/day intraperitoneally for 14 days. Another group received MC-LR along with coenzyme Q10 (CoQ10, 10 mg/kg bw/day, intramuscularly) as a co-treatment for 14 days. This study investigates the role of the unfolded protein response (UPR) in MC-LR-induced toxicity and evaluates the potential protective effects of CoQ10. The protein levels and expression of key UPR markers, including GRP78, GRP94, IRE1 α , XBP1, PERK, eIF2 α , ATF4, and ATF6, were analysed using Western blotting and Real-Time PCR. The findings reveal a significant upregulation of UPR markers GRP78 and GRP94, indicating the activation of UPR as a response to ER stress caused by MC-LR. Additionally, elevated levels of IRE1 α , XBP1, and PERK were also observed, supporting the involvement of UPR pathways. Furthermore, increased protein level and expression of ATF4 and ATF6 suggested downstream engagement of stress-related signalling³². Importantly, CoQ10 treatment markedly reduced the protein and mRNA expression of these UPR markers, indicating its ability to alleviate ER stress and restore cellular balance. These findings highlight the potential of CoQ10 as a treatment for reducing ER stress and cellular damage caused by MC-LR and offer a critical understanding of the involvement of UPR in MC-LR toxicity. This study emphasises the importance of targeting UPR pathways when developing treatments that protect against cyanobacterial toxins.



***Tinospora cordifolia* (Giloy) downregulates D-Galactose induced aging via AMPK-SIRT1 pathway in liver and testes of a mouse model**

Bhupender Singh^{1,2, #} and Jogeswar S. Purohit^{2 *}

¹ Department of Zoology

University of Delhi, Delhi, India, 110007

² Cluster Innovation Centre

University of Delhi, Delhi, India, 110007

jspurohit@cic.du.ac.in

ABSTRACT

D-Galactose has recently been reported to induce aging in animal models. Additionally, *Tinospora cordifolia* (Giloy) has been reported to possess anti-aging properties. However, the biochemical pathway mediating the reversal of aging by *Tinospora cordifolia* in the D-Galactose-induced aging mice remains elusive. Here, we established an assay system for aging induction by injecting D-Galactose in the mouse model. Moreover, the induction in the aging was downregulated by feeding *Tinospora cordifolia*. Following treatments, the animals were sacrificed, and the liver, testes, brain, and blood tissues were collected. Serum of blood and total proteins from the tissue extracts were assayed for inflammation and oxidative stress by ELISA, western blotting and enzyme assays and the underlying pathway was delineated. The results indicated that *Tinospora cordifolia* improved the antioxidant system, with elevated levels of superoxide dismutase, glutathione, and catalase activity in the tissues. Further, there was a concomitant reduction in the levels of malondialdehyde activity in the tissues and AST and ALT activities in the serum. The antiaging effect of *Tinospora cordifolia* was further confirmed by a decrease in inflammation, as inflammatory cytokines (TNF- α , IL-6, IL-10, and TGF- β 1) were downregulated, and anti-inflammatory cytokines (IL-10) were upregulated in serum. Immunoblot analysis revealed that cytoprotective mechanisms were enhanced by downregulation of the p53-p21 and p16-pRb pathways in the tissues. Furthermore, our efforts to delineate the pathways of aging induction and downregulation by D-Galactose and *Tinospora cordifolia*, respectively, indicated to act via the AMPK-SIRT1 pathway in the mouse liver and testes.



Systems-Level Insights into Agrochemical Impacts on Earthworms: Evidence from Metabolomic Meta-Analysis

Praddum Kumar Namdev* and Shweta Yadav

Earthworm and Molecular Biology Laboratory, Department of Zoology,
School of Biological Sciences, Dr Harisingh Gour Vishwavidyalaya
(A Central University), Sagar- 470003, Madhya Pradesh, India

praddum.namdev0520@gmail.com

ABSTRACT

Agrochemical contamination represents a persistent pressure on soil ecosystems, yet the biochemical mechanisms underlying sublethal stress in soil fauna remain fragmented across individual studies. Here, we present a quantitative synthesis of earthworm metabolomic responses to agrochemicals using a meta-analytical framework integrating dose, exposure duration, toxicant class, and species identity. Fourteen eligible studies employing GC-MS, LC- MS, and NMR platforms were systematically evaluated using multilevel random-effects models and meta-regression. Across studies, increasing toxicant concentration was associated with a significant decline in overall metabolic activity, while prolonged exposure amplified metabolic disruption, indicating cumulative biochemical stress. Distinct class-specific signatures emerged: neonicotinoids consistently induced metabolic activation, whereas organophosphates and pyrethroids produced strong metabolic suppression. Pathway-level synthesis revealed coordinated upregulation of amino acid and energy metabolism alongside downregulation of carbohydrate metabolism and the tricarboxylic acid cycle, suggesting stress-driven metabolic reprogramming. Marked interspecific variability was observed, with tropical earthworms exhibiting greater metabolic sensitivity than the standard model species *Eisenia fetida*. Despite substantial heterogeneity among studies, reproducible trends were identified, demonstrating that metabolomics can capture early, mechanistic indicators of agrochemical stress that are not resolved by conventional toxicity endpoints. This synthesis highlights the need for standardized metabolomic protocols and supports the integration of metabolomics into ecological risk assessment frameworks for soil health monitoring.



GC–MS metabolomics and multi-level biomarkers reveal oxidative stress and metabolic disruption in earthworms exposed to LDPE microplastics

Kiran Singh and Shweta Yadav

Department of Zoology, School of Biological Sciences,

Dr. Harisingh Gour, Vishwavidyalaya, Sagar (Madhya Pradesh), India

kiransingh141094@gmail.com, kmshweta@gmail.com

ABSTRACT

Microplastic particles (< 5 mm) are now ubiquitous across terrestrial ecosystems, with polyethylene (PE), a widely used polymer particularly prevalent in agricultural soils. Accordingly, soil-dwelling invertebrates, especially earthworms encounter PE microplastics frequently. Earthworms of the species, *Eudrilus eugeniae* were exposed to adjacent environmentally realistic concentrations of polyethylene microplastics (0.05–1.0 g kg⁻¹) over a 56-day period to investigate biochemical and metabolomic effects. While survivability remained normal than growth, reproduction, and molecular disruptions emerged on exceeding concentration tested from 0.5 g kg⁻¹. Key antioxidant enzymes including, superoxide dismutase (SOD), catalase (CAT), and glutathione-S-transferase (GST) were significantly changed, accompanied by markedly increased lipid peroxidation (LPO), thus the signalling pronounced oxidative stress. Neurotoxic effects were also observed, as evidenced by altered acetylcholinesterase (AChE) activity. Additionally, untargeted GC–MS metabolomic profiling revealed widespread perturbations across multiple metabolic pathways: energy metabolism was disrupted, with altered glycolytic intermediates and tricarboxylic acid (TCA) cycle. Together, these findings demonstrate that sub-lethal even low-density PE microplastic exposure initiates a cascade of biomolecular dysfunctions oxidative damage, neurotoxicity, energy deficit, destabilized lipid membranes, and disrupted detoxification. By integrating traditional biochemical assays with high-resolution metabolomics, this study identifies early biomarkers of soil microplastic toxicity, elucidates mechanistic pathways in earthworm stress responses, and supports the refinement of ecological risk assessments as well as the design of targeted soil remediation and pollution mitigation strategies.



Melatonin-Loaded Nanoparticles: A Preclinical Review for Better Osteoporosis Treatment

Brijesh Prajapat[#] and Somenath Ghosh

Department of Zoology,

Dr. Harisingh Gour Vishwavidyalaya (A Central University),

Sagar, Madhya Pradesh

bk571064@gmail.com

ABSTRACT

Melatonin-loaded nanoparticles (MLNs) are currently an effective therapeutic approach for osteoporosis due to the superior capabilities of nanotechnology combined with the bone-protective properties of melatonin. When combined into nanosized carriers, drug absorption is enhanced, site-specific targeting is made possible, systemic side effects are decreased, controlled release is provided, and bone mineral density (BMD) is raised. Conventional osteoporosis treatments often result in adverse effects and poor patient compliance, which these properties address. Examples of nanocarriers that offer a range of platforms for efficiently delivering melatonin to bone tissues are “Chitosan Nanoparticles (CS-NPs), PLGA Nanoparticles, Hydroxyapatite Nanoparticles, Superparamagnetic Iron Oxide Nanoparticles (SPIONs), Exosomes, and Lipid Nanocarriers”. Despite their advantages, MLNs still have a number of challenges before they can be applied in clinical settings. Regulatory approval, toxicity, long-term safety, and scalable production concerns must all be appropriately managed. Furthermore, because osteoporosis is an ongoing problem, long-term animal and clinical trials are necessary to evaluate administration strategies, modify dosage, and determine efficacy. Ongoing studies on the molecular causes of osteoporosis and advancements in nanocarriers system will be necessary to provide safe, efficient, and site-specific therapies. MLNs may serve as adjuvants or the main therapeutic agents, even if their full biological potential is still unclear. Thus, continuing research will be necessary to advance MLNs from experimental models to clinical use. Whenever considered, MLNs are a novel and effective drug delivery technique that could improve the treatment of osteoporosis, reduce systemic issues, and significantly progress the development of drugs based on next-generation nanomedicine.



Eugenol loaded Chitosan Nanoparticles in Allergic Airway Inflammation: Metabolomic Profiling and Pathway Regulation of NF- κ B p65 and HDAC1 through *In Vivo* and *In Silico* Approaches

Kainat Usmani, Subodh Kumar Jain, and Shweta Yadav *

Department of Zoology

Dr. Harisingh Gour Vishwavidyalaya, A Central University, Sagar

470003, MP. India

kainatusmanisgr@gmail.com

ABSTRACT

Eugenol, the principal bioactive compound from *Syzygium aromaticum* L., is recognized for its strong anti-inflammatory effects and has been reported in numerous pharmacological studies to reduce asthma-induced inflammation. The present study aims to improve the thermal stability and therapeutic effectiveness of eugenol by encapsulating it within chitosan nanoparticles. Eugenol was encapsulated in chitosan nanoparticles using ionic gelation, and formulation parameters were refined through the Design of Experiment (DoE) approach to enhance its stability and delivery. The synthesized eugenol-chitosan nanoparticles, sized 50 to 200 nm, demonstrated superior dispersibility, which is a result of electrostatic and hydrogen bonding between eugenol molecules and the chitosan matrix. Enhanced dispersibility observed via SEM and TEM analyses implies a higher potential for bioavailability and therapeutic benefit in respiratory disease treatment. An allergic asthma phenotype was induced in Balb/c mice by sensitizing and challenging them with ovalbumin (OVA). A dose of EUGCNP (10 mg/kg) was administered to evaluate its effects on NF- κ B p65 and HDAC1 signaling pathways. Immunofluorescence and hematoxylin and eosin (HandE) staining techniques were used to examine inflammatory alterations. Analysis of metabolites in BALF and lung tissues identified alterations linked to EUGCNP administration. Pro inflammatory cytokines (IL-13, IL-4, IL-5, and TNF- α) were measured by ELISA, while molecular docking and molecular dynamics simulations elucidated EUGCNP's interactions with key regulatory targets. Treatment with EUGCNP significantly lowered the increased expression of NF- κ B p65 and HDAC1 seen in the asthma group, suggesting its effectiveness in mitigating airway inflammation.



Dia-Thor Assessment of Diatom Communities: Evaluating Ecological Health of Ken-Betwa River Linkage

Anuradha Yadav[#], Arpita Srivastava and Jyoti Verma

Aquatic Ecology Lab, CMP College

Department of Zoology, University of Allahabad, Prayagraj, 211001

diatomatool@gmail.com

ABSTRACT

The Ken-Betwa Linking Project aims to enhance water availability for irrigation and domestic use, but its ecological implications necessitate a thorough assessment. This study employs diatoms as a biomonitoring tool to evaluate the water quality and environmental health of the Ken and Betwa rivers. Data from various sampling sites (B1 to B8 for Betwa and K1 to K8 for Ken) were analyzed using key ecological metrics, including species richness, Shannon's diversity index, and the Trophic Diatom Index (TDI). Diatom community composition further reflects water quality, with TDI values indicating varying pollution levels across sites. The analysis of chloroplast characteristics, including number and shape, provides insights into primary productivity and ecological adaptability. Additionally, metrics related to salinity preferences, oxygen levels, and saprobic levels underscore the importance of these parameters in supporting aquatic life. Overall, this study demonstrates that diatoms are effective bioindicators for assessing the ecological impacts of the Ken-Betwa Linking Project. Continuous monitoring of diatom communities and associated ecological metrics is essential for informing management strategies to preserve biodiversity and ensure sustainable water quality in the region. The findings emphasize the need for integrated approaches that balance developmental goals with ecological health in riverine systems.



Assessment of Functional Feeding Groups of Benthic Macroinvertebrates from the Bhagirathi River in Indian Himalaya

Jitendra, Asheesh Shivam Mishra[#] and Vijay Prakash Semwal

¹Benthic Ecology Lab, Department of Zoology,
Nehru Gram Bharati (Deemed to be University), Prayagraj-221505, U.P.

shivam_a2000@yahoo.co.in

ABSTRACT

The present study was focused to determine the distributional patterns of the functional feeding groups (FFG) benthic macroinvertebrate fauna in the river Bhagirathi. Bi-monthly macroinvertebrate samples were collected at seven sampling sites (S1–S7) during November 2023 to October 2024. Scrappers (31%) were most dominant group at S1, while gathering collectors (37%), filtering collectors (36%), predators (30%) and shredders (13%) at S7, S6, S3 and S4, respectively. Longitudinally, scrapers declined from S1 to S7, while gathering collectors increased from S1 to S7. However, no definite patterns were observed for filtering collectors, predators and shredders. Shredders, scrapers, gathering collectors, filtering collectors and predators were found significantly different among the stations. Longitudinally, scraper decreased while filtering collector increased from headwater to mouth. No definite patterns were observed for shredder, gathering collector and predator. Functionally, the river indicated shredder-scraper and collector-predator groups.



Diatom Diversity and Bioindication in Extremophile Hot Springs of Garhwal Himalaya

Jagriti Rai and Jyoti Verma

Aquatic Ecology Lab, Department of Zoology, CMP College, University of Allahabad,
Prayagraj-211001, India
jagriti.raio808@gmail.com

ABSTRACT

Hot springs represent unique extremophile habitats where diatom communities thrive under extreme physicochemical conditions, serving as valuable bioindicators of geothermal and ecological dynamics. This study investigates diatom assemblages in four prominent hot springs of Garhwal Himalaya—Sahastradhara, Gangnani, Tapovan, and Suryakund—characterized by temperatures ranging from 40–85°C, variable pH (6.5–9.0), and high mineral content. Samples were collected from epilithic and planktonic habitats, with diatoms identified morphologically using light microscopy, supplemented by ecological indexing (species richness, diversity indices, and pollution tolerance scores). A total of 42 diatom taxa were recorded, dominated by thermotolerant genera such as *Pinnularia*, *Navicula*, *Nitzschia* and *Cocconeis*, with site-specific variations reflecting thermal gradients and silica availability. Higher diversity at moderate-temperature sites (Sahastradhara, Tapovan) contrasted with low-diversity, stress-tolerant assemblages at hotter springs (Gangnani, Suryakund). These findings establish baseline diatom profiles for Himalayan geothermal ecosystems and highlight their potential as sentinels for monitoring climate-induced thermal shifts and geothermal pollution. Integrating diatom-based biomonitoring into hot spring conservation strategies will aid sustainable management of these fragile biodiversity hotspots.



Predicting the Invasion Potential of the Brazilian Earthworm *Pontoscolex corethrurus* Across India Through Species Distribution Modelling

Anupam Kumar* and Shweta Yadav

Department of Zoology

Dr. Harisingh Gour Vishwavidyalaya (A Central University),

Sagar, Madhya Pradesh, India- 470003

anupam.verma98284@gmail.com

ABSTRACT

Pontoscolex corethrurus, a tropical earthworm species native to the Neotropical regions of Brazil, is widely recognized as a highly invasive soil macrofauna capable of colonizing diverse habitats across tropical and subtropical regions. Its broad ecological tolerance, rapid reproductive capacity, and ability to persist in disturbed, agricultural, and urban environments contribute significantly to its invasion success. Once established, *P. corethrurus* often displaces native earthworm species, leading to declines in soil biodiversity and substantial alterations in soil structure, nutrient cycling, and microbial community composition. In this study, we modelled the potential distribution of *P. corethrurus* across India using an optimized Maximum Entropy (MaxEnt) species distribution modelling framework to assess its invasion risk. A total of 353 georeferenced occurrence records from published literature were utilized, covering diverse agro-ecological zones, including the Andaman and Nicobar Islands. Spatial filtering minimized sampling bias, and environmental predictors were screened to reduce multicollinearity. The optimized MaxEnt model exhibited strong predictive performance, identifying minimum temperature of the coldest month, elevation, soil organic carbon, precipitation seasonality, and soil texture as key determinants of habitat suitability. Spatial projections highlighted highly suitable regions, offering the first comprehensive, data-driven assessment of this species' invasion potential under changing climatic conditions.



Academic Campuses as Refuges for Urban Avian Diversity in Aligarh, India

Aditya Kumar Chauhan[#] and Pooja Kumari^{*}

Department of Zoology

Dharma Samaj College, Raja Mahendra Pratap Singh University, Aligarh (U.P) 202002, India.

pooja.lifescience@gmail.com

ABSTRACT

Urbanization is a major driver of biodiversity loss in rapidly developing Indian cities, where natural habitats are increasingly fragmented. In this context, academic institutions with relatively stable green spaces can play a significant role in conserving urban wildlife, particularly avian communities. The present study evaluates the contribution of academic campuses to avian diversity conservation in Aligarh, Uttar Pradesh, India, by documenting bird species richness and composition across three educational institutions: Dharma Samaj College (DSC), Shri Varshney College (SVC) and Shri Tika Ram Kanya Mahavidyalaya (STRKM). Avian diversity was assessed through systematic field surveys conducted during two time periods, from 15 March to 30 April and from 14 October to 4 December 2025. Birds were observed using binoculars and photographic records were obtained with a digital camera to aid in accurate species identification and documentation. Standard visual encounter and observational methods were employed across different habitat types within each campus. A total of 58 bird species were recorded across the three campuses, representing over 20% of the 288 bird species reported from Aligarh district on eBird to date. The recorded species belonged to various orders and families. Urban-tolerant species such as Brown Rock Chat, Rock Pigeon and Common Myna were dominant, whereas dense vegetation patches supported relatively sensitive species including Red-whiskered Bulbul and Greenish Warbler. Among the institutions, STRKM supported the highest avian species richness (51 species), followed by DSC (47 species), while SVC exhibited the lowest diversity (31 species). Variation in species composition and richness among campuses was likely influenced by differences in vegetation structure, habitat heterogeneity and campus management practices.



Isolation and Characterisation of Probiotic Lactic Acid Bacteria from Indigenous Cavity Nesting Honeybee, *Apis cerana*

Ankush Verma[#] and Sunil Kumar^{*}

Department of Animal Sciences

School of Life Sciences, Central University of Himachal Pradesh, Dharamshala, Kangra (HP)-176206

ankushvermaoffice402@gmail.com

ABSTRACT

Apis cerana is an essential pollinator for biodiversity conservation and food production in the cold Himalayan region, yet it faces increasing threats from environmental stressors such as climate change, pests, pesticide exposure, and competition from exotic species (*Apis mellifera*). Traditional apicultural practices often rely on antibiotics to mitigate biotic stressors; however, this adversely affects the bee health in the long term, as highlighted by recent studies. Therefore, we emphasise exploring gut microbiota for developing sustainable apiculture practices. In this study, we aim to isolate probiotic lactic acid bacteria (LAB) from the gut of *Apis cerana*. Foraging worker bees were collected from different agro-climatic zones of Himachal Pradesh. The gut was isolated, homogenised, serially diluted and spread on agar to isolate numerous lactic acid bacterial colonies. Bacterial colonies were re-streaked, purified and primary characterisation was done based on colony characteristics, gram staining, catalase and oxidase test. Isolated colonies were further tested for antimicrobial potential against two gram-positive and two gram-negative bacteria, i.e. *Escherichia coli*, *Staphylococcus aureus*, *Bacillus subtilis* and *Pseudomonas* sp. The samples AcM1, AcM2, AcM3, AcM4, AcM5, and AcA1 were found to possess antimicrobial potential and were subsequently screened for biochemical, physicochemical properties, tolerance to gastric conditions, safety analysis, physiological characterisation, and functional attributes. Molecular characterisation was performed through genomic DNA extraction using a non-phenol–chloroform method, followed by PCR amplification and sequencing. All isolates were found to possess strong probiotic potential, exhibiting favourable physicochemical characteristics, high cell adhesion capacity (auto-aggregation and cell surface hydrophobicity), and satisfactory safety and functional attributes. The findings demonstrate the presence of probiotic LAB with promising functional and antimicrobial properties in the gut of *A. cerana*. This highlights their potential application as sustainable natural alternatives to antibiotics for improving honeybee health and promoting sustainable apiculture practices.



Lepidopteran Diversity and Behavioural Responses in a Restoring Urban Wetland of Delhi

Ansh Pathak[#], Krish Narayan, Aaditya, Suresh Babu, Mayanglambam Ojit Kumar Singh^{*}

Department of Zoology, Ramjas College,
University of Delhi
ojitsingh@ramjas.du.ac.in

ABSTRACT

Rapid urbanization along the Yamuna floodplain in Delhi has led to extensive degradation of seasonal wetlands, resulting in altered habitat structure, environmental conditions, and species interactions. The present study examines Lepidopteran diversity and behavioural responses within a restoring urban wetland system, focusing on the Dheerpur Wetland Park and its surrounding landscape. Butterflies and moths (Lepidoptera), owing to their strong ecological association with vegetation and sensitivity to environmental gradients, were used to assess ecological patterns within the study area. Field surveys were carried out across multiple habitat zones to document butterfly and moth diversity. Nocturnal sampling of moths was conducted using light trap methods. More than 15 butterfly species and 10 moth species were recorded from the study site, representing a significant proportion of the Lepidopteran diversity reported from Delhi. Spatial variation in species richness and abundance was observed in relation to vegetation heterogeneity, ambient illumination, and localized environmental conditions. Moth assemblages exhibited distinct behavioural responses to variations in light intensity, indicating sensitivity to environmental cues influencing activity rhythms and biological timing. The results indicate that restoring urban wetlands can retain functional ecological complexity and support diverse insect assemblages despite surrounding anthropogenic pressures. Systematic documentation of Lepidopteran communities provides valuable insight into ecological change and highlights the ecological importance of maintaining heterogeneous habitats within urban landscapes.



Whispers of green: plant acoustics from perception to communication

Princi Gupta and Aarti Gupta

Department of Botany

Dr. Harisingh Gour Vishwavidyalaya (A Central University) Sagar

ap_aartig@dhsgsu.edu.in

ABSTRACT

Plants were traditionally considered to be silent bearers. However, continuous research efforts have been challenging such orthodox opinions to describe plants as communicative, alert, and acoustically expressive. Extensive research over the past few years have established the phenomenon of plant acoustics or phytoacoustic. Phytoacoustics is an emerging field studying how plants produce, perceive and respond to sounds and vibrations. Studies have suggested that sound and vibrations modulated the gene expression profile and enhanced the levels of soluble proteins, thereby, enhancing plants growth and development. Reportedly, plants exposed to high vibrational noise, grew significantly faster, flowered earlier and enhanced defence against pathogens. Such an understanding of perception and processing of sound and vibrations have ecological and agricultural implications. Here we intend to elaborate on the use and integration of phytoacoustics with artificial intelligence in agriculture.



Cue Driven Mating Dynamics in Ladybird Beetle, *Cheilomenes sexmaculata* (Fabricius)

Deeksha Jattan*, Ashutosh Singh, Geetanjali Mishra

Ladybird Research Laboratory, Department of Zoology, Yeast Microbiology Lab,
Department of Biochemistry, University of Lucknow, Lucknow, Uttar Pradesh – 226007
deekshajattan2908@gmail.com

ABSTRACT

The integration of multiple sensory cues plays a critical role in enabling successful mating interactions in insects. Although many studies on insect communication focus on single modalities (largely for ease of interpretation), natural mating behaviour typically relies on the simultaneous processing of multiple sensory signals. Consequently, the individual and relative contributions of different cues to mating decisions remain poorly understood. The present study aims to examine the role of specific sensory cues in mating behaviour and to evaluate how mating responses change when multiple cues are combined. Behavioural bioassays were conducted alongside chemical profile characterization using gas chromatography–mass spectrometry (GC–MS). Results showed that males were able to recognize females using visual cues alone, as indicated by aedeagus extrusion during mating attempts. However, chemical and behavioural cues each conferred distinct advantages and contributed uniquely to different stages of the mating process. These findings enhance our understanding of multimodal communication in insects and provide a foundation for future research targeting specific sensory cues, with potential applications in the development of more precise and effective pest management strategies.



Characterisation and Probiotic Dynamics of Selected Lactic Acid Bacteria Isolates from Honey Bee Gut

Rajat Bhatia[#] and Sunil Kumar Thakur^{*}

Department of Animal Sciences
Central University of Himachal Pradesh, India-176206
rajatchoudharyshiv@gmail.com

ABSTRACT

Probiotic development, delivery optimisation, interaction mechanism, and efficacy rely primarily on identifying, characterizing and understanding the dynamics of symbiotic microorganisms. Some strains of lactic acid bacteria (LAB) are considered probiotics, which have positive effects on the host's health. Gut microbiota of honeybees closely parallels that of the mammalian system, making them valuable models for studying gut microbial communities. Previous studies have identified symbiotic lactic acid bacteria that reside in different regions of the bee gut and their isolation through culturable and non-culturable methods. This study focuses on isolating and identifying potential probiotic gut bacteria from *Apis dorsata*, the giant honeybee species known for its significant ecological and economic importance. Using culture-dependent techniques and selective medium (MRS), 10 probiotic lactic acid bacteria (LAB) isolates - designated as Ad. A, Ad. B, Ad. C, B2-1, B2-2, B2-3, B6-3, B6-4, B6-5, and B6-6 were successfully isolated and cultivated from the gut of *A. dorsata*. Gram staining and the catalase test were initial screening criteria for selecting bacterial isolates. Safety criteria and probiotic profiling included acid and bile tolerance, adhesion ability (auto-aggregation and hydrophobicity), antibiotic resistance, and antimicrobial activity. All isolates inhibited both Gram-positive and Gram-negative pathogens, including *Staphylococcus aureus*, *E. coli*, and *Pseudomonas* sp., and were also found to be sensitive to the nine tested antibiotics. Strains were found to be moderately tolerant to stimulated gastric conditions (pH and bile conditions) and demonstrated high auto-aggregation (≥ 70) and hydrophobicity (≥ 62) percentages. Overall, the strains demonstrated promising probiotic properties, but further molecular characterisation is required to elucidate their species identity and genetic profiles.



Assessment of Antioxidant Enzyme Alterations Induced by Metabolites of *Paramyrothecium* and *Volutella* in Rat Liver Tissue

Anuj Singh and Rajkumar Koiri

Department of Zoology
School of Biological Sciences
Dr. Harisingh Gour University, Sagar
singhsushma614@gmail.com

ABSTRACT

This study investigates the toxicological and bio-modulatory effects of *Paramyrothecium* and *Volutella* secondary metabolites on mammalian hepatic systems. While fungal metabolites often pose physiological risks, their interactions with cellular antioxidant defence mechanisms remain a critical research area. Using an *in vitro* rat liver homogenate model, this study evaluated the modulation of the enzymatic antioxidant cascade. Total protein was estimated via the Lowry method to normalise enzyme activity, while Superoxide Dismutase (SOD) and Catalase (CAT) activities were quantified through spectrophotometric assays and Native Polyacrylamide Gel Electrophoresis (Native PAGE) profiling. The results reveal a significant elevation in SOD and CAT specific activities following exposure to fungal extracts, including *Pet* (ethyl acetate extract of *Paramyrothecium*), *Pme* (methanol extract of *Paramyrothecium*), and *Vet* (ethyl acetate extract of *Volutella*). Densitometric analysis of zymograms confirmed the up-regulation of SOD1 and SOD2 isoforms, particularly mitochondrial Mn-SOD (SOD2). Unlike typical hepatotoxins that deplete antioxidant reserves, these findings demonstrate a distinct preservation and enhancement of enzyme levels. This suggests potential protective antioxidant modulation, likely mediated by bioactive secondary metabolites such as phenols or flavonoids. This coordinated response indicates that *Paramyrothecium* and *Volutella* extracts actively interact with the mammalian redox environment to facilitate cellular detoxification. The study highlights the complex bioactive potential of environmental fungal metabolites and underscores the need for further molecular investigation to determine their therapeutic or toxicological thresholds.



CRISPR for Conservation: Risks and Rewards

Shanta Kumari Panda

Department of Zoology

School of Biological Sciences, Dr. Harisingh Gour Vishwavidyalaya (A Central University),
Sagar- 470003, Madhya Pradesh, India

shantakumaripanda572@gmail.com

ABSTRACT

Global biodiversity loss threatens ecosystem stability and the services nature provides. CRISPR gene editing offers intriguing conservation possibilities, from boosting disease resistance in endangered species to controlling invasive populations. However, these powerful tools raise difficult questions about ecological safety and long-term consequences when applied to wild populations. We examined what CRISPR can realistically offer conservation biology and what risks accompany it. Our analysis evaluated current gene editing applications in threatened species management, tracking gene flow dynamics, off-target mutations, and ecosystem-level effects. We developed assessment frameworks combining molecular data with ecological modelling to understand real-world implications across multiple generations. The results reveal both promise and complexity. CRISPR interventions successfully enhanced disease resistance in controlled settings, showing genuine potential to help struggling populations. However, edited genes spread into non-target populations at rates of 15-40% depending on species mobility. Off-target mutations appeared in 3-8% of cases examined. Long-term evolutionary modelling suggested that without adaptive oversight, genetic interventions could reduce natural adaptive capacity by 25-35% over several generations. CRISPR offers conservation value but demands careful application through rigorous risk assessment, monitoring, and adaptive governance. In line with Viksit Bharat 2047, responsible integration of molecular technologies with traditional conservation can strengthen India's ecological resilience, protect endemic biodiversity, secure ecosystem services vital for agriculture and livelihoods, and position India as a leader in science-driven sustainable development. This approach envisions a future where cutting-edge biotechnology serves environmental stewardship, contributing to a scientifically empowered and ecologically secure nation.



Integrated farming system as a tool for sustainable agriculture and rural livelihood

Sumit Raj

Department of zoology

Dr Harisingh Gour Vishwavidyalaya Sagar [MP]

sr8198940@gmail.com

ABSTRACT

India faces a critical challenge in ensuring adequate food availability for its rapidly growing population of over 1.428 billion. Rapid population growth, urbanization, declining per capita land availability, and mounting pressure on natural resources have intensified concerns regarding food and livelihood security. This challenge is particularly acute for small and marginal farmers, who constitute the majority of the farming community and operate on limited landholdings with constrained resources. Conventional monoculture crop-based farming systems have become increasingly unsustainable due to high input costs, declining soil fertility, income instability, and vulnerability to climatic and market fluctuations. There is an urgent need for sustainable and diversified farming approaches that can enhance productivity, profitability, and resilience while efficiently utilizing limited farm resources and providing year-round income opportunities. The present study aims to evaluate the effectiveness of Integrated Farming Systems (IFS) in enhancing farm productivity, income generation, soil health, and livelihood security of small and marginal farmers. This study is based on a comprehensive review of published research articles, institutional reports, and documented field experiences from different agro-ecological regions of India, focusing on IFS models integrating crops with allied enterprises such as livestock, poultry, and fisheries. The findings indicate that Integrated Farming Systems significantly enhance overall farm productivity through efficient resource recycling, where the output of one component serves as the input for another. IFS reduces production costs, diversifies income sources, improves income stability, and enhances soil fertility. Additionally, IFS strengthens food and nutritional security and reduces risks associated with climatic variability and market uncertainties. Integrated Farming Systems emerge as a viable, sustainable, and resilient agricultural model capable of improving economic stability, environmental sustainability, and socio-economic upliftment of small and marginal farmers.



Emerging Micropollutants in Aquatic Environment: Occurrence, Environmental Fate, Toxicity, and Mitigation Approaches

Shvetambri Jasrotia[#] and Davinder Singh

Department of Zoology

School of Life Sciences, Central University of Jammu, Samba, Jammu.

shvetambri.zool@cuammu.ac.in

ABSTRACT

Emerging micropollutants have gained increasing global attention due to their ubiquitous presence, persistence and potential ecological risks in aquatic environments. These contaminants including pharmaceuticals, personal care products, Steroid hormones, pesticides, microplastics, Toxic Nanoparticles and heavy metals, are continuously introduced into freshwater through wastewater effluents, agricultural runoff, industrial discharges, and urban activities. Their persistence in the aquatic environments, even at extremely low concentrations ($\mu\text{g/L}$), has recently been recognised as hazardous. These pollutants induce environmental toxicity and detrimental health consequences in aquatic ecosystems and human health. Analysis of emerging micropollutants underscores the urgent need for comprehensive monitoring, particularly concerning human exposure via drinking water, as evidenced by studies linking these pollutants to health risks, including cancer. The focus of this review paper offers an approximate categorisation of emerging micropollutants and the detrimental effects they have on the aquatic ecosystem. Mitigation measures are crucial for reducing emerging micropollutants into the environment. The current study emphasises the critical need for innovative research and the implementation of effective mitigation technologies such as bioremediation to address this unavoidable environmental issue.



Present status of ecosystem health of the central Indian waters: A systematic review and implication for conservation framework

Raksha Khangar^{*#} and Sandeep Kumar

Department of Zoology

Doctor Harisingh Gour Vishwavidyalaya, Sagar, Madhya Pradesh

rairaksha9826@gmail.com

ABSTRACT

The rivers have historically sustained human-civilization, serving as center for settlement, culture and resource utilization. Since civilization first developed around water bodies, humans initiated the earliest forms of environmental management by conserving and safeguarding these freshwater ecosystems. Despite this long-standing relationship, rivers are now recognized as among the most threatened ecosystems worldwide, facing escalating anthropogenic pressures and climate-induced stressors. Effective management and conservation of the riverine ecosystems have thus become an unavoidable scientific and policy challenge. The present study systematically reviews scientific literature pertaining to the aquatic ecosystem health of Central Indian Rivers particularly those traversing the Bundelkhand Plateau-one of the geologically oldest landscape in the region. Standard protocol was followed to collect and synthesize information from the major research databases using carefully selected keywords Aquatic biodiversity and ecosystem; Fishes; Diatoms; Benthic Macroinvertebrates; Plankton; Ken and Betwa river to ensure comprehensive coverage. The review aims to provide an integrated understanding of the ecological status, to find the research gap and provide the baseline data, which is expected to assist the future ecosystem level monitoring of these water bodies to ensure effective management and hence long-term sustainability.



Early-Life Environmental Optimization Improves Zebrafish Developmental Outcomes

Shikha Kumari[#] and Deepali Jat*

Neuroscience Laboratory, Department of Zoology,
School of Biological Sciences, Dr. Harisingh Gour Vishwavidyalaya
(A Central University), Sagar- 470003, Madhya Pradesh.

y24265029@dhsgsu.edu.in

ABSTRACT

Zebrafish (*Danio rerio*) embryos are widely used in developmental biology and toxicology, yet high early-life mortality can compromise data quality, reproducibility, and animal welfare. In the present work, husbandry conditions in a newly established zebrafish facility were systematically optimized after observing consistent mortality of fries around the fourth day post-hatching when maintained in distilled water without prophylactic antifungal support. Initial spawns showed progressive loss of viability and visible fungal contamination on chorions and tank surfaces, indicating suboptimal physicochemical and microbiological conditions. To address this, a standardized E3 embryo medium (containing defined concentrations of NaCl, KCl, CaCl₂, and MgSO₄) was introduced in place of distilled water to provide stable ionic balance and support normal osmoregulation and development. In parallel, a zebrafish-safe antifungal additive at recommended low concentrations was incorporated, targeting fungal growth while remaining non-toxic to embryos and larvae, in line with established zebrafish husbandry practices. Following these interventions, survival up to and beyond 4 days post-fertilization markedly improved, with a visible reduction in fungus-related egg loss and better fry vigor, as judged by normal morphology and active free-swimming behavior. These observations demonstrate that simple yet evidence-based modifications to early-life support; specifically, the use of E3 medium and carefully selected antifungal agents; can substantially reduce unexplained early mortality in zebrafish cultures. This protocol refinement strengthens the reliability of downstream experimental work and provides a practical framework for laboratories newly setting up zebrafish systems or experiencing early-stage embryo and fry losses.



Helminth diversity and host interaction dynamics in Indian catfishes (*Heteropneustes fossilis* and *Clarius batrachus*)

Sonmati[#], Abhilash Choudhary and Payal Mahobiya

Department of Zoology

Dr. Harisingh Gour University, Sagar (M.P)

sonam13804@gmail.com

ABSTRACT

Helminth parasites are a major group of endoparasites infecting freshwater fishes in India and are responsible for various pathological effects that reduce fish health and productivity. Among Indian freshwater fishes, *Heteropneustes fossilis* and *Clarias batrachus* are economically and nutritionally important air-breathing catfishes widely distributed in rivers, ponds, lakes, and wetlands. These fishes act as suitable hosts for a wide diversity of helminth parasites, including trematodes, cestodes, nematodes, and acanthocephalans. The present review summarizes available literature on the occurrence, diversity, and distribution of helminth parasites reported from *Heteropneustes fossilis* and *Clarias batrachus* in different regions of India. Several researchers have documented high infection rates of helminths such as *Clinostomum*, *Allocreadium*, *Lytocestus*, *Proteocephalus*, *Camallanus*, and *Neoechinorhynchus* species in these hosts. The prevalence and intensity of infection vary depending on environmental conditions, host size, feeding habits, season, and geographical location. Helminth infections cause significant damage to vital organs such as the intestine, liver, and body cavity, leading to reduced growth, poor immunity, and sometimes mortality in fishes. Such infections not only affect natural fish populations but also create economic losses in aquaculture. This review highlights the need for regular parasitological monitoring and effective management strategies to control helminth infections. The compiled information will be useful for researchers, fishery biologists, and aquaculture managers working on fish health and parasite diversity in India.



Spatial Variation of Benthic Diatoms as Indicators of Anthropogenic Stress in Varuna River

Vindu, Asheesh Shivam Mishra[#] and Shweta Tiwari

Department of Zoology

Nehru Gram Bharati (Deemed to be University) Kotwa, Jamunipur, Prayagraj, U.P

Shivam_a2000@yahoo.co.in

ABSTRACT

Diatoms are widely recognized as an important forensic and ecological indicators. They are microscopic, unicellular algae predominantly inhabit aquatic environments and are characterized by siliceous cell walls and the presence of chlorophyll pigments that enable photosynthesis. The present study investigated the longitudinal distribution and abundance of benthic diatom assemblages along the Varuna River, a tributary of the Ganga. Samples were collected from the headwaters to the downstream reaches at four locations corresponding to S1 (Phulpur), S2 (Jaunpur), S3 (Varanasi) and S4 (Adikeshav ghat) during September months 2025. Standard protocols were followed for sample collection, slide preparation, and taxonomic identification. Total, 11 diatoms genera were recorded across all sampling stations. with a progressive increase in genera richness observed from upstream to downstream sections of the river belonging to family Bacillariaceae, Naviculaceae, Cymbellaceae, Stephanodiscaceae. The richness varied from S1 (8), S2 (6), S3 (5) and S4 (5). At S1, *Nitzschia* sp. (62.5%) was predominant taxa followed by *Navicula* sp. (37.5%), while at S2 *Bacillaria* sp. (83.3%) was most abundant taxa followed by *Cymbella* sp. (32.3%). Higher abundance of *Bacillaria* sp. (%) was recorded at S3 followed by *Navicula* sp. (75%), while *Cyclotella* sp. (85%) was dominant at S4. The variation in the abundance patterns was attributed to change in the land-use practices along the river course.



Strengthening Adaptive Capacities of Fish-Farming Communities through Climate-Resilient Models.

Vivek Kumar[#] and Akhilesh Kumar Verma

Department of Zoology

Bundelkhand University, Jhansi, U.P. 284128

vivekgautam890@gmail.com

ABSTRACT

The sustainability of small-scale aquaculture, which is essential to food security and stable livelihoods for vulnerable rural populations, is seriously threatened by climate change. The effectiveness of Climate-Resilient Management Models (CRMs) in strengthening these communities ability to adapt to rising environmental volatility is assessed. This research's goals were to identify site-specific climate risks, such as salinity intrusion, flooding, and thermal fluctuations; design localised management frameworks that combine indigenous knowledge with climate-smart technologies; and evaluate the ensuing socio-economic effects on household resilience. In order to accomplish this, a mixed-methods study design was used in four ecologically diverse zones, comparing CRM-enhanced ponds with conventional control sites through comparative field trials. In addition to deploying localised early warning systems for real-time water quality monitoring, the methodology combined quantitative data from several household surveys with qualitative focus group insights. The results show that, in comparison to communities using traditional methods, those using CRMs saw a considerable increase in fish survival rates during extreme weather events and a respectable increase in annual net income. Furthermore, these findings suggest that enhancing adaptive capacity is a multifaceted process that calls for the combination of strong social capital and technological innovation. Effective resilience is contingent upon the integration of scientific forecasting with community-led collective resource management. Research concludes that these CRMs provide a scalable and sustainable blueprint for global aquaculture, emphasising that long-term success depends on shifting from reactive crisis response to proactive, policy-integrated climate governance. This paradigm shift is essential for safeguarding protein production and rural livelihoods in an increasingly volatile global environment.



Omics-Based Signatures of Cyanotoxin-Induced Toxicity: A Systematic Review

Kishan Kumar Mourya[#], Brajesh Kumar Maurya, Raj Kumar Koiri

Department of Zoology

Dr. Harisingh Gour Vishwavidyalaya, (A Central University),

Sagar, Madhya Pradesh- 470003

mourya.kishankumar@gmail.com

ABSTRACT

The global increase in cyanobacterial harmful algal blooms has intensified concerns regarding exposure to cyanotoxins and their adverse effects on human, animal, and ecosystem health. While conventional toxicological studies have characterized many of the phenotypic outcomes of cyanotoxin exposure, they often provide limited insight into the underlying molecular mechanisms. Advances in omics technologies have enabled a more comprehensive evaluation of biological responses to toxicants at the genomic, transcriptomic, proteomic, and metabolomic levels. This systematic review critically examines current literature on omics-based signatures associated with cyanotoxin-induced toxicity. A structured literature search was conducted using scientific databases, PubMed, following established systematic review guidelines. Studies employing omics approaches to investigate the biological effects of cyanotoxins in experimental and environmental models were included. The selected studies were analyzed qualitatively to identify consistently reported molecular pathways and biomarkers of toxicity. Across the reviewed literature, omics investigations frequently indicate perturbations in oxidative stress regulation, mitochondrial function, inflammatory signaling, and xenobiotic metabolism following cyanotoxin exposure. Transcriptomic studies commonly report altered expression of genes related to apoptosis, antioxidant defense, and cellular stress responses, whereas proteomic and metabolomic analyses highlight disruptions in energy metabolism, lipid regulation, and neurotransmission. Evidence from integrated multi-omics studies suggests enhanced sensitivity in detecting early molecular alterations compared to single-omics approaches. At the end conclusion has derived that, omics-based analyses provide valuable mechanistic insight into cyanotoxin-induced toxicity and highlight potential biomarkers relevant for environmental surveillance and health risk assessment. Further harmonization of omics methodologies and data integration strategies is essential to strengthen their application in regulatory and environmental toxicology.



Comparative Bioinformatics Analysis of Melatonin Receptor in Human, Rat, and Fish

Priyanshi Patel[#] and Somenath Ghosh

Department of Zoology

Dr. Harisingh Gour Vishwavidyalaya (A Central University),

Sagar, Madhya Pradesh

ABSTRACT

The pineal gland is primarily responsible for producing the indoleamine hormone melatonin. It is essential to regulating circadian rhythm, sleep-wake cycles, and numerous other physiological processes, including antioxidant defense and immunological response. Its effects are mediated by G protein coupled receptors, mainly MT1 and MT2, which vary structurally and functionally across between species. Several bioinformatics tools were used to perform this comparative analysis: receptor sequences were retrieved in FASTA format from the NCBI; the STRING database was used to evaluate interaction profiles and binding affinities; Phyre2 was used to predict 3D structural models; and Biovia Discovery Studio (BDS) was used to evaluate molecular visualizations. This study provides a comparative bioinformatics analysis of melatonin-receptor interactions and their structure in human, rat, and fish. The aim is to investigate species specific differences in ligand binding and receptor configuration, which can affect downstream signaling pathways, and receptor sensitivity, as well as evolutionary conservation. These results revealed significant changes in binding site residues and interaction energies among the species, demonstrating evolutionary modifications in receptor function. Such findings may aid in facilitating the development of receptor targeted therapeutics and provide insightful information about the molecular variety of melatonin signaling.



Comparative Bioinformatics Study of Fish and Human Melatonin Receptors and Pineal Peptides

Umang Verma[#] and Somenath Ghosh

Department of Zoology

Dr. Harisingh Gour Vishwavidyalaya (A Central University),

Sagar, Madhya Pradesh, 470001

umang.uv.pk@gmail.com

ABSTRACT

The pineal gland releases melatonin, a neurohormone that regulates circadian rhythm, reproduction, and neuroendocrine balance. Melatonin acts physiologically through certain receptors and is influenced by pineal peptides. Although melatonin receptors have been extensively studied in mammals, limited information is known about how they relate to pineal peptides in other species, especially fish. The molecular characteristics, evolutionary conservation, and possible interactions between melatonin receptors and pineal peptides in fish and humans are examined in this study using a comparative bioinformatics approach. Multiple sequence alignment, phylogenetic reconstruction, and structural modeling were used to investigate the protein and peptide sequences that were obtained from public databases such as Clustal W, MEGA11, and AlphaFold. Docking simulations were used for predicting interactions between receptors and peptides. Strong conservation of transmembrane domains in melatonin receptors across species was discovered by comparative study, whereas extracellular regions that can affect peptide binding showed significant variability. Fish-specific receptors, like Mel1c, showed evolutionary branching in phylogenetic trees. According to docking studies, there are species-specific variations in the binding affinity of pineal peptides interactions with receptor extracellular loops. This comparative bioinformatics investigation shows that melatonin receptors and pineal peptides in fish and humans have both similar and different characteristics. The results indicate that species-dependent fine-tuning of receptor function by pineal peptides may represent evolutionary adaptations in neuroendocrine regulation. These findings provide the basis for possible therapeutic investigation in circadian and metabolic disorders as well as experimental validation.



Interplay of Heavy Metals and Water Physicochemical Properties in Cyanotoxin Production and Synergistic Mammalian Toxicity

Ankit Soni[#] and Raj Kumar Koiri

Department of Zoology,

Dr. Harisingh Gour Vishwavidyalaya (A Central University), Sagar, Madhya Pradesh.

soniankit17072003@gmail.com

ABSTRACT

Cyanobacterial blooms represent a growing environmental and public health challenge due to the concurrent occurrence of cyanotoxins and heavy metals in freshwater systems. Variations in water physicochemical properties, including pH, temperature, nutrient status, light availability, salinity, and redox potential, play a critical role in regulating cyanobacterial proliferation, metal speciation, and cyanotoxin biosynthesis. Heavy metals such as arsenic, cadmium, lead, mercury, and copper influence cyanobacterial metabolic processes by inducing oxidative stress, modifying enzyme activity, and affecting the expression of toxin-associated gene clusters, thereby altering the production of major cyanotoxins including microcystins, anatoxins, cylindrospermopsin, and saxitoxins. Simultaneously, physicochemical conditions govern metal mobility and bioavailability, facilitating their accumulation within cyanobacterial biomass and aquatic food webs. In mammalian systems, combined exposure to cyanotoxins and heavy metals leads to synergistic toxicological effects that are more severe than those induced by individual contaminants. Shared mechanistic pathways, including oxidative and nitrosative stress, mitochondrial dysfunction, neurotoxicity, endocrine disruption, and impaired hepatic detoxification, contribute to enhanced cellular and tissue injury. The interaction between cyanotoxins and metals may overwhelm antioxidant defenses, disrupt intracellular signalling pathways, and amplify inflammatory responses, thereby increasing vulnerability to chronic toxicity. The integrated influence of water physicochemical characteristics on cyanotoxin–metal interactions underscore the necessity for holistic risk assessment approaches. Incorporating multi-stress exposure scenarios, mechanistic biomarkers, and environmental modeling into monitoring frameworks will be essential for improving drinking water safety and mitigating cumulative ecological and human health risks associated with eutrophic and metal-contaminated waters.



Eco-Printing with Marigold Flowers: A Sustainable Approach to Natural Textile Printing

Arif Patel and Smurti Sohani

Department of Life Sciences
Sage University, Indore, Madhya Pradesh

ABSTRACT

Eco printing is a sustainable textile printing technique that utilizes natural pigments from plants to create unique patterns on fabric with minimal environmental impact. The present work explores the use of marigold (*Tagetes* spp.) flowers as a natural dye source for eco printing on cotton fabric. Fresh marigold flowers were arranged on the fabric surface, bundled, and subjected to steaming to facilitate pigment transfer. The results revealed vibrant yellow to orange floral impressions with organic and non-repeatable designs. The process demonstrated good color uptake and satisfactory wash fastness without the use of synthetic chemicals. This study highlights the potential of marigold flowers as an eco-friendly, biodegradable, and locally available resource for sustainable textile design. Eco printing with marigold flowers promotes environmental conservation while preserving traditional craft practices and offering aesthetic value to natural textiles.



Effects of Vibrational and Acoustic Stimuli on Earthworm Behaviour

Neeraj Kol[#] and Shweta Yadav

Department of Zoology,

Dr. Harisingh Gour, Vishwavidyalaya, Sagar (Madhya Pradesh), India

neerajkol676@gmail.com

ABSTRACT

Earthworms are critical ecosystem engineers that rely on mechanosensory perception to navigate the soil environment. As soil effectively transmits vibrational and acoustic signals, earthworms have evolved specialized sensory cells to detect such stimuli. Previous research indicates that low-frequency vibrations (<500 Hz) can induce emergence behavior in certain species, yet systematic understanding of species-specific responses and sensitivity thresholds remains limited. Additionally, anthropogenic noise pollution from machinery and infrastructure may disrupt earthworm behavior and soil ecosystem function. This study investigates earthworm behavioural responses to controlled vibrational stimuli using worm grunting experiments- a traditional technique that generates soil vibrations. By examining responses across different ecological groups (epigeic, endogeic, and anecic), this research aims to: (1) quantify species-specific vibrational sensitivity, (2) identify optimal frequencies for inducing emergence behavior, and (3) assess potential impacts of anthropogenic disturbances on soil-dwelling invertebrates. Results will contribute to understanding mechanosensory ecology in earthworms and inform conservation strategies for soil biodiversity in human-modified landscapes. Experimental trials are ongoing, with results to be reported upon completion.



Genetic Polymorphism and Diversity in Earthworm Populations: A Molecular Marker-Based Study

Neeraj Kapoor and Shweta Yadav

Department of Zoology,

Dr. Harisingh Gour Central University, Sagar, Madhya Pradesh 470003

neerajkr8227094892@gmail.com

ABSTRACT

Earthworms are crucial ecosystem engineers that regulate nutrient cycling, soil structure, and decomposition processes, yet genetic characterization of native populations remains limited in many regions, including central India. Despite global diversity exceeding 5,738 described species across 23 families and 312 genera, and India harboring 489 valid species within 9 families and 72 genera, molecular data are available for fewer than 10–20% of Indian taxa, hindering accurate species identification and conservation efforts. Traditional morphological taxonomy is often insufficient for accurate species identification due to phenotypic plasticity, cryptic diversity, and overlapping diagnostic characters, particularly in species complexes such as *Metaphire houlleti* and *Amyntas corticis*. This study assessed genetic polymorphism and diversity in earthworm populations from Dr. Harisingh Gour Vishwavidyalaya campus, Sagar, Madhya Pradesh, using molecular markers including mitochondrial COI gene sequences. Specimens were collected from multiple microhabitats across campus soils and analyzed to evaluate genetic variation and population structure. Preliminary results revealed significant polymorphism and substantial genetic heterogeneity within and among populations. Preliminary study identified distinct genetic groupings influenced by microenvironmental conditions and potential gene flow patterns. This study provides baseline molecular data for central Indian earthworms and demonstrates the value of integrating molecular approaches with traditional taxonomy for uncovering cryptic diversity, refining species boundaries, and supporting biodiversity conservation and ecosystem management.



Is Lakha Banjara Lake in Sagar Ecologically Managed? A Review and Its Implications for Integrated Lake Management

Pawan Kumar[#] and Sandeep Kumar

Aquatic Ecosystem Research Lab

Department of Zoology

Doctor Harisingh Gour Vishwavidyalaya, Sagar, Madhya Pradesh

ahirwarpavn@gmail.com

ABSTRACT

Lakha Banjara Lake represents a prominent urban freshwater ecosystem and serves as a central landmark within Sagar city. Recently, aesthetic enhancements such as improved embankments, recreational spaces, and other infrastructural developments have been completed under the Smart City Mission of the Government of India, reflecting ongoing initiatives aimed at integrated lake management. The ecological health of the lake remains a major concern within this framework. The present study reviews scientific investigations on the water quality of Lakha Banjara Lake, under the assumption that the lake is ecologically managed. Observations indicate that very little attention has been paid to the ecological aspects of the lake, despite its provision of enormous ecosystem services to local inhabitants. Available information has primarily focused on water quality using traditional methods, which are known for their limitations and often fail to adequately reflect ecological health. Biological water quality assessments based on parameters such as algal communities, macroinvertebrates, algal biomass, and cyanobacteria are lacking for Lakha Banjara Lake. This study hypothesizes that the efficacy of traditional water quality assessment methods is substantially limited when applied within integrated management frameworks. Accordingly, the present investigation contributes to the development of advanced ecological assessment protocols aimed at enhancing the sustainable management of Lakha Banjara Lake, while simultaneously supporting the conservation of its aquatic ecosystem.



Environmental and Ecological Assessment of Different Solids and Dissolved Oxygen in Shivganga Pond, Deoghar, Jharkhand, India

Pritam Sharma[#], Dr Nilesh Kumar, Dr NK Mandal

Department of Zoology
Sido Kanhu Murmu University Dumka Jharkhand India
pritamdistricticondeoghar@gmail.com

ABSTRACT

Freshwater ponds are ecologically significant ecosystems whose water quality directly influences aquatic biodiversity and environmental sustainability. The present study evaluates the environmental and ecological status of Shivganga Pond, Deoghar, Jharkhand, India, through a seasonal assessment of Total Dissolved Solids (TDS), Total Suspended Solids (TSS), and Dissolved Oxygen (DO). Water samples were collected quarterly during July 2024, October 2024, January 2025, and April 2025 to capture seasonal variations. TDS values ranged from 590 to 770 mg/L, with the highest concentration recorded during the summer season, indicating increased mineralization and organic matter decomposition. TSS showed maximum concentration during the monsoon period (33.66 mg/L), reflecting the influence of surface runoff and sediment inflow, while significantly lower values were observed during post-monsoon and winter months. Dissolved oxygen levels exhibited marked seasonal fluctuation, ranging from 0.63 to 6.2 mg/L, with critically low concentrations observed during summer, suggesting hypoxic conditions and ecological stress. The inverse relationship between solids concentration and dissolved oxygen highlights the impact of organic and particulate load on oxygen availability. The study emphasizes that seasonal variations and anthropogenic pressures significantly affect the ecological health of Shivganga Pond, underscoring the need for regular monitoring and sustainable management strategies to conserve this important freshwater ecosystem.



Ecology of insect-plant interaction in response to nitrogen fertilizer plasticity: A case study in *Zygogramma bicolorata*

Yuvraj Kumar[#] and Desh Deepak Chaudhary

Department of Zoology

Indira Gandhi National Tribal University, Amarkantak

Madhya Pradesh, India-484887

ABSTRACT

The application of fertilizers in agricultural fields is common. But along with crops, weeds often benefit from fertilizers. Generally, farmers use urea as nitrogen source to enhance productivity, but, unintentionally, some non-target phytophagous insects that primarily depend on plants for nutrition and shelter are also exposed to urea fertilizers. Present study was designed on *Zygogramma bicolorata* Pallister (Coleoptera: Chrysomelidae), a host-specific phytophagous beetle on *Parthenium hysterophorus*, which is an invasive dominant weed in agricultural fields to investigate behavioural and biochemical effect of urea (N=46g/kg) through three different treatment groups applied on host plant: control, low, and high (0, 1.8g, and 3.6 g urea/L of water). For this, 13-day-old adults were released into 13-day-old weed plants in daily-irrigated pots under the above conditions. Time to commencement of mating (TCM), latent period (LP), mating duration (MD), oviposition, and egg viability were recorded. The feeding potential of females and larval protein concentrations were analysed at different instar stages. The results revealed that MD was significantly higher in high-nitrogen-treatment and lowest in the control group. Clustered and scattered patterns of oviposition were observed on leaves in the low and high-nitrogen-treatment, respectively. However, feeding duration was longest in low-nitrogen-treatment, which might be due to fewer nitrogen molecules and thus, fewer defensive chemicals, providing beetles with an advantage in survival. The results of protein estimation showed significantly higher values in the 3rd instar of control group, while lowest were in high-nitrogen-treatment. So, it can be concluded that nitrogen can regulate behavioural and ecological aspects of *Parthenium* beetle.



Pathophysiological Insights and Social Determinant of HIV/AIDS and PCOD/PCOS in Human Health

Abhishek Kumar Yadav

School of Biological Sciences

Dr. Harisingh Gour Vishwavidyalaya, Sagar, Madhya Pradesh.

y24104006@dhgsu.edu.in

ABSTRACT

Human health is shaped by complex interactions between biological mechanisms and social determinants, particularly in diseases that carry major medical and societal consequences. Among such conditions, HIV/AIDS and Polycystic Ovary Syndrome (PCOD/PCOS) are two critical global health concerns affecting diverse populations. HIV/AIDS, caused by the Human Immunodeficiency Virus, progressively weakens the immune system through the depletion of CD4⁺ T-cells, increasing vulnerability to opportunistic infections and related complications. Although antiretroviral therapy and preventive measures have improved survival and quality of life, persistent social stigma, misinformation, and unequal access to healthcare continue to impede early diagnosis and effective management in many regions. In contrast, PCOD/PCOS is a widespread endocrine disorder among women of reproductive age, marked by hormonal imbalance, ovarian cyst formation, insulin resistance, and metabolic disturbances. Its underlying pathophysiology involves dysregulation of the hypothalamic-pituitary-ovarian axis, excess androgen production, and impaired glucose metabolism. However, sociocultural barriers, limited awareness of women's reproductive health, and unhealthy lifestyle patterns contribute to delayed detection and inadequate treatment. This study integrates pathophysiological insights with social determinants to analyze how biological and societal factors collectively influence the burden of HIV/AIDS and PCOD/PCOS. By synthesizing recent scientific literature and public health perspectives, the research underscores the need for combined biomedical interventions and community-based awareness programs to enhance early diagnosis, reduce stigma, promote equitable healthcare access, and improve overall human health outcomes.



Pathogenesis of Human Papillomavirus (HPV) in Cervical Cancer and the Preventive Role of Vaccination

Janvi

Department of Zoology,
Dr. Hari Singh Gaur Vishwavidyalaya,
(A Central University) Sagar, M.P.
janvi02092004@gmail.com

ABSTRACT

Cervical cancer remains a major global health concern and is among the most common malignancies affecting women worldwide. Persistent infection with high-risk human papillomavirus (HPV), particularly genotypes HPV-16 and HPV-18, is well established as the primary etiological factor in cervical carcinogenesis. This review is based on the work of * Amitabha Ray (2025) published in the International Journal of Molecular Sciences and examines the biological mechanisms through which HPV contributes to cervical cancer, along with additional host and environmental factors that influence disease progression. The review focuses on the molecular pathogenesis of HPV infection, highlighting viral entry into cervical epithelial cells and the oncogenic roles of the viral proteins E6 and E7. These proteins interfere with key tumor suppressor pathways, including p53 and retinoblastoma (Rb), leading to uncontrolled cellular proliferation. In addition to viral factors, the reviewed literature emphasizes the contribution of cofactors such as hormonal influences, tobacco exposure, immune dysfunction, co-infections, and alterations in the cervicovaginal microbiome, which collectively promote malignant transformation. The preventive role of prophylactic HPV vaccination is also discussed. The vaccine targets high-risk HPV genotypes and serves as a critical tool for primary prevention. Evidence summarized by Ray (2025), along with supporting global studies, demonstrates that vaccination prior to viral exposure significantly reduces HPV infection rates and the development of precancerous cervical lesions.



Endometriosis and Menstrual Distress: A synoptic study of Sagar city, Madhya Pradesh

Khushi Sharma

Department of Zoology,

Dr. Harisingh Gour Vishwavidyalaya, (A Central University) Sagar, M.P.

khushis2145@gmail.com

ABSTRACT

Endometriosis is an estrogenic-dependent inflammatory gynaecological chronic disorder. It significantly contributes to menstrual distress (MD) delayed diagnosis, and long-term impairment of women's health and welfare. The MD is a clinically meaningful indicator of underlying gynaecological pathology. The present work documents the level of menstrual distress and endometriosis menstrual dysfunction using a structured, non-invasive screening approach in the Sagar city of Madhya Pradesh. A cross-sectional, questionnaire was conducted targeting females of age group 18-40 years ($n > 120$) using the Endometriosis and MD Questionnaire. Alongside a clinically reviewed report, independently approved and verified by a gynaecologist was also considered. The study recorded moderate symptoms scores (13-25) in 69.1%; high (>26) in 12.2% and low (<10) in 18.7% of the questionnaire. Moderate scores were primarily associated with PCOS/PCOD, where menstrual changes were more closely linked to hormonal imbalance and metabolic factors rather than persistent pain. High scores ($n > 26$) showed a strong association with acyclic pelvic pain, severe dysmenorrhea, fatigue, dyspareunia, and gastrointestinal symptoms. These findings suggest inflammatory and estrogen-driven mechanisms involving prostaglandins, IL-6, TNF- α , VEGF, and related protein interaction networks. In contrast, low scores (LD) reflected mild and generally manageable symptoms. Menstrual distress should be recognized as an important clinical warning rather than a normal or harmless experience. Paying attention to these symptoms allows early identification of health risks, helps reduce delays in diagnosis, and supports fair and timely reproductive healthcare. Addressing menstrual distress in this way strengthens women's health outcomes and contributes to overall human well-being.



Cyanotoxins induced endocrine, immune disruption and Mammalian health implications

Aditi Lal[#] and Raj Kumar Koiri

Department of Zoology,

Dr. Harisingh Gour Vishwavidyalaya (A Central University), Sagar, Madhya Pradesh.

aditidaisylal2003@gmail.com

ABSTRACT

Cyanotoxins are bioactive secondary metabolites produced by cyanobacteria that frequently contaminate freshwater and coastal ecosystems worldwide. Increasing evidence indicates that chronic and acute exposure to cyanotoxins poses significant risks to mammalian health, particularly through disruption of endocrine and immune system homeostasis. This abstract synthesizes current understanding of cyanotoxin-induced endocrine and immune dysregulation and highlights their potential implications for mammalian health. Major cyanotoxins, including microcystins, cylindrospermopsin, anatoxins, and saxitoxins, interfere with hormonal signalling pathways by altering hormone synthesis, receptor binding, and intracellular signal transduction. These disruptions may lead to reproductive dysfunction, metabolic imbalance, thyroid irregularities, and altered stress responses. Concurrently, cyanotoxins modulate immune function by inducing oxidative stress, inflammatory signaling, and immunosuppression, affecting both innate and adaptive immune responses. From a public health perspective, long-term low-dose exposure through contaminated drinking water, food, or recreational activities represents an underrecognized risk, particularly for vulnerable populations such as infants, pregnant individuals, and immunocompromised hosts. Understanding the mechanistic basis of cyanotoxin-induced endocrine and immune disruption is essential for accurate risk assessment and the development of regulatory guidelines. Future research integrating toxicology, molecular endocrinology, and immunology is crucial to better predict mammalian health outcomes associated with environmental cyanotoxin exposure.



Melatonin receptors and pineal peptide interaction in rats and fish: an in-silico study

Ayushi Singh[#] and Somenath Ghosh

Department of Zoology

Dr. Harisingh Gour Vishwavidyalaya (A Central University),

Sagar, Madhya Pradesh, 470001

ABSTRACT

The pineal gland secretes melatonin, which uses particular receptors to control neuroendocrine balance, reproduction, and circadian rhythm. Pineal peptides are known to modulate pineal function and may affect receptor activity. Some of these peptides include epitalon and related regulatory molecules. Melatonin receptors have been identified in fish and mammals, but it is still unclear how these receptors relate to pineal peptides. The molecular characteristics, evolutionary conservation, and possible interactions between melatonin receptors and pineal peptides in fish and rats are the focus of this in silico study. Public database NCBI were used to obtain the protein sequences of rat melatonin receptors (MTNR1A, MTNR1B) and fish homologs (MTNR1A-homolog, MTNR1B-homolog and Mel1c). Peptide repositories were used to gather sequences of pineal peptides. Multiple sequence alignment, phylogenetic reconstruction, and structural modeling were used in comparative analyses. Docking simulations were used to predict receptor–peptide interactions. Transmembrane domains were found to be strongly conserved across species through sequence alignment, while extracellular regions showed divergence that might affect peptide binding. Phylogenetic analysis confirmed that fish-specific receptors underwent evolutionary branching. Pineal peptides interact with receptor extracellular loops, according to docking simulations, and their binding affinities may vary depending on the species. This in silico study reveals both similar and different characteristics of pineal peptides and melatonin receptors in fish and rats. These finding provide the basis for futuristic therapeutic and experimental validation in metabolic and circadian disorder.



Nattokinase as a Neuroprotective Representative in Brain Disorders

Hemant Ahirwal[#] and Priyoneel Basu

Department of Zoology

Dr. Harisingh Gour Vishwavidyalaya (A Central University),

Sagar, Madhya Pradesh, 470003

ABSTRACT

Nattokinase a bioactive extracellular serine protease with strong fibrinolytic, antithrombotic and cardiovascular protective qualities recent development have shown that Nattokinase (NK) is a promising multitarget neuro vascular modulator with therapeutic potential in both acute brain damage and chronic neurodegenerative illnesses extending its biological relevance beyond hemostatic regulation. Mechanistically, NK increases endogenous fibrinolysis by modifying tissue plasminogen activator, plasmin and plasminogen activator inhibitor-1 while directly breaking down fibrin and fibrinogen. NK limits ischemic infarct volume, reduces excitotoxicity, suppresses oxidative stress, and downregulates pro-inflammatory signaling pathway involving NF- κ B and microglial activation, according to preclinical research. Concurrently, NK has been linked to mitochondrial dysfunction, toxin-induced neuronal damage, and amyloid β aggregation and clearance, indicating relevance to Alzheimer's disease and environmentally caused neurodegeneration. Despite this encouraging result, nothing is known about NK's pharmacokinetics, bioavailability, blood-brain barrier permeability, and long-term safety, which limits translational advancement. The majority of the evidence comes from preclinical model, which emphasizes the necessity of carefully planned clinical studies that incorporate biomarker, neuroimaging, and cognitive endpoints. In addition to outlining future research priorities to establish NK as a viable adjunct or disease-modifying therapeutic strategy in neurological disorders, this review summarizes current mechanistic and experimental evidence supporting NK's neuroprotective potential across ischemic stroke, post-stroke cognitive impairment, Alzheimer's disease, and toxin-mediated neural injuries.



Influence of Circadian Rhythms on Cognitive Performance in Urban and Rural Settings

Mantu Meher[#], Sweta Arora and Priyoneel Basu

Department of Zoology,

Kalinga Institute of Social Sciences Deemed to be University, Bhubaneswar, Odisha

mehermantu2019@gmail.com

ABSTRACT

Circadian rhythms are inherent biological processes that coordinate the fluctuations of cognitive processes in the form of attention, processing speed, and reaction time on a daily basis. The differences in the lifestyle habits, working hours, and natural lighting exposure in both urban and rural areas could potentially adjust circadian alignment and resulting mental performance. The current research covers the effect of circadian rhythms on the cognitive functioning in urban and rural settings by examining participants at various times of the day. The cognitive activities assessing attention and reaction time were conducted in the morning, afternoon, evening and night sessions to obtain the diurnal variations of performance. The standardized self-report measures were used to measure chronotype and daytime sleepiness in order to consider personal circadian preferences. The sample was both shift and non-shift workers who were selected among urban and rural populations. The findings showed that there were strong time-of-day effects on cognitive performance with better performance being recorded during circadian-consistent times. The urban subjects, especially the shift workers, were more variable and less cognitive efficient during the misaligned hours compared to the rural ones, which had more consistent performance patterns. These results stress the impact of the circadian rhythms on cognitive performance in specific environmental conditions and emphasize the need to consider temporal impacts in work and health planning.



Variations of chronotype in tribal society: A comparison of urban and rural population in relation to sleep and health

Sambid Sunamajhi[#], Sweta Arora and Priyoneel Basu
Kalinga Institute of Social Sciences -Deemed University, Bhubaneswar, Odisha
majhisambid1998@gmail.com

ABSTRACT

We studied chronotype differences among tribal members in urban and rural areas, focusing on age, genetics, and environmental influences. Chronotype, which indicates an individual's preference for sleep-wake timing, can be morning, evening, or intermediate. While many studies exist for urban populations, research on tribal groups is limited. We analyzed data from 500 individuals and found that elderly individuals in rural areas were more likely to have morning-type chronotypes. In contrast, younger individuals in urban settings reported higher levels of daytime sleepiness, reflecting changes in sleep habits due to modern lifestyles. These findings highlight the complex interplay of environmental, socio-cultural, and biological factors affecting circadian rhythms and emphasize the need for context-sensitive sleep and health research. Further studies are essential to understand the long-term health implications of chronotype variations in tribal populations.



Biodiversity of lepidoptera in Sagar Madhya Pradesh

Anita Ahirwal and Smita Shukla

Department of Zoology

Dr. Harisingh Gour Vishwavidyalaya (A Central University), Sagar, Madhya Pradesh,
470001

ABSTRACT

Lepidoptera, comprising butterflies and moths, represent one of the most diverse and ecologically significant orders of insects, playing vital roles in pollination, food webs, and ecosystem stability. Due to their sensitivity to environmental changes, lepidopteran species are widely recognized as effective bioindicators of habitat quality and biodiversity health. The present dissertation titled “Biodiversity of Lepidoptera in Sagar” aims to document the diversity, distribution, and seasonal abundance of lepidopteran fauna in and around the Sagar region of Madhya Pradesh, an area characterized by heterogeneous landscapes including forest patches, agricultural fields, grasslands, wetlands, and semi-urban habitats. The study was conducted over a defined sampling period covering different seasons to capture variations in species composition and population dynamics. Standard field survey methods such as visual encounter surveys, line transect walks, and opportunistic sampling were employed for butterflies, while light trapping techniques were used for nocturnal moths. Species identification was carried out using standard taxonomic keys, field guides, and photographic documentation, ensuring accurate classification up to the species level wherever possible. Data on habitat type, host plants, and activity patterns were recorded to understand ecological associations. The findings of the study reveal considerable lepidopteran diversity in the Sagar region, with representatives from multiple families including Nymphalidae, Pieridae, Papilionidae, Lycaenidae, Hesperidae among butterflies, and Erebidae, Noctuidae, Geometridae, and Crambidae among moths. Variation in species richness and abundance was observed across different habitats, with forested and semi-natural areas supporting higher diversity compared to intensively cultivated and urbanized zones. Seasonal fluctuations were evident, with peak diversity recorded during the post-monsoon and early winter months, corresponding to increased vegetation cover and availability of nectar and larval host plants. The study also highlights the influence of anthropogenic factors such as habitat



fragmentation, pesticide use in agriculture, urban expansion, and deforestation on lepidopteran populations. Several species of conservation interest and habitat specialists were found to be restricted to relatively undisturbed areas, emphasizing the need for habitat protection. The presence of common, rare, and migratory species reflects the ecological complexity of the region and underscores the importance of Sagar as a significant habitat for lepidopteran biodiversity in central India. In conclusion, this dissertation provides a baseline inventory of Lepidoptera in the Sagar region and contributes valuable data to the limited regional studies on insect biodiversity. The findings underline the necessity for long-term monitoring, habitat conservation, and sustainable land-use practices to preserve lepidopteran diversity. This study not only enhances our understanding of local biodiversity but also supports broader conservation planning and environmental awareness initiatives.



A Systematic Review on Helminthes Fauna of Fishes of Ganga River

Bhavya, Anshika Yadav, Abhilash Choudhary and Payal Mahobiya

Department of Zoology, School of Biological Sciences

Dr. Harisingh Gour University, Sagar (M.P)

bhavyamishra@gmail.com

ABSTRACT

A systematic review of literature was carried out using major scientific databases and predefined inclusion criteria, and fifty relevant studies were analysed to assess geographical distribution, seasonal trends, host specificity, and zoonotic significance. The present study examines published research conducted between 2015 and 2025 on the helminth fauna of fishes of the Ganga River across Uttarakhand, Uttar Pradesh, Bihar, and West Bengal. Helminth infections represent one of the most widespread and damaging parasitic problems in freshwater fishes, affecting growth, and in some cases poisoning risks to human health. Ganga River, which supports one of the most important inland and freshwater fish assemblages in India, such infections have become very prominent. The results reveal a clear longitudinal gradient in infection patterns, with low prevalence in the cold, and progressively higher diversity and infection intensity in the middle and lower stretches, particularly in densely populated and polluted regions. Trematodes, cestodes, nematodes, and acanthocephalans constitute the dominant parasite groups, with peak infection levels generally reported during the monsoon season and increased availability of intermediate hosts. Host specificity varies among groups, being highest in trematodes and lowest in nematodes. Despite the growing volume of research, important gaps remain, as many stretches of the river are still poorly studied and several helminth forms remain inadequately described or not clearly assigned to established taxonomic groups. These limitations hinder reliable risk assessment and highlight the need for systematic surveys and improved taxonomic resolution.



Zebrafish- A Vertebrate Paradigm in Neuroscience Research

Ashutosh Kumar Nahak[#] and Deepali Jat

Department of Zoology

Dr. Harisingh Gour Vishwavidyalaya, Sagar, Madhya Pradesh, 470001

nahakashu4996@gmail.com; djat@dhsgsu.edu.in

ABSTRACT

Zebrafish as animal model in experimental setup is becoming a centre of shift from the contemporary rodent models. From budget friendly like economic feasibility to transparent embryonic development like biological attributes, it has testified apparently to be an epitome in terms of animal model for a wide range of scientific endeavours. But establishing standardized lab conditions to obtain maximum obvious results is a weak point leading to fish mortality and increased stress directly affecting the experimental procedure detrimentally. To address this, initial optimization focused on key water quality parameters: dissolved oxygen (DO, typically maintained at 6-8 mg/L), pH (7.0-8.0), and temperature (26-28°C). Zebrafish cohorts were acclimatized to these controlled aquaria conditions to mitigate acute stress responses. For the assessment of behaviour patterns of zebrafish various analysis was done including novel tank test, dark light test and open field test. These assays collectively indexed stress resilience and neurological homeostasis, serving as benchmarks for procedural standardization. Detailed dissections were conducted to map the morphology and anatomy of the zebrafish brain, identifying key regions responsible for the observed behaviours. Furthermore, immunohistochemical analysis was employed to visualize specific neural structures, providing a high-resolution view of the brain's architecture. Thus, integrating physicochemical optimization with behavioural and histological endpoints establishes robust protocols, enhancing zebrafish utility as a translational model.



Thermal Regimes govern development and reproductive output in a biocontrol agent, the ladybird beetles: A Systematic Review

Ekta Kumari ^{#*}, Lalit Prajapati, Krishna Murari, Smita Shukla and Shashwat Singh

Insect Behaviour and Biocontrol Research Laboratory
Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya (A Central University)
Sagar, Madhya Pradesh, 470001
ektak1794@gmail.com

ABSTRACT

All biological entities are susceptible to diurnal as well as temporal variation in thermal levels. Insects are poikilotherms, highly sensitive to temperature changes in their surroundings. In addition to affecting their growth and reproduction, these temperature variations serve as a sign of shifting photoperiods and, consequently, seasons. Many laboratory studies have been conducted to elucidate the impact of temperature on the development and reproduction of different organisms, including the biocontrol agent of aphid pest, *Menochilus sexmaculatus* (Coleoptera: Coccinellidae). The ladybird, *Menochilus sexmaculatus* (Fabricius, 1781) experiences changing temperatures every day and throughout the seasons. The previous studies suggested that the ladybirds laid the most eggs, and those eggs were healthiest, when experiencing a steady 27°C. The next best results came from temperatures that shifted daily but averaged around 30.3°C. Grew the quickest at a constant high temperature of 35°C, followed closely by a daily cycle that shifted between 35°C and 27 °C. When the temperature was swapped every 24 hours between very cold (15°C) and very hot (35°C), the ladybirds showed unusual and less predictable patterns in egg-laying and development. The understanding of best suited temperature would help supplement population fluctuations of these biological control agents to suppress insect pests.



Breast Cancer and the Immune System

Harshpreet Kaur

Dr. Harisingh Gour Vishwavidyalaya (A Central university) Sagar

ABSTRACT

Breast cancer is the most prevalent cancer among women globally and remains a major contributor to cancer-related deaths. While genetic mutations and hormonal factors are well-recognized drivers, increasing evidence shows that failure of immune surveillance is central to tumor progression and limited success of immunotherapy. A clear understanding of immune evasion mechanisms and reliable immune biomarkers is still lacking. This study used an integrative immuno-bioinformatics and systems biology approach to address two key research gaps: The molecular mechanisms underlying immune evasion in breast cancer and Lack of predictive immune biomarkers for therapeutic response. Immune-related molecules involved in antigen presentation, immune checkpoints, effector T-cell activity, regulatory immunity, and cytokine signaling were selected through systematic literature analysis. Expression patterns were examined, and protein–protein interaction networks were constructed using the STRING database. The analysis revealed that breast cancer exhibits coordinated immune suppression rather than isolated immune defects. Antigen presentation components were consistently reduced, limiting tumor recognition by cytotoxic T cells. Immunosuppressive pathways involving PD-L1, CTLA-4, FOXP3, and TGF- β 1 formed highly interconnected regulatory hubs, while immune activation markers such as CD8A and IFN- γ showed weaker connectivity. Single immune biomarkers demonstrated limited predictive value, whereas network-based immune signatures more accurately reflected immune responsiveness. Breast cancer immune evasion is a complex, network-driven process. Network-based immune biomarkers provide a more reliable framework for predicting therapeutic response and designing personalized immunotherapeutic strategies, supporting improved clinical outcomes and advancing human health and welfare.



A Systematic Review on the Natural antioxidant and Nutritional Profile of *Vigna radiata* (Mung Bean)

Kajal Kuchya, Abhilash Choudhary and Payal Mahobiya

Department of Zoology

School of Biological Sciences

Dr. Harisingh Gour Vishwavidhyalaya (A Central University), Sagar M.P.

kajalgupta85874@gmail.com

ABSTRACT

Vigna radiata (L.) R. Wilczek, commonly known as mung bean, is a widely consumed legume for its rich nutritional profile and bioactive compounds. This systematic review summarizes the nutritional composition, antioxidant and health promoting properties of mung bean seeds and sprouts, with particular focus on their role in oxidative stress-related disorders. Studies indicate that mung bean is a good source of protein, carbohydrates, dietary fiber, essential amino acids, vitamins and minerals such as Fe, Mg, K andamp; P. Germination enhance the bioavailability of phenolics, flavonoids, peptides, and secondary metabolites increased antioxidant activity. In vitro and animal studies shows that mung bean have bioactive strong antioxidant, hypolipidemic, antihypertensive, hepatoprotective, antimicrobial, anti-inflammatory, anti-diabetic, immunomodulatory and antitumor effects. These biological activities are mainly linked to compounds such as vitexin, isovitexin, polyphenols, bioactive peptides and dietary fibers that modulate oxidative stress, lipid metabolism, inflammatory pathways and glucose homeostasis. Despite promising findings, there remains a lack of organ-specific in vivo studies, particularly in mouse models focusing on the liver, kidney, brain, heart, pancreas andamp; lung. *Vigna radiata* as a nutritionally important functional food, antioxidant and therapeutic potential, with focus on the need for targeted organ-based research and human clinical trials to validate its clinical applications in disease prevention and nutrition.



Genetic enhancement of plant-based phytoremediation for lead contaminated soil

Kanika Sharma

Department of Zoology,
Dr. Harisingh Gour Vishwavidyalaya (A Central University)
Sagar, Madhya Pradesh.

ABSTRACT

Lead (Pb) contamination of soil remains a persistent environmental and public health concern due to its excessive industrial use, non-biodegradable nature and high toxicity. Conventional physical and chemical remediation strategies are sometimes expensive, energy-intensive, and environmentally disruptive, highlighting phytoremediation as a sustainable alternative. However, even though many studies exist, the efficiency of Pb phytoremediation remains limited by low Pb bioavailability in soil, restricted plant uptake, and inefficient root-to-shoot translocation. This review analyses recent advances in understanding the physiological, biochemical, and molecular mechanisms involving Pb uptake, accumulation, and detoxification in plants, with particular emphasis on metal transporter systems. Transporter families such as ZIP, NRAMP, and heavy metal ATPases (HMAs) facilitate nonspecific Pb entry through essential metal transport pathways but their limited specificity, saturation effects, and associated cellular toxicity constrain overall remediation efficiency. Fast-growing, high-biomass plant species, particularly those native to India, demonstrate notable tolerance to Pb stress, yet their phytoremediation potential remains underexploited due to incomplete optimization of transporter-mediated uptake and intracellular sequestration mechanisms. This review highlights the role of chelation, vacuolar sequestration, and antioxidant defence systems in Pb detoxification, and evaluates how their coordination with transporter activity influences Pb accumulation and plant fitness. By identifying key knowledge gaps particularly, the limited focus on Pb-specific transport optimization and the underrepresentation of native Indian species in molecular-level studies this review provides an integrated framework to guide future research. The synthesis presented here emphasizes the need to bridge mechanistic insights with applied strategies to advance efficient, scalable, and eco-friendly phytoremediation approaches for Pb-contaminated soils.



Prey species modulates the oviposition decision in the aphidophagous ladybird beetle, *Menochilus sexmaculatus*

Lalit Prajapati*[#], Krishna Murari, Ekta Kumari, Smita Shukla and Shashwat Singh

Insect Behaviour and Biocontrol Research Laboratory
Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya (A Central University),
Sagar, Madhya Pradesh, 470001, India
lalitprajapati628@gmail.com

ABSTRACT

Aphidophagous ladybird beetles are vital biological control agents, and their reproductive success is strongly influenced by prey quality. Most studies focused on fecundity and egg viability; however, little attention has been given to the timing of oviposition. This study assesses the effect of aphid prey species on oviposition decision, more specifically on the latency of oviposition in the ladybird beetle *Menochilus sexmaculatus* (Fabricius, 1781). Oviposition latency is defined as the time interval between adult pairing and the laying of the first egg batch. The experiment was performed with the aphid *Aphis nerii* (host plant: Nerium oleander) and compared with a previous study conducted with *Aphis craccivora* (Koch). Ten-day-old adults, consisting of 10 females and 10 males, were taken from the laboratory stock and allowed to mate until natural disengagement. Post-mating females were provided with *ad libitum* *A. nerii*, and the time (hours to days) taken by females to lay the first egg batch was recorded along with the fecundity and egg viability. The results revealed that females fed on *Aphis nerii* showed delayed initiation of oviposition as compared to a previous study conducted with *A. craccivora*. The present study suggested the prey-mediated modulation of oogenesis and oviposition in ladybird beetles. The findings demonstrated that aphid prey species not only affect the number of eggs and their viability but also the timing of oviposition decisions in *M. sexmaculatus*. This study points out oviposition latency as a sensitive early indicator of prey suitability and entails understanding predator–prey interactions.



Study on Inflammatory Response, Biochemical Profiling and Histopathological Alteration in Asian stinging catfish *Heteropneustes fossilis* Infested with Nematode parasites

Raghuveer Kumar Gupta and Malabika Sikdar

Department of Zoology,
Dr. Harisingh Gour Vishwavidyalaya (A Central University),
Sagar, Madhya Pradesh, 470001
raghuveergupta961@gmail.com

ABSTRACT

The pathological deformities and systemic inflammatory response induced by infection are regarded as fundamental aspects of nematode parasite pathophysiology. Parasitism poses a significant economic and health threat to freshwater catfishes, often leading to physiological stress and reduced host fitness. The objective of this study was to evaluate histopathological alterations, oxidative status, and immunological responses to infection. A total of thirty *Heteropneustes fossilis* (*H. fossilis*) fish specimens were utilized for this investigation, comprising fifteen healthy individuals and fifteen naturally infected with a nematode parasite. Due to a parasitic infection, an increased level of reactive oxygen species (ROS) impairs the host catfish's antioxidant defense system, which is crucial for protecting it against oxidative damage. After dissection, infection was confirmed during the examination of the fish. Infected tissues were examined for histopathological abnormalities and for oxidative stress parameters, including malondialdehyde (MDA), as well as antioxidants such as superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), glutathione reductase (GR), and glutathione (GSH). Gills, intestine, and liver tissue, as well as blood serum, were utilized to assess carbohydrate, protein, and lipid content. For health assessments, elemental mapping, haematological analysis, and various nutrition-related biochemical tests were conducted. Histopathological alterations and elevated oxidative stress markers (MDA) were observed, while levels of SOD, CAT, GPx, GR, and GSH were decreased in tissues infected with *H. fossilis*. It indicates that endoparasites significantly affect catfish tissues by inducing oxidative stress, altering antioxidant responses, and altering biochemical components. We examined the immunological status and observed a higher expression of inflammatory cytokines in infected tissue compared to non-infected tissue. It was also found that most minerals were decreased in EDS elemental mapping, while haematological parameters, such as white blood cells (WBCs), increased, whereas red blood cells (RBCs) decreased. Serum protein levels (g/dL) decreased, while glucose levels (mg/dL) increased in the infected group.



Histological injuries, oxidative stress, and markers of pathological damage may be elevated in infected tissue, indicating infection. Concurrently, the nutritional status of fish naturally infected with nematode parasites declines. The collective findings of this investigation unequivocally demonstrate that parasitic infection induces significant, quantifiable systemic damage in catfish tissue, resulting in diminished growth rates and heightened mortality.



AI-Designed Synthetic Symbionts for Human Health

Swati Maurya[#] and Sonam Jha

Department of Applied Microbiology
Dr. Hari Singh Gour Vishwavidyalaya, Sagar, (M.P.), India

ABSTRACT

Health problems caused by lifestyle, pollution, and stress are increasing worldwide. Most healthcare approaches focus on treating diseases after they occur, while preventive strategies get little attention. The human body naturally hosts many microorganisms that help with digestion, immunity, and overall health. Learning more about these helpful microbes and finding ways to improve their function could open new opportunities for preventive healthcare. This study aims to identify beneficial microorganisms found in humans using computational approaches and to design a stable synthetic microbial group that may support health. Microbiome and environmental datasets will be collected from publicly available scientific sources. These datasets will be examined to identify microorganisms commonly linked to positive health outcomes. Computational tools and AI models will be used to study how these microbes interact, whether they are compatible, and how they might work together. Based on these analyses, a synthetic microbial group will be designed and tested using computer simulations to check its stability and balance. No laboratory work or testing on humans or animals will be done at this stage. The study is expected to find a set of microorganisms that are compatible and work well together. Simulations are likely to show that the designed microbial group can coexist without one species overtaking the others.



A Step Towards Breaking Seasonal Barriers: Artificial Diet Based Rearing of *Cheilomenes sexmaculata* and *Propylea dissecta*

Lata Verma#, Taufik Rahman, Hera Alam, Tripti Yadav, Geetanjali Mishra and Omkar*

Ladybird Research Laboratory
Department of Zoology, University of Lucknow, Lucknow 226007, UP
Lataverma856@gmail.com

ABSTRACT

Ladybird beetles are key biological control agents in agricultural field due to their predation on a wide range of insect pests. Their large-scale utilization is limited by seasonal availability of natural prey, highlighting the need for an effective artificial diet to support continuous mass rearing. This study evaluated the suitability of an artificial diet for rearing *Cheilomenes sexmaculata* Fabricius and *Propylea dissecta* Mulsant and examined its effects on their development, mating behaviour, and reproductive performance. Artificial diet, formulated with high levels of nutrients, comprised beef, beef liver, shrimp, egg yolk, honey, sucrose, yeast extract, royal jelly, infant formula, vitamins, preservatives, antibiotics, agar, olive oil, and distilled water. Beetles fed the artificial diet were compared with those reared on natural prey to assess comparable biological performance. Developmental duration, mating parameters (Time to Commence Mating and Mating Duration), and reproductive parameters (Pre Oviposition Period, fecundity, and egg viability) were recorded. Results indicated that overall developmental durations of immature stages in both species were similar to controls, although slightly prolonged first instar and pupal stages were observed in *C. sexmaculata*. Mating behavior remained largely unaffected, with no differences in TCM, however, MD was reduced in *P. dissecta*. Reproductive performance showed certain constraints, including extended POP, reduced egg viability in both species, and lower fecundity in *P. dissecta*. Both species successfully oviposited in the absence of natural prey. These findings demonstrate that artificial diet can sustain ladybird beetles, though further refinement is needed to enhance reproductive outcomes.



Density-dependent selection in *Drosophila*: Amelioration of grandparental effects in hatching time

Mohnish Singh^{#1}, Bhawna Mittal², Bindya RS², Temura Chinmay Krishna², Sonia EJ², Amitabh Joshi² and Geetanjali Mishra^{*1}

¹Ladybird Research Laboratory

Department of Zoology

University of Lucknow, Lucknow-226007, UP

²Evolutionary Biology Lab, EOBu, JNCASR, Bengaluru, Karnataka

mohnlishsingh1@gmail.com

ABSTRACT

Recent experimental evolution studies on *Drosophila* populations adapted to chronic high larval density (LCU) have reported the evolution of larger egg size and a faster hatching rate compared to their low-density controls (MB). To follow up on these findings, we investigated the presence of heritable polymorphisms in egg traits, specifically egg size, hatching time, and viability, that are components of egg-to-adult development time and survivorship, respectively. Consistent with previous results, we find that LCU eggs are significantly larger in both width and length, and hatch faster than the controls (~0.4 hours faster). We also find an evolutionary cost associated with these traits, evidenced by reduced egg viability in the LCUs, particularly in the "Late" subpopulation. Furthermore, eggs from the MBs experienced a delay due to high grandparental larval density (GLD), whereas eggs from the LCU populations have evolved to be unaffected by high GLD. Thus, our studies also show that adaptation to larval crowding can lead to the amelioration of crowding effects from previous generations or transgenerational crowding effects.



Bioactive compounds from Earthworms: Diversity, Mechanisms of action, and pharmaceutical potential

Priyadarsani Mishra and Shweta Yadav

Department of Zoology,
Dr. Harisingh Gour Vishwavidyalaya (A Central University)
Sagar, 470003, Madhya Pradesh, India
priyadarsani0p4@gmail.com

ABSTRACT

Earthworms are widely recognized for their ecological functions; however, accumulating evidence indicates that they are also a rich source of bioactive compounds with significant pharmacological potential. This systematic review aims to comprehensively classify earthworm-derived bioactive compounds and critically evaluate their therapeutic activities, molecular mechanisms of action, and translational prospects. A structured literature search was conducted in Web of Science, PubMed, and Scopus databases for studies published between 1990 and June 2025, in accordance with PRISMA 2020 guidelines. Following rigorous screening and eligibility assessment, 61 original research articles were included for qualitative synthesis. The analysis reveals a diverse spectrum of bioactive compounds, including proteins, peptides, enzymes, lipids, polysaccharides, glycoproteins, and secondary metabolites. Key bioactive compounds, including lumbrokinase, lysenin, fetidins, lumbricin, antimicrobial peptides, antioxidant enzymes, and sulfated polysaccharides, exhibit broad pharmacological activities, encompassing antimicrobial, anti-inflammatory, antioxidant, fibrinolytic, wound-healing, anticancer, and cardioprotective effects. Mechanistic evidence demonstrates that these compounds modulate critical intracellular signalling pathways, notably PI3K–Akt, MAPK, HIF-1, and NF- κ B, leading to enhanced angiogenesis, immune regulation, cellular proliferation, and attenuation of oxidative stress and inflammation. Despite promising preclinical outcomes, challenges remain regarding species-specific variability, standardisation of extraction methods, scalability, toxicity assessment, and limited clinical validation. This review highlights key research gaps and emphasizes the need for advanced omics-based approaches and translational studies to facilitate the development of earthworm-derived bioactive compounds as novel therapeutic agents.



Exploring Oscillatory Gene Expression in *Euglena gracilis* Using Integrated Bioinformatics and Experimental Analysis

Ashish Kumar Sahu and Priyoneel Basu
Department of Zoology,
Doctor Harisingh Gour Vishwavidyalaya,
Sagar (M.P.), 470003
ashishkumar30121999@gmail.com

ABSTRACT

Oscillatory gene expression generates a rhythmic pattern in mRNA and specific protein expression. Circadian rhythms in protozoan models have not been sufficiently studied. *Euglena gracilis* is a mixotrophic protozoan exhibiting characteristics of both plants and animals. Several physiological and behavioural characteristics such as photosynthesis, phototaxis, chemotaxis, cell division, respiration, bioluminescence and zoo sporogenesis have been associated with oscillatory gene expression in *Euglena*. We attempted to identify conserved domains in genes responsible for rhythmic behaviour in *Euglena*, and searched for homology between protozoan and mammalian proteins to better understand how circadian genes have evolved. *In-silico* analyses revealed that adenylate cyclase and BLUF domain-containing proteins in bacteria and cyanobacteria have some degree of similarity with Photoactivated Adenylyl Cyclase (PAC) protein. Adenylyl cyclase modulates the bimodal shape-shifting seen in *Euglena*. Further, PKA, transient receptor potential-like protein (TRP), and calmodulin 2 (CaM2) from *Euglena* show a marked degree of similarity with their mammalian homologues, suggesting that the cAMP pathway that regulates gravitaxis and phototaxis in *Euglena* may have contributed to the evolution of photoperiod-regulated transcription-translation feedback loops in mammals.



Chikungunya virus (CHIKV) infection, a neglected tropical disease causes severe morbid symptoms that can be persistent and debilitating

Sayaree Pan

Virology Lab

Central council of Research in Homeopathy, Ministry of Ayush, Rajendra Chatterjee Road
50, near Alam Bazar, Alambazar, Baranagar, West Bengal 700035

ABSTRACT

CHIKV mediated pathogenesis is a complex combination of host and viral factors that results in immune responses causing incapacitating symptoms. A significant player of disease development is tumor necrosis factor- α (TNF- α), the villain responsible for unremitting inflammation and disease pathogenesis. This study explored the potential of TNF- α dysregulation that can enhance CHIKV mediated disease development along with the prospective of ultradiluted hydroethanolic preparation of *Eupatorium perfoliatum* to limit the symptoms. In silico molecular docking studies revealed that *Eupatorium perfoliatum* has strong molecular interactions with TNF- α . To substantiate the results, in vivo transcriptional and translational quantification of TNF- α by qRT-PCR and immunohistochemistry before and after treatment with candidate medicine was performed which produced similar outcome. Macroscopic and histology results also revealed neuropathogenesis and muscle waste caused by CHIKV infection and a systemic lowering of the same after treatment. Hub genes of TNF- α were analyzed to identify the other probable players that can augment CHIKV mediated pathogenesis. qRT-PCR results showed that the candidate medicine could lower the transcriptional overexpression of the hub genes thereby lowering disease pathogenesis. In vitro cytopathic effects upon infection were also lowered by the candidate medicine. Therefore, this study helps not only to recognize the possible villainous role of TNF- α but to also identify novel therapeutic markers of CHIKV mediated disease development by hub gene analysis and the potential of the alternative medicine, ultradiluted *Eupatorium perfoliatum* in lowering the same.



Sustainable use and Conservation of inland fisheries: Integrating Ecology, Assessment, and Governance

Aradhya Singh Parihar

Department of Zoology
Dr. Harisingh Gour Vishwavidyalaya, Sagar(M.P) India

ABSTRACT

Inland fisheries are essential for global food security, nutrition, and livelihoods. Currently, natural freshwater resources are under critical crisis. Rivers, lakes, floodplains, and reservoirs support diverse fish communities while providing essential ecosystem services to millions of people. Overexploitation, loss of aquatic habitat and fragmentation, water pollution, destruction by land use activities, the introduction of invasive aquatic species, over harvesting and changes in geochemical cycles and global climate change are major threats to freshwater biodiversity are affect both fish populations and the sustainability of fisheries dependent communities. Sustainable use depends on healthy ecosystems, while long-term conservation is strengthened when fisheries contribute to food security and livelihoods. The following dissertation explores recent interdisciplinary research as to how sustainable use and conservation of inland fisheries can be achieved. Prime reasons for the same are inadequate stock assessment, poor monitoring, and governance frameworks that fail to integrate fisheries into broader water and development planning. The requirement for ecosystem backed and adaptive management approach that account for habitat connectivity, and multi-species fisheries to sustain Aquatic Ecology. By Strengthening data-poor assessment methods, incorporating local ecological knowledge, and recognizing inland fisheries within ecosystem service and Sustainable Development Goal (SDG) frameworks will sustain the Inland fisheries and use. The paper proposes an integrated framework that links conservation objectives with sustainable use through cross-sectoral governance, offering pathways to enhance resilience and equity in inland fisheries management.



Plant-based therapeutic approaches in Type-1 and Type-2 diabetes: implications for the growing burden of diabetes in India

Aryan Khan

Department of Zoology
Dr. Harisingh Gour Vishwavidyalaya, Sagar(M.P) India

ABSTRACT

Diabetes mellitus is a chronic disorder characterized by high blood sugar due to impaired insulin production or action. Type-1 diabetes results from autoimmune destruction of pancreatic β -cells, while Type-2 diabetes involves insulin resistance and/or reduced β -cell function. Worldwide, over 800 million people are affected, with India alone accounting for about 212 million adults. Unlike Western populations, a notable proportion of Indian Type-2 diabetics are lean, showing normal or low BMI but impaired glucose regulation due to altered fat distribution, early β -cell decline, and genetic predisposition. Sedentary lifestyles and high-carbohydrate diets further increase risk. While standard medicines remain the main treatment, they often focus on symptom control and can have long-term side effects. Medicinal plants offer promising complementary strategies. Bioactive compounds such as polyphenols, flavonoids, saponins, and terpenoids can enhance insulin sensitivity, promote glucose uptake, reduce intestinal absorption, and modulate key signaling pathways (GLUT-4, PPAR γ). Plants such as *Momordica charantia*, *Trigonella foenum-graecum*, *Cinnamomum verum*, and others have demonstrated these benefits in preclinical and clinical studies. Although they cannot replace insulin in Type-1 diabetes, plant-based therapies may support Type-2 diabetes management, including in lean patients, especially when combined with modern medicines and lifestyle changes. This review highlights the potential of plant-derived therapies as multi-targeted, supportive interventions to reduce India's growing diabetes burden.



Status of genetic diversity and population dynamics of Asian silurid catfish, *Wallago attu* in Ganga River basin

Naveen Negi*, Ajit Kumar, Syed Ainul Hussain, Ruchi Badola, Sandeep Kumar Gupta

Ganga Aqualife Conservation Monitoring Centre (GACMC),
Wildlife Institute of India, Dehradun
naveen@wii.gov.in

ABSTRACT

The Ganga River System (GRS) is a biogeographic region with a complex geological history. The present study investigated genetic diversity, spatial connectivity and population structure of the Asian Silurid catfish *Wallago attu* in the Ganga River and its tributaries. We used three mtDNA regions: cytochrome c oxidase subunit I (COXI), cytochrome b (Cyt b) and the control region (CR) for the study. Our complete dataset includes 2420 bp of mtDNA collected from 176 *W. attu* individuals at 19 sample sites across GRS and its tributaries. High gene diversity ($H_d:0.99$) was found in *W. attu* populations and maximum genetic variations were found within the populations according to our findings. Analysis of Molecular Variance (AMOVA) showed that there was minimal to moderate genetic divergence among the populations of *W. attu*. Three different genetic clades were found via network analysis; however, they did not specifically correlate with the rivers under study. The demographic history of *W. attu* was revealed via Bayesian skyline plots, which suggested a recent population growth. Bayesian skyline plots gave insights into the demographic history of *W. attu*, suggesting a recent population explosion estimated to have occurred around 0.04 million years ago (mya) during the Pleistocene period. These findings enhanced the understanding of *W. attu*'s genetic diversity and spatial connectivity, which will serve as foundation for creating informed conservation strategies and the sustainable management of this commercially valuable resource within the Ganga River System.



Assessment of pesticide induced alterations in the molecular indices of earthworm, *Eudrilus eugeniae*

Ravi S Pandey* and Rishikesh K Tiwari

Biochemistry laboratory
Department of Zoology
University of Allahabad
rishijtiwari2017@gmail.com

ABSTRACT

University of Allahabad, Allahabad-211002, India. Pesticides of different chemical nature are applied simultaneously in agricultural field and earthworms get exposed not only to one group of pesticides but mostly by their combination which may alter the potential toxicity of pesticide in combination variably. The present study was aimed to explore the effect of combination of pesticide along with individual (chlorpyrifos (CPF), cypermethrin and their combination) on earthworm, *Eudrilus eugeniae*. *E. eugeniae* were exposed to 5% and 10% concentrations of insecticides (individual and combination) against LC 50 (0.165, 0.066 and 0.020 $\mu\text{g}/\text{cm}^2$ respectively) for 48h by paper contact toxicity method. Alterations in morpho-behavioral patterns like coiling, clitellar swelling, mucus release, and bleeding followed by segmentation of body in earthworm were observed during experimentation. Significant pesticide induced alterations in the molecular indices (DNA, RNA protein content and their ratios) of earthworm was recorded in the following sequence pre-clitellar, clitellar and post – clitellar regions upon exposure. Further, biochemical and histopathological studies are required to have insight into the mechanism of action of these pesticides.



Gestational Diabetes Mellitus and Future Cardiovascular Risk: Evidence from Maternal and Offspring Outcomes

Chandra Narain Saxena¹, Shashwat Singh², Suchit Swaroop^{2*}

¹Department of Zoology
Sri JNMPG (KKC) College, Lucknow, 226004, India

² Department of Zoology
University of Lucknow, 226007, India
ephlab19@gmail.com

ABSTRACT

Gestational diabetes mellitus (GDM) is a frequent metabolic complication of pregnancy that was once viewed as a temporary condition resolving after childbirth. Growing evidence indicates that GDM has lasting health implications, particularly increasing the long-term risk of cardiovascular disease (CVD) in affected women. Women with a history of GDM demonstrate a higher likelihood of developing hypertension, coronary artery disease, stroke, and heart failure, even in the absence of conventional cardiovascular risk factors. Emerging data also suggest that exposure to GDM in utero may adversely influence cardiovascular health in offspring. This study aims to summarize current evidence linking GDM to adverse cardiovascular outcomes, with a focus on maternal and offspring risk, underlying biological mechanisms, and implications for clinical practice and public health. A structured review of open-access studies was conducted, including meta-analyses, cohort studies, and mechanistic research. The included literature was evaluated for consistency of findings, magnitude of risk, and relevance to long-term cardiovascular outcomes. Across varied populations, women with prior GDM exhibited a 1.3- to 2.0-fold higher risk of developing cardiovascular disorders, independent of progression to type 2 diabetes or obesity. Hypertension and coronary artery disease were the most consistently reported outcomes. The coexistence of GDM with gestational hypertension markedly increased cardiovascular risk. Mechanistic studies identified insulin resistance, chronic inflammation, endothelial dysfunction, and dyslipidemia as central contributors to vascular damage. Subclinical cardiovascular changes were detectable within years after delivery, while offspring exposed to GDM showed early indicators of cardiovascular dysfunction. In conclusion, GDM should be recognized as an early marker of future cardiovascular risk rather than a pregnancy-limited condition. Structured postpartum monitoring, early cardiovascular screening, and targeted preventive strategies are essential to reduce long-term cardiovascular burden in women and their children.



Lifestyle Behaviours and Clinical Characteristics of Coronary Artery Disease Patients in a North India

Shashwat Singh¹, Chandra Narain Saxena², Suchit Swaroop^{1*}

¹ Experimental and Public Health Laboratory

Department of Zoology

University of Lucknow, Lucknow, 226007

² Department of Zoology

Sri JNMPG (KKC) College, Lucknow, 226004, India

singhshashwat94@gmail.com

ABSTRACT

India is experiencing a steady rise in coronary artery disease (CAD), influenced by rapid socioeconomic changes, sedentary lifestyles, and increasing metabolic risk factors. Evaluating patient-level characteristics can help identify key contributors to disease burden. The present study aimed to describe the sociodemographic profile, lifestyle behaviours, and clinical features of CAD patients in North India and to explore their relationship with diabetes mellitus and other risk factors. This cross-sectional study included 142 diagnosed CAD patients aged 15–80 years, enrolled from two hospitals in Uttar Pradesh between September 2024 and March 2025. Information on demographics, anthropometry, physical activity, sleep patterns, and clinical history was collected using a standardized questionnaire. Descriptive statistical methods summarized participant characteristics, while independent t-tests were used to assess associations between variables such as sex and BMI. A high prevalence of unhealthy lifestyle practices was observed, particularly low physical activity levels and disturbed sleep patterns. Diabetes mellitus was a common comorbidity among participants. Statistically significant differences in BMI were noted between male and female patients. Furthermore, individuals with a family history of CAD showed higher rates of diabetes. This study underscores the significant contribution of lifestyle and metabolic factors to CAD in North India. The findings support the need for region-specific preventive and intervention strategies aimed at reducing modifiable risk factors and improving cardiovascular outcomes.



Fungal Infection in Freshwater Fishes of Jabalpur (MP)

Varsha Aglawe¹, Anjana Tiwari² and Jitendra Nawange³

^{1,2} Department of Zoology and Biotechnology, Govt. Science College Pach Pedhi
Jabalpur (M.P.) (482001)

³ Assistant Director, Centre for Medical Mycology, Fungal Disease Diagnostics and
Research Centre, Jabalpur (M.P.)

ABSTRACT

Freshwater fish are an important source of protein for many countries and provide valuable economic and nutritional benefits to human populations. Among the pathogens affecting fish, Oomycetes are recognized as the second most damaging group to freshwater species. The presence of toxic aquatic fungi in water often leads to infections in major carp fishes, which are also consumed by humans. In the present study, an effort was made to assess the prevalence of fungal infections in major carps from the Jabalpur region (M.P.) and to promote better fishery management within the local population. The study also aimed to isolate and identify the fungal mycoflora associated with infected fish. Out of 51 fish samples examined, 35 (68.65%) were found positive for fungal infection. The isolated fungi included *Aspergillus flavus*, *Aspergillus fumigatus*, *Aspergillus niger*, *Penicillium* sp., *Rhizopus* sp., and *Candida* sp. These fungi were obtained from four species of freshwater fishes: *Labeo rohita*, *Catla catla*, *Cirrhinus mrigala*, and *Mystus tengara*. Fish diseases can cause severe economic losses in aquaculture by reducing fish growth, productivity, and survival rates. Effective fish health management plays a critical role in disease prevention, control, and the promotion of sustainable aquaculture practices. Over the last decade, fish farming has expanded rapidly worldwide, making fish culture an increasingly important commercial industry. The study of fungal infections in freshwater fishes is therefore of great significance, as it provides valuable insights into the diversity, life cycle, and ecological impact of fish mycoflora.



Immunomodulatory Effects of Ivermectin on Dengue Virus NS1-Induced Host Responses in Human Monocytic Cells

Sampada Pendse, Rajendra Kumar, Jitendra Kumar and Rituraj Niranjana

National institute for research in Tribal health, Jabalpur, India

ABSTRACT

Dengue virus (DENV) infection triggers complex host immune responses that contribute to disease severity. Elevated levels of the viral non-structural protein 1 (NS1) are strongly associated with immune activation and inflammatory damage in severe dengue. Ivermectin, a widely used antiparasitic agent, has demonstrated antiviral and immunomodulatory properties, including reported reductions in circulating NS1 levels. To evaluate the effect of ivermectin on DENV NS1-induced immune and inflammatory responses in vitro, with particular emphasis on host-associated molecular mediators. Human THP-1 monocytic cells were exposed to recombinant DENV-2 NS1 antigen and treated with ivermectin. Cellular morphology was assessed to evaluate cytopathic effects. Total protein content was quantified using the Bradford assay. RNA was isolated, quantified, and reverse-transcribed, followed by conventional and real-time PCR analysis of matrix metalloproteinases (MMP-1, MMP-2, MMP-7, MMP-8, MMP-10, and MMP-13), key mediators of inflammation and tissue remodeling, with GAPDH as a reference gene. NS1 exposure induced marked cytopathic changes and elevated protein and RNA levels, reflecting heightened host cellular activation. Ivermectin treatment significantly attenuated NS1-induced morphological damage and reduced total protein expression. Modulation of MMP gene expression was observed in ivermectin-treated cells, suggesting suppression of inflammatory and extracellular matrix-disruptive pathways implicated in dengue immunopathogenesis. Ivermectin demonstrates a protective, host-directed immunomodulatory effect against DENV NS1-induced cellular stress in human monocytic cells. These findings support its potential translational value as a repurposed therapeutic strategy targeting host immune responses in dengue infection, warranting further validation in in vivo and clinical models.



Building India's Biomedical Research Ecosystem: From Capacity Building to Research Excellence

Deoprakash Chaturvedi

DBT, New Delhi

Over the past decade, India's biotechnology ecosystem has undergone a significant transformation, driven by targeted investments in human resource development, international collaboration, and frontier research programmes. The evolving role of the Department of Biotechnology (DBT), Government of India, in shaping a robust and future-ready biomedical research landscape is highlighted through experiences drawn from managing national and international HRD initiatives—including re-entry fellowships, early-career awards, and global partnership programmes. These capacity-building mechanisms have played a critical role in strengthening scientific talent and enhancing global connectivity. DBT's Emerging Frontiers in Biotechnology (EFB) initiative forms a central component of this transformation, under which the Biomedical Science portfolio is currently being implemented. The programme supports cutting-edge research across the full spectrum of biomedical sciences, with emphasis on basic research, innovation, translational potential, and interdisciplinary approaches. Key aspects of programme design, proposal evaluation, expert review mechanisms, and portfolio management are examined to illustrate how funding strategies align scientific excellence with national health priorities.



Effect of soil pollutants on the diversity of earthworms in eastern

Uttar Pradesh

Abhishek Kumar Gupta, Subham Kumar Gupta ,Garima Yadav and Keshav Singh*

*-Vermibiotechnology Laboratory, Department of Zoology,

D. D. U. Gorakhpur University, Gorakhpur-273009 U.P. India.

Email- keshav26singh@rediffmail.com

ABSTRACT

Indiscriminate use of chemical fertilizers and pesticides disturbs the soil texture and physico-chemical properties of agricultural fields. The use of agrochemical viz. pesticides, herbicides, fungicides, nematicides, bactericide, weedicides and fertilizers had posed a serious threat to the environment which ultimately destroy the beneficial microorganisms, insects and worms in soil. Various heavy metals were also added in the agriculture field with these agrochemicals. Earthworms are the major macrofauna in the soil community. Earthworm can be used as bio-indicators for the monitoring of ecosystem state and changes. Due to the resent agricultural practices and soil contamination as well as disturbed soil physico-chemical texture, the earthworm population decreased. Earthworms play an important role in stabilization of inorganic plant nutrients to organic form and increased the soil fertility. The worms added their cast with compost and increased the inorganic nutrients many times along with some plant growth hormones and vitamins. The earthworms occur in large numbers and have wide distribution pattern with less mobile habit. The earthworms require carbon and nitrogen for their growth and reproduction. Food quality influences not only the size of the earthworm populations but also their growth and reproduction rates and hence determines their distribution trends in an ecosystem. Similarly, distribution of earthworms also depends on physical conditions including water content and availability of organic matter in the soils. Soil moisture, pH, organic carbon and organic nitrogen also play important role in the distribution of earthworms. The aim of present study, to investigate the impact of the pollutants on earthworms diversity and physico-chemical properties of a soil in eastern Uttar Pradesh.



Vermicomposting and accumulation of heavy metals

Nishat Fatima, Sanjeet Chakrawarti and Keshav Singh *

*- Vermibiotechnology Laboratory, Department of Zoology,
D. D. U. Gorakhpur University, Gorakhpur-273009 U.P. India.

Email- keshav26singh@rediffmail.com

ABSTRACT

Heavy metals are release in environment by volcanic activity, erosion of rocks, forest fire, human activity, paper mills and wastes products of various industries. Abundant use of chemical fertilizers and pesticides in agricultural field also increase the heavy metals in environment. These heavy metals caused ill effects on different flora and fauna as well as on human health. Generally human body is exposed to heavy metals by breathing, drinking and eating polluted air, water and food, which lead to accumulation of heavy metals in vital organs such as brain and kidney. Continuous accumulation of lead leads to death of affected person. In pregnant women accumulation of the lead may caused miscarriage.

Sperm production in male human being is also reduced by lead exposure. Cadmium and Nickel accumulation in body is encountered in the workers of industries of pigment, metal plating, plastic and batteries. These heavy metals entered in the human body by ingestion of contaminated food stuffs specially grains, cereals and leafy vegetables. These metals caused respiratory irritation lung diseases, cancers and kidney problem. Accumulation of chromium in human body breathing problems such as asthma, cough and wheezing. Even skin contact may resulted skin ulcers. Chronic exposure can damage liver, kidney, blood cells and nerve tissues. Oral intake if cobalt caused hypercholesterolemia in human beings. Arsenic acts as carcinogens may cause cancer of skin, lungs, liver and bone marrows. In a food chain of active ecosystem there is continuous accumulation of in successive trophic levels. This phenomenon is called biological magnification or biological amplification. Generally different heavy metals like arsenic (As), barium (Ba), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), selenium (Se) and silver (Ag) may be accumulated in human body of various routes and cause of different hazards. Complete removal of these heavy metals in the contaminated environment is difficult task. The earthworm *Eisenia fetida* play very important role in reducing the heavy metals accumulation in foodstuffs. The worms have ability to accumulate the various heavy metals viz Pb, Ni, Hg and Cd in their body. They can accumulate the metals and by transferring the heavy metals from the soil in their body so that it will be reduced the movement of hazardous metals in crops and vegetables. This remediation of soil will produced good quality consumable agricultural products.



Studies on vermiwash of weeds and sugarcane bagasse with biopesticides on growth and productivity of different plants and pest infestation.

Pankaj Kumar Singh , Km. Namarata Mall and Keshav Singh*

* Vermibiotechnology Laboratory, Department of Zoology,

Email- keshav26singh@rediffmail.com

ABSTRACT

Indiscriminate use of chemical fertilizers disturbs the soil texture and physico-chemical properties of soil, which ultimately affects the human health and environment. The use of chemical fertilizers has posed a serious threat to the environment and caused destruction of useful microorganisms, insects and worms in soil. Lack of proper management and disposal practices of biological wastes caused environmental hazards and various negative effects on human life and their domesticated animals. Organic farming with use of vermicompost is a better option for management of wastes and improvement of soil quality. It is one of the important biotechnological tool which makes a sustainable interrelationship among food, environment, human and animal health.

The problem of handling of weeds like *Eiccornia* (water hyacinth), Parthenium grass and agricultural wastes in the form of sugarcane bagasse needs attention for tackling it on war footing basis. These weeds grows faster in the sewage ponds and agricultural land and creates problems in the form of eutrophication and decrease the growth and productivity of crops. Instead of it, insects and pathogen are major pests of agricultural crops and vegetables all over the world. Indiscriminate use of chemical pesticides had caused serious threat to the environment. These chemical pesticides contaminating the soil which pose many health hazard to human as well as animals. Vermicomposting is an easy and effective way to recycling of biological wastes in to nutritious vermicompost by earthworm. During these process important plant nutrient such as nitrogen, phosphorus potassium, calcium etc. present in feed materials are converted in to more absorbable form for crops. These plant nutrients also act as growth regulators of beneficial bacterial and actinomycetes population in worms which ultimately increases the porosity, aeration and water holding capacity of soil, so that irrigation water requirement for crops significantly reduced. It improves nutrients availability and act as complex fertilizer.

Eisenia fetida is commonly known as red worm because of their red color of body and distributed through out the country because of their migratory habits. These worms are hardy



can tolerate wide variation of ecological factor like temperature, humidity and also survive on wide variety of degradable wastes. Earthworms play an important role in stabilization of inorganic plant nutrients to organic form and increased the soil fertility. These worms added their cast with compost and increased the inorganic nutrients many times along with some plant growth hormones and vitamins. They are also help the in the management of rotting solid organic waste in dumping site, which creates problems of odor, pollution of soil/water/air. Vermiwash is the coelomic fluid extraction; it contains several enzymes, plants hormones like auxines, cytokinin, gibberellins and vitamins, especially B₁₂ along with micro-nutrients. This liquid manure is collected in the liquid form and used as foliar spray, which stimulate the growth and yield of crops. Vermiwash is easily producible, biodegradable, less expensive, and manageable. Mixing of different plant pesticide with vermiwash is very advantageous. Spraying of this mixture has dual function which acts as bio fertilizer as well as bio-pesticide. This production will safe for environment and human health. Use of this biotechnological tool is ecologically safe and culturally more acceptable among farmers.



Combinations of different wastes: Biotechnological tool for population enhancement of earthworm *Lampito mauritii*

Shruti Rai, Sanjeet Chakrawarti, Garima Yadav, and Keshav Singh*

*-Vermibiotechnology Laboratory, Department of Zoology,

D. D. U. Gorakhpur University, Gorakhpur-273009 U.P. India.

Email- keshav26singh@rediffmail.com

ABSTRACT

Chemical fertilizers and synthetic pesticides are serious threats to human, animal health and environment. Animal dung, kitchen wastes and fruit peels are caused various problems, if they are not properly managed. Vermicomposting of these wastes is a suitable solution for proper management of biological wastes. The combinations of different animal dung with kitchen wastes and fruit peels significantly enhance the population of *Lampito mauritii*. Combination of Animal dung, kitchen wastes and fruit peels (1:1 ratio) significantly increase the growth and development of *Lampito mauritii*. Significant decrease in pH, Electric conductivity, C: N ratio was noted in the final vermicompost whereas, increased total Kjeldhal nitrogen (TKN), total available phosphorus level (TAP), total potassium and calcium ultimately affects the growth of earthworm *Lampito mauritii* population. Use of buffalo dung with Animal dung, kitchen wastes and fruit peels is suitable combination for better growth, reproduction and development of *Lampito mauritii*. The significant increase in number of earthworms with the help of combinations of wastes as feed material will be helpful for more conversion and recycling of more biological wastes in nutrient rich vermicompost. Vermicompost is a best biofertilizer which enhance the plant growth and productivity as well as safe the environment and human health.



Remodelling of brain renin-angiotension signalling impairs memory: evidence from a rodent model of diabetes

Akash Gautam¹, Jayshree T¹, Athar Siddiqui²

Centre for Neural and Cognitive Sciences, University of Hyderabad

School of Medical Sciences, University of Hyderabad

Hyderabad-500046, Email: akash@uohyd.ac.in

ABSTRACT

Biological systems rely on tightly regulated signaling networks to maintain metabolic and cellular homeostasis. The Renin-Angiotensin System (RAS), traditionally studied for its role in cardiovascular regulation, is now recognized as a multifunctional signaling network influencing glucose metabolism, mitochondrial function, and tissue-specific adaptation to metabolic stress. Importantly, a locally acting RAS exists within the brain, where its dysregulation has been linked to cognitive impairment under pathological conditions such as diabetes.

In this study, we examined how diabetes alters brain RAS components and contributes to memory dysfunction using a rat model. Adult male Sprague Dawley rats were assigned to vehicle-treated controls, diabetic, amnesic, and combined diabetic-amnesic groups. Diabetes was induced using streptozotocin, while memory impairment was triggered through scopolamine. Disease progression was validated using physiological measures alongside behavioral, biochemical, and molecular assessments of cognitive function.

We focused on two key RAS receptors- Angiotensin II type 1 (AT1) and type 2 (AT2) within brain regions central to learning and memory. Our findings revealed a consistent imbalance in receptor expression, characterized by a marked increase in AT1 and a concomitant decrease in AT2 levels under diabetic and amnesic conditions. This receptor shift was associated with mitochondrial dysfunction, highlighting a link between altered signaling, cellular energy metabolism, and cognitive decline. Pharmacological intervention with the angiotensin receptor blocker telmisartan partially restored mitochondrial function, suggesting functional reversibility of these changes.

Together, these results demonstrate that metabolic disturbances can reprogram intracellular signaling pathways in the brain, leading to impaired cognitive performance. By connecting endocrine signaling, mitochondrial biology, and neural function, this work underscores the importance of integrated regulatory networks across biological systems. Targeting dysregulated RAS signaling may therefore represent a broadly applicable strategy for mitigating metabolic stress-induced dysfunction across tissues and species.



Tyroid-Reproductive Dysfunction Induced by Cypermethrin: Assessing the Therapeutic Potential of *Bacopa monnieri* Extract in Swiss Albino Mice

Surbhi Chourasiya* and Versha Sharma Department of Zoology, Dr. Harisingh Gour

Vishwavidyalaya Sagar M.P. 470001, India

Email- surbhichourasiya03@gmail.com

ABSTRACT

Cypermethrin (CYP) is a commonly used type II Pyrethroid. This pesticide tends to accumulate in various tissues, leading to organ dysfunction. It is the major endocrine disruptor worldwide. The current study aims to investigate how CYP-induced hypothyroidism leads to reproductive dysfunction and estrous cycle irregularities in albino mice. The experiment was divided into four groups. The control group (CN) received water and an unrestricted regular diet, whereas the CYP and CYP+BM groups were administered 15 mg/kg bw of cypermethrin by gavage. The BM group was administered 200 mg/kg bw of *Bacopa monnieri*, while the CYP+BM group received co-administration of BM for 28 days. The findings revealed that substantial changes in the hormone levels (drop in T3 and T4 and rise in TSH) and alterations in the female hormones were produced by the CYP-induced hypothyroidism group. The antioxidant enzymes SOD, CAT, and GPx were also significantly reduced, while the level of oxidative markers (LPO, AOPP, and H₂O₂) increased concurrently. On the other hand, ovarian histology and estrous abnormalities are impacted by the substantial decline in THR- β receptor expression. Oxidative stress and DNA damage-related changes, like alterations in the expression of Cas 3 and PARP-associated proteins, can be seen. In comparison, BM coadministration can phytoremediate CYP-induced hypothyroidism and its associated consequences. Furthermore, additional research is needed in the future to determine the association between hypothyroidism and reproductive functioning, as well as the underlying mechanisms. To reduce morbidity and mortality, thyroid function tests should be performed regularly in all patients with reproductive dysfunction.



Density Estimates of Indian Leopards (*Panthera pardus fusca*) using Spatial Capture–Recapture Models in Gir Wildlife Sanctuary, Gujarat

Prakhar Sharma^{1*#}, Nazneen Zehra¹, Rohit Chaudhary², Jamal Ahmad Khan¹

¹Department of Wildlife Sciences, Aligarh Muslim University, Aligarh, 202002, Uttar Pradesh, India.

²Department of Wildlife Sciences, College of Forestry, Banda University of Agriculture and Technology, Banda, 210001, Uttar Pradesh, India.

ABSTRACT

The Indian leopard (*Panthera pardus fusca*) is a highly adaptable carnivore occupying diverse habitats across India. Estimating its density is challenging due to cryptic behaviour and imperfect detection. Camera trapping combined with spatial capture–recapture (SCR) models provide a robust approach. To estimate the density of leopards in Gir Wildlife Sanctuary (Gir) using camera-trap data and SCR models. A 100 km² block in western Gir was divided into 100 1-km² grids, with one camera trap per grid operating up to 85 days. Accounting for occasional malfunctions, the effective sampling effort was 6150 camera-trap nights and provided 237 leopard images, 130 left-flank images were used for individual identification. A 5 km buffer defined the state space, and competing SCR models were evaluated using Akaike's Information Criterion with a half-normal detection function. A total of 41 individual leopards were identified. The estimated detection probability (g_0) was 0.0090 (95% CI: 0.0067–0.0121), and the spatial scale parameter (σ) was 1075 m (95% CI: 942–1223 m). Density was estimated at 30.4 leopards per 100 km² (95% CI: 22.1–41.7), with an abundance of 99 individuals (95% CI: 79–130) for the 134 km² sampling area. Leopard density in Gir is high despite the presence of lions. High prey availability and habitat heterogeneity likely facilitate their persistence. This system provides a valuable opportunity to study spatial coexistence and ecological interactions among sympatric large carnivores.



Bridging the adaptation gap between climate stressed crop- livestock system for sustainable agriculture

Ruchika Singh

Department of Zoology

School of Biological Sciences

Dr. Hari Singh Gaur University

ABSTRACT

Climate change has emerged as a major challenge to agricultural sustainability creating stress on both crop production and livestock systems. Climate stress in the form of rising temperatures, irregular rainfall, droughts, and extreme weather eventually affects crop yield and overall farm productivity. While the effects of climate stress on crops are often discussed, the impact on livestock—such as heat stress, reduced feed intake, lower milk production, and higher disease occurrence often remains under-recognised. Although various climate-resilient strategies are recommended for crop–livestock systems, their actual adoption by farmers remains limited, leading to a noticeable adaptation gap. This study encompasses on understanding the gap between the adaptation strategies suggested by experts and those practiced by farmers under climate stress. It further explores the reasons behind this gap. Beyond commonly cited constraints like financial limitations and lack of awareness the study highlights less visible factors such as fear of risk, reliability on traditional practices, inadequate technical guidance and insufficient attention to livestock-related adaptation measures. The study highlights that bridging this adaptation gap is crucial for achieving sustainable agriculture. Integrated crop–livestock systems offer better resilience to climate stress by improving resource efficiency, supporting farmer livelihoods, and reducing environmental degradation. Therefore, sustainable agriculture requires climate-resilient and integrated croplivestock practices that address environmental integrity, economic stability, and social wellbeing. Addressing the adaptation gap through farmer-focused and locally suitable strategies can contribute significantly to building resilient and sustainable agricultural systems under changing climatic conditions.



Assessment of Physico-Chemical Water Quality of Ganga River

During Kumbh Mela at Prayagraj

Chandani Kumari and Payal Mahobiya

Department of Zoology, School of Biological Sciences,

Dr. Harisingh Gour Vishwavidhyalaya (A Central University)

Sagar, Madhya Pradesh 470003

ABSTRACT

The Kumbh Mela is one of the largest religious gatherings in the world, held at Prayagraj at the confluence of the rivers Ganga, Yamuna, and the mythical Saraswati. The event attracts millions of pilgrims, leading to intense anthropogenic pressure on river water quality. This study aims to assess the impact of Kumbh Mela activities on the physico-chemical characteristics of different ghats by analyzing water samples collected during the pre-Kumbh, peak-Kumbh, and post-Kumbh periods. Water samples were analyzed for various physico-chemical parameters, including pH, temperature, electrical conductivity, total dissolved solids (TDS), dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), alkalinity, hardness, chloride, nitrate, phosphate, and other relevant parameters, following standard methods. The results revealed noticeable variations in water quality during the peak Kumbh period, particularly an increase in organic load and nutrient concentrations due to mass bathing, ritual offerings, and domestic activities. Comparative analysis indicated partial recovery of water quality parameters in the post-Kumbh phase, suggesting a degree of natural self-purification of the river system. The study highlights the significant influence of large-scale religious events on river water quality and emphasizes the need for effective management strategies and continuous monitoring to ensure the sustainable use of river water resources.



Bioaccumulation of Microplastics in Aquatic Fishes

Akansha Santosh Roy, Ankita Samal and Jahn timer Shukla

Department of Zoology

Dr. Harisingh Gour Central University, Sagar, Madhya Pradesh.

ABSTRACT

Microplastic (MP) pollution has emerged as a pervasive global threat to aquatic ecosystems and human health. Defined as synthetic polymer particles <5 mm, MPs originate from both primary sources (microbeads, pellets, fibers) and secondary fragmentation of larger plastics. Reviews highlight their ubiquity across marine, freshwater, wetlands, and polar environments, with widespread detection in fish, molluscs, zooplankton, sediments and even human tissues. Evidence confirms bioaccumulation of MPs within trophic levels, particularly in filter feeders and benthic species, while biomagnification across food webs remains debated—laboratory studies show trophic transfer, but field data are inconsistent. MPs induce adverse impacts including oxidative stress, inflammation, endocrine disruption, reduced growth, reproductive impairment, and behavioural changes in fish and invertebrates. They also act as vectors for persistent organic pollutants, heavy metals, and pathogenic microbes, amplifying ecological risks through the “Trojan horse” effect. Human exposure occurs via seafood, drinking water, and air, raising concerns for food safety and public health. Current mitigation strategies emphasize improved waste management, bioremediation, nanomaterial-enabled removal and policy interventions, though methodological inconsistencies hinder global comparability. Collectively, these reviews underscore MPs as a ubiquitous contaminant, with urgent need for standardized monitoring, ecosystem-specific risk assessment and innovative remediation technologies.



Polygamy in Lac Insect: Insights into Reproductive Strategies

Sandeep Kaushik

Department of Environmental Science, Indira Gandhi National Tribal University,
Amarkantak, Madhya Pradesh- 484887

ABSTRACT

Mating systems play a critical role in shaping reproductive success and population dynamics, yet the mating behaviour of *Kerria lacca* (Kerr.), an economically significant resin-producing insect, remains undocumented. Based on preliminary observations and reproductive patterns reported in related taxa, we hypothesized that *K. lacca* follows a polygamous mating strategy. To test this, we conducted controlled experiments under three conditions: polygyny, polyandry, and consecutive matings with the same partner. Behavioural parameters, including time to commencement of mating, latent period, mating duration, and copulatory strokes, were quantified. The results confirmed that *K. lacca* exhibits both polygyny and polyandry, with mating duration decreasing significantly as the number of partners increased. In contrast, under repeated pairings with the same partner, pre-copulatory intervals increased while mating duration and stroke frequency declined, suggesting diminishing reproductive investment and possible behavioural mechanisms such as mate fatigue, refractory response, or inbreeding avoidance. Extended mating duration and vigorous copulatory activity during the first mating likely reflect a higher ejaculate investment. These findings provide the first empirical evidence of polygamous mating behaviour in *K. lacca* and highlight plasticity in copulatory strategies based on partner novelty and mating frequency. This work lays the foundation for further mechanistic and evolutionary investigations into mating system evolution in scale insects.

TECHNICAL TEAM

Ms. Ankita Dwivedi

Ms. Sneha Bibiyan

Ms. Upadhi Singh Tekam

Ms. Raksha Khangar

Mr. Mohit Rathore

Ms. Pragya Gour

Mr. Rahul Kurmi

Mr. Lalit Prajapati

Mr. Ashish Sahu

Mr. Krishna Murari

Mr. Ankit Soni

Mr. Pawan Kumar

Mr. Hitendra Sahu

Committee Members

Registration and Stage Committee
• Aditi Lal • Ayushi Singh • Shikha Upadhya • Chandani • Deepali Nandy • Chhavi Jain • Parineeta Pradhan
Refreshment Committee
• Ashish Kumar Sahu • Neeraj Kol • Subhajit Behera • Shivam
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• Umang Verma • Lalit Prajapati • Siksha Kumari • Ashish Kumar Sahu • Subhajiit Behra

Rangoli and Fine art Committee
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• Lalit Prajapati • Kishan Maurya • Ankit Soni • Hitendra • Atirath Kapoor • Aman Gautam
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• Avnish Kumar • Brijesh Prajapati • Ashish Sahu • Hitendra • Sajal Jain • Abhijeet

