



PROCEEDINGS OF THE 2ND JOINT INTERNATIONAL SCIENTIFIC CONFERENCE AND PRE-CONFERENCE TRAINING WORKSHOPS

3RD – 12TH JUNE, 2026

**THEME: “HARNESSING BIODIVERSITY AND
CULTURAL HERITAGE FOR ECONOMIC
TRANSFORMATION” .**



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Published By
National Museums of Kenya
P.O. Box 40658-00100
Nairobi, Kenya

Citation

This publication may be cited as; Malaki P, Kioko G, Bwong B. A, Namikoye S, Kirika P, Macharia J, Ngoka B, Muthama E, Wei N, Wang Q, Kioko E (Eds) (2026). Proceedings of the 2nd Joint International Scientific Conference and Pre-Conference Training Workshops: Harnessing Biodiversity and Cultural Heritage for Economic Transformation, National Museums of Kenya, Nairobi

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ISBN: 9966-955-70-4

Book Design, Layout and Type Setting: Clique Solutions Limited

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Conference Partners and Sponsors



Prof. Jack Harris



**Harnessing
Biodiversity
and Cultural
Heritage for
Economic
Transformation,”**

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Acronyms

AKE	Association of Kenyan Entomologists
AKEF	Association of Kenyan Entomologists Fellow
AKEHF	Association of Kenyan Entomologists Honorary Fellow
ASALs	Arid and Semi-arid Lands
AU	African Union
BDSUs	Biodiversity Stewardship Units
BGCI	Botanic Garden Conservation International
BTC	Bodoland Territorial Council
CAS	Chinese Academy of Sciences
CBD	Convention on Biological Diversity
CERK	Centre for Ecosystem Restoration Kenya
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DNA	Deoxyribonucleic acid
DRSRS	Directorate of Resource Surveys and Remote Sensing
eDNA	Environment deoxyribonucleic acid
GBIF	Global Biodiversity Information Facility
GDP	Gross Domestic Product
GIS	Geographic Information System
GOTS	Global Organic Textile Standard
IBA	Important Bird Areas
ICEA LION	Insurance Company of East Africa
ICIPE	International Centre of Insect Physiology and Ecology
ICOM	International Council of Museums
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change.
IPM	Integrated Pest Management
IUCN	International Union for Conservation of Nature [*]
JOOUST	Jaramogi Oginga Odinga University of Science and Technology
JRS	Biodiversity Foundation (USA)
KALRO	Kenya Agricultural and Livestock Research Organisation
KBA	Key Biodiversity Areas
KEFRI	Kenya Fisheries Research Institute
KFRTP	Koobi Fora Research & Training Program

KFS	Kenya Forest Service
KM-GBF	Kunming-Montreal Global Biodiversity Framework
KWS	Kenya Wildlife Service
LULCC	Land Use and Land Cover Change
MtSES	Mountain regions act as critical Social-Ecological Systems
Nbs	Nature-Based Solutions
NBSAPs	National Biodiversity Strategies and Action Plans
NEMA	National Environment Management Authority
NGOs	Non-Governmental Organisations
NMK	National Museums of Kenya
OPC	OI Pejeta Conservancy
PEBCA	Pathways for Emerging Biodiversity Changemakers in Africa
SDG	Sustainable Development Goals
PES	Payment Ecosystem Services
PGF	Pollen Glory Farm
PPCPs	Public Private Community Partnerships
REMA	Rwanda Environment Management Authority
SAJOREC	Sino-Africa Joint Research Center
SHG	Self-Help Group
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USA	United States of America
WRUAs	Water Resource Users Associations

1.0 Conference Preface

The 2nd Joint International Scientific Conference, held from 8th to 12th June 2026 under the theme “Harnessing Biodiversity and Cultural Heritage for Economic Transformation,” was jointly organized by National Museums of Kenya (NMK), Association of Kenyan Entomologists (AKE), and Sino-Africa Joint Research Center (SAJOREC). The conference brought together researchers, policymakers, practitioners, development partners, students, community representatives, and the private sector from across the globe to share knowledge, showcase innovations, and explore pathways through which biodiversity and cultural heritage can contribute to sustainable economic transformation.

The conference provided a platform for multidisciplinary dialogue on conservation, heritage management, climate resilience, ecosystem restoration, sustainable livelihoods, and bioeconomy development. Participants examined emerging scientific evidence, innovative technologies, community-led approaches, and policy frameworks that support the sustainable use and conservation of natural and cultural resources.

A defining feature and major highlight of this conference was its strong commitment to student mentorship through the program; Pathways for Emerging Biodiversity Changemakers in Africa (PEBCA). The program was conducted online from February to May 2026 and onsite hands-on training at NMK from 3rd to 6th June 2026. PEBCA provided opportunities for upcoming scholars to present their research through oral and poster presentations alongside established experts in their respective fields. Graduate and undergraduate students from both local and international academic institutions also participated in structured pre-conference training sessions designed to strengthen their scientific, professional, and communication skills. This mentorship initiative fostered intergenerational knowledge exchange, networking, and professional growth, helping to nurture the next generation of conservation scientists, heritage practitioners, and environmental leaders.

To recognize excellence and encourage high-quality scientific communication, outstanding student contributions were celebrated through awards for the best oral and poster presentations. These awards acknowledged innovation, scientific rigor, originality, and the ability to communicate research findings effectively. The recognition of young scholars underscores the conference's belief that investing in emerging researchers is essential for advancing science, conservation, and sustainable development.

The conference attracted more than 300 participants drawn from 81 institutions across 20 countries representing four different continents (Africa, Asia, Europe, and North America) (See Appendix 4). This reflected the growing international interest in biodiversity conservation, cultural heritage, and sustainable development. The diversity of expertise and perspectives enriched discussions and strengthened collaborations across disciplines, institutions, and geographical regions.

The keynote presentations and technical sessions consistently highlighted the importance of strengthening the science-policy-practice interface. Participants emphasized the need for inclusive governance, community participation, equitable benefit-sharing, sustainable financing mechanisms, and stronger partnerships among diverse entities. Collectively, the presentations demonstrated that biodiversity and cultural heritage are not merely resources to be protected, but strategic assets capable of driving economic growth, climate resilience, social well-being, and sustainable livelihoods.

In conclusion, these proceedings demonstrate that the future of biodiversity conservation and cultural heritage stewardship lies in collaboration, innovation, and the empowerment of the next generation. The organizers look forward to building on the momentum generated in advancing collective action towards a more resilient, inclusive, and sustainable future.



Conference Participants

1.1 Acknowledgement

The 2nd Joint International Scientific Conference was made possible through the partnership of the NMK, AKE and SAJOREC who worked tirelessly to ensure the success of the conference. The organizers would also like to acknowledge support from sponsors of the conference. The JRS biodiversity foundation supported a pioneering program “PEBCA” that supported the pre-conference trainees and 15 case study post graduate projects. It was a pleasure to have Dr. Siro Masinde, the JRS Program Officer grace the occasion.

Financial support was also received from ICEA LION Group, a comprehensive financial services provider, and Liaison Group, a Pan African non-banking financial services organization both specializing in risk management, insurance, healthcare, pensions, and investment advisory. The British Institute in Eastern Africa (BIEA) which promotes innovative humanities and social sciences research within Eastern Africa and beyond supported the conference. We also acknowledge the support from individual collaborators, notably Prof. Jack Harris, whose long-term research collaboration with NMK has been invaluable. The Kenya Museum Society, a long-standing partner with NMK and their ongoing collaboration has been crucial in both research and development activities especially in the support of upcoming scientists to build capacity. Other notable sponsors included the Fauna and Flora and Mpala Research Centre both focused on conservation and multi-disciplinary research. The organizers remain grateful for the sponsorship by African Academy of Sciences (AAS) whose focus is on transforming lives on the continent through recognition of excellence, think tank functions and program implementation.

Further, the organizers acknowledge the continued partnership with the exhibitors. The participation of 11 institutions including NMK, SAJOREC, ICEA LION Group, LIAISON Group, RhinoArk, Inqaba Biotec in East Africa, Kenyatta University National Phytotherapeutics Research Centre, Nature Kenya, Wyss Academy for Nature, Mpala Research Center and Fauna and Flora further enhanced the conference visibility through the exploration of the theme in their various exhibitions.

Finally, the organizers extend sincere gratitude to all keynote speakers, presenters, participants, reviewers, mentors, judges, moderators, rapporteurs, service providers, and technical staff whose dedication and support contributed to the success of this conference. In particular, the organizers are grateful to the students whose enthusiasm, curiosity, and scientific contributions embodied the spirit of learning and innovation that defined this gathering.

1.2 About the Hosts

The three hosts of the conference were NMK, AKE and SAJOREC. The NMK is a state corporation established under the Museums and Heritage Act of 2006. As a multidisciplinary institution, NMK is mandated to collect, preserve, study, document, and present Kenya's cultural and natural heritage. These efforts are aimed at fostering knowledge, appreciation, and respect for heritage, while promoting its sustainable use for the benefit of Kenya, the region, and the global community now and for future generations. In line with its commitment to biodiversity conservation, cultural preservation, and public engagement, NMK manages numerous regional museums, heritage sites, and monuments of national and international significance. These are complemented by priceless collections that reflect Kenya's dynamic living heritage.

AKE is a professional scientific body that brings together insect scientists, researchers, students, conservationists, agricultural experts, and public health practitioners across Kenya. The association serves as a national platform for advancing the science of entomology and promoting the role of insects in biodiversity conservation, agriculture, ecosystem health, and sustainable development. Through research, training, collaboration, and public outreach, AKE seeks to strengthen Kenya's capacity in insect science and support evidence-based solutions to national and global challenges.

SAJOREC is an international scientific research and capacity-building institution. It was created to strengthen long-term scientific collaboration between Africa and China in biodiversity conservation, environmental research, climate change studies, and sustainable development. The center functions as a multidisciplinary hub that brings together scientists, students, conservation practitioners, and policymakers to generate evidence-based solutions to the pressing ecological and socio-economic challenges facing Africa and the wider world.

2.0 Keynote Presentations

Session Moderators: Prof. Linet Gohole, University of Eldoret; Paul Gacheru, Nature Kenya; Prof. Benson Ojwang, Kaimosi Friends University.

Rapporteurs: Sam Guchu, National Museums of Kenya; and Jeff Ochieng', Mbarara University; and Erneste Uwimana, Dian Fossey Gorilla Fund, Rwanda; Vivian Kathambi, National Museums of Kenya.

2.1 Summary of Keynote Messages

The keynote presentations collectively reinforced the conference theme, by demonstrating that conservation, cultural heritage, scientific research, and community participation are not competing priorities but mutually reinforcing pillars of sustainable development.

The presentations highlighted the transformative potential of biodiversity and cultural heritage as strategic assets for economic growth, climate resilience, social inclusion, and sustainable livelihoods. Drawing from diverse experiences in heritage research, conservation finance, agroecology, restoration ecology, mountain ecosystems, and indigenous knowledge systems, the speakers collectively emphasized that sustainable development must be grounded in the stewardship of natural and cultural resources.

A recurring theme across all presentations was the importance of placing communities at the center of conservation and development initiatives. Through the community-based heritage stewardship demonstrated by the Koobi Fora Research and Training Program, the benefit-sharing models of Wildlife Works, the agroecological innovations at Pollen Glory Farm, and the women-led Eri silk enterprises of Bodoland; successful interventions were shown to depend on local ownership, equitable participation, and inclusive governance.

The presentations further demonstrated that biodiversity conservation is increasingly recognized as an economic investment rather than a development constraint. Ecosystem services such as carbon sequestration, pollination, water regulation, soil restoration, tourism, and

sustainable production systems provide measurable economic benefits while enhancing resilience to climate change. Emerging mechanisms, including carbon markets, biodiversity stewardship units, ecosystem service payments, and ethical value chains, offer practical pathways for translating environmental stewardship into tangible socio-economic gains.

Another key lesson was the value of integrating scientific innovation with traditional and indigenous knowledge. Advances in paleoanthropology, environmental DNA (eDNA), participatory scenario modeling, ecosystem service mapping, and climate-resilience research were presented alongside local ecological knowledge, cultural practices, and community-led conservation approaches. This interdisciplinary integration strengthens evidence-based decision-making while ensuring local relevance and long-term sustainability.

The keynote sessions also underscored the importance of long-term thinking. Historical and paleoecological records reveal that today's landscapes are the products of centuries of interactions between people and nature. Understanding these historical trajectories enables policymakers and practitioners to design more resilient futures that accommodate biodiversity conservation, ecosystem functionality, and economic development simultaneously. The sessions also call for strengthened partnerships among governments, research institutions, local communities, indigenous people, civil society, and the private sectors. Such partnerships are essential for achieving national development priorities, advancing the Sustainable Development Goals (SDGs), supporting the Kunming-Montreal Global Biodiversity Framework, and realizing Africa's Agenda 2063 aspirations.

The presentations collectively call upon policymakers to reposition biodiversity and cultural heritage from being viewed solely as environmental and cultural concerns to being recognized as strategic national assets for economic transformation, climate resilience, food security, and social well-being. The conference emphasized that biodiversity and cultural heritage are strategic assets for economic transformation, climate resilience, food security, and sustainable livelihoods. Policymakers should strengthen the link between policy

formulation, implementation, and enforcement to ensure that conservation commitments translate into tangible outcomes on the ground. This requires inclusive governance, strong institutions, adequate resources, community participation, and evidence-based decision-making that integrates scientific and indigenous knowledge. Investments in nature-based solutions, ecological restoration, sustainable financing mechanisms, and community-led enterprises will be critical for achieving long-term prosperity, environmental sustainability, and social equity.

The session concludes that biodiversity and cultural heritage are not merely resources to be protected; they are foundational capital for innovation, resilience, identity, and inclusive economic transformation. Investing in their conservation and sustainable use is therefore an investment in the prosperity and well-being of present and future generations.

2.2 Keynote 1: Towards Achieving the Whole of Society Approach to Conservation: The Role of Research and the Private Sector

Speaker: Dr. Mwangi Githiru, Wildlife Works, Kenya



Summary

The keynote emphasized that effective conservation policies should promote inclusive participation, equitable benefit sharing, and accountability mechanisms that incentivize long-term stewardship of natural resources. Focusing on the Kunming-Montreal Global Biodiversity Framework (KM-GBF), this presentation explored how to operationalize a “whole-of-society” approach

to conservation by linking polycentric governance with nature-based market mechanisms like carbon and biodiversity credits to address complex environmental challenges.

Key Insights

- **The Challenge of Collective Action:** the speaker noted that according to Mancur Olson’s theory; “The Logic of Collective Action”, a shared interest does not automatically guarantee collective action due to free-rider problems and diffuse costs. Overcoming this requires structured individual incentives or aligned governance frameworks.
- **The Three Pillars of Wildlife Works:** The organization utilizes a holistic model funded by the development and sale of REDD+ carbon offset credits.
 - i. Wildlife Protection
 - ii. Job Creation (over 400 local employees)
 - iii. Forest Protection

- **Financial & Benefit-Sharing Models:** The revenue-share model ensures that over 70% of funds stay in-country, with 50-60% going directly to local communities to offset land-use opportunity costs. This has funded over 500 community projects across water, healthcare, and education benefiting over 80,000 students via bursaries.
- **Biodiversity Stewardship Units (BDSUs):** Developed alongside the Yawanawá-ASCY and Forest Trends, for indigenous people and local communities; BDSUs allow earning of market-based credits for maintaining or protecting intact, biodiverse ecosystems. They require no demonstration of net uplift or additional actions, meaning they cannot be used to mitigate ecological damage done elsewhere.
- **Polycentric Governance:** True conservation relies on multiple independent, nested authorities operating across localized projects and communities up to sub-national, national, and international frameworks like the United Nations Framework Convention on Climate Change (UNFCCC).

2.3 Keynote 2: How Four Million Years of Heritage is Building Kenyan Science and Kenyan Communities.

Speaker: Prof. David R. Braun, George Washington University, USA



Summary

This address highlighted the approximately 40-year collaborative history between the Koobi Fora Research & Training Program (KFRTPT) and the National Museums of Kenya (NMK). It demonstrated how East African paleoanthropology and archaeology have evolved into robust, locally driven scientific disciplines that simultaneously foster global academic excellence and uplift local

indigenous communities. Policymakers should therefore recognize heritage resources not only as cultural assets but also as strategic investments that contribute to national identity, tourism, scientific leadership, and sustainable development.

Key Insights

- **A Legacy of Collaboration:** The long-standing partnership has focused heavily on research and deep capacity development of more than more than 115 Kenyan students since 1997.
- **Empowering Kenyan Authorship:** Since 2006, the program has produced over 150 publications, with Kenyans making up more than 70% of the authorship. Analysis from 1997 to 2026 highlights a continuous upward trajectory in the Kenyan share of East African paleo-science output, rising from under 5% to an estimated midpoint of 13% by 2026.
- **Global Heritage Discoveries:** Key findings continue to reshape human evolutionary history, such as the 1.5-million-year-old hominin footprints the oldest evidence of a modern human foot structure discovered at Ileret.

- **Community Integration & Economic Impact**
 - **Climate & Community Insecurity:** Research among local groups, such as the Daasanach, reveals extreme environmental pressures. For example, adults face a daily water turnover of ~7.5 L, and 93% of households experience severe food and water insecurity, driving 55% to consider migrating during the 2019-2022 drought.
 - **The Heritage Economy:** Heritage acts as a massive economic driver. In 2024, travel and tourism contributed Ksh 1.2T to Kenya's economy (over 7% of GDP) and supported 1.7M jobs (~8% of national employment).
 - **Science that Stays and Serves:** The program models shared stewardship via initiatives like the Ileret Footprint Centre, ensuring local communities act as partners and co-authors rather than passive subjects.

2.4 Keynote 3: Using the Past to Shape a Prosperous Future with Space for Wildlife, Functioning Ecosystems, and Strong Economic Development

Speaker: Prof. Rob Merchant, University of York, United Kingdom



Summary

The keynote emphasized use of long-term historical and environmental data to shape a sustainable future that balances wildlife conservation, functioning ecosystems, and robust economic development. The present is viewed as a complex “tapestry” woven from thousands of years of human land use, fire dynamics, forest changes, and colonial-era

legacies. Understanding how landscapes have changed over centuries and millennia provides valuable lessons for managing present-day environmental challenges and designing resilient futures. Policymakers should integrate historical perspectives, climate science, biodiversity conservation, and socioeconomic planning into national development strategies to ensure that economic growth does not compromise ecosystem integrity and human livelihoods.

The presentation organizes research timelines into three distinct phases to map out optimal future ecological and developmental pathways:

- **Long-term Perspectives:** Looking back 6,000+ years to trace deep human–environmental interactions.
- **Deep History Perspectives:** Evaluating changes over the last 500 to 100 years, including the construction of historic terraces and irrigation networks.
- **Colonial to Post-Independence Transitions:** Examining the last 100 years up to the present day, especially historical logging and the introduction of exotic timber plantations (e.g., Eucalyptus, Pine, and Acacia).

Key Insights

- **The Importance of Mountain Regions:** Mountain regions act as critical Social-Ecological Systems (MtSES) that are uniquely vital to both global biodiversity and human welfare:
 - Vertebrate Biodiversity Hotspots: High-altitude zones house a disproportionate share of the global mammal, bird, and amphibian species despite comprising a smaller portion of global land area.
 - Africa's "Water Towers": Mountain ranges provide essential freshwater for drinking, sanitation, agriculture, and downstream hydropower. They offer fertile soils and cool temperatures with fewer pests, sustaining highly culturally diverse human communities.
- **Climate Change Impacts & Paleoecology:**
 - Climate change is deeply impacting mountain ecosystems, as seen through the rapid melting and loss of tropical glaciers. Local communities across African mountain regions report experiencing reduced stream flows, escalating landslides, intense soil erosion, and shifting crop/livestock pest dynamics.
 - To build resilience, researchers examine paleoecological data (such as sediment cores, charcoal levels, and 25,000-year pollen records) to analyze how vegetation, climate, and human modifications have co-evolved over millennia. This long-term dataset is combined with weather and satellite data to feed into predictive model scenarios.
- **Future Modeling: The KESHO Tool:** A cornerstone of the presentation is KESHO, a participatory scenario-modeling tool designed to project Land Use and Land Cover Change (LULCC):
 - **Co-Production:** It heavily relies on stakeholder engagement across multiple tiers, involving local communities, businesses, NGOs, media, researchers, and local governments.
 - **Scenario Pathways:** The tool maps and models diverse future possibilities (ranging from a green economy to "Business as Usual" scenarios) based on socioeconomic drivers, population growth, and regional tourism economies.

- o **Impact Quantification:** It simulates how different future pathways will directly impact water yield, carbon storage capacity, and overall biodiversity.
- **Strategic Alignment and Moving Forward:** The final portion of the keynote emphasizes bridging science and regional-to-global policy frameworks. The proposed sustainable pathways align directly with international targets, including the African Union (AU) Agenda 2063 and the UN Sustainable Development Goals (SDGs) (specifically Goal 2: Zero Hunger, Goal 13: Climate Action, and Goal 15: Life on Land).

Key Takeaways & Future Directions:

- Transitioning from purely scientific observation tools to active, participatory land-use planning.
- Fostering robust communities of practice to actively manage tropical mountains, connecting local indigenous knowledge with downstream socio-economic needs.
- Ensuring inclusive representation by making sure the voices of local farmers, youth, and women are embedded within policy planning to foster stakeholder ownership of the future.

2.5 Keynote 4: Biodiversity-Friendly & Climate-Smart Agriculture: A Pathway to Sustainable Food Security and Economic Transformation

Speaker: Prof. Suresh K. Raina, International Technical Advisor, SAARC International & RTM Nagpur University, India



Summary

This presentation emphasized that Biodiversity-Friendly and Climate-Smart Agriculture (BFCSA) provides a comprehensive framework for addressing the interconnected challenges of food insecurity, biodiversity loss, and climate change. He explained that Climate-Smart Agriculture (CSA) is founded on three key pillars:

- i. Sustainably increasing agricultural productivity and incomes,
- ii. Building resilience and adaptation to climate change, and;
- iii. Reducing greenhouse gas emissions.

Key Insights

- **Adoption of biodiversity-friendly agricultural practices:** conservation agriculture, agroforestry, regenerative agriculture, crop diversification, crop rotation, intercropping, organic farming, and integrated pest management. This contributes significantly to enhancing ecosystem services, improving soil health, conserving biodiversity, and increasing agricultural productivity. He noted that diversification of agro-based livelihoods through activities such as apiculture, sericulture, mushroom cultivation, bamboo farming, medicinal plant production, and livestock enterprises provides, additional opportunities for income generation and climate resilience.

- **Advances in Artificial Intelligence (AI):** Machine Learning (ML), Internet of Things (IoT) technologies, drones, robotics, and precision agriculture are transforming agricultural systems worldwide. AI-enabled technologies facilitate precision farming through real-time crop monitoring, predictive analytics, optimized irrigation and fertilizer application, early detection of pests and diseases, and automated agricultural operations. These innovations have the potential to improve productivity, reduce production costs, minimize environmental impacts, and strengthen climate resilience.
- **Critical importance of pollinators:** Honeybees and stingless bees support agricultural productivity and food security. Digital technologies such as application programming interfaces (APIs) and blockchain-enabled traceability systems in precision apiculture, smart hive monitoring, pollinator health assessment, and the development of climate-resilient bee populations; can improve market access, enhance transparency, and support evidence-based decision-making in agricultural value chains.

In conclusion, the speaker emphasized that integrating biodiversity conservation, climate-smart practices, pollination services, and emerging digital technologies offers a viable pathway toward sustainable food systems, improved livelihoods, enhanced climate resilience, and long-term food security. He called for strengthened collaboration among governments, research institutions, local communities, and the private sector to promote sustainable agricultural transformation in Africa and beyond.

2.6. Keynote 5: “Eri Culture as a Livelihood for Fibre and Human Food”

Speaker: Dr. Jogesh Deuri, Director (Retd.), Sericulture Dept., Bodoland Territorial Council (BTC), Assam, India



Summary

Eri culture is an ancient, fully domesticated silk-rearing tradition deeply rooted in Northeast India. Commonly known as “Indi” in the Boro language, the *Samia ricini* silkworm feeds primarily on castor and tapioca leaves. Unlike conventional silk production, Eri is globally recognized as “Peace Silk” (Ahimsa Silk). The moth naturally exits the cocoon before

processing, meaning no life is harmed during its harvest. This makes it the world’s only commercially viable, cruelty-free silk.

Key Insights

- **Socio-Economic and Ecological Advantages:** Eri culture serves as a highly resilient and inclusive economic driver due to several unique characteristics:
 - **Fully Domesticated & Resilient:** Rearing is completely home-based, requiring no wild habitat dependency. The silkworms are multivoltine allowing year-round continuous income and highly disease-tolerant.
 - **Women-Led Empowerment:** Roughly 90% of all rearing, spinning, and weaving is managed by women, driving financial independence and community leadership across BTC.
 - **Zero-Waste Engine:** The entire ecosystem yields zero waste cocoons convert to silk, the pupae serve as human food, and host plants yield oil or agricultural food.

- **UN SDGs Alignment:** The practice directly advances 6 of the 17 UN Sustainable Development Goals: SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 5 (Gender Equality), SDG 8 (Decent Work & Economic Growth), SDG 12 (Responsible Consumption & Production), and SDG 15 (Life on Land).
- **The Triple Income Model & Innovation:** Eri culture optimizes agricultural efficiency through a Triple Income Model derived from host plants:
 - **Host Plants (Castor/Tapioca):** Castor seeds yield cosmetic/industrial oils. Concurrently, the introduction of Tapioca as a dual-purpose host plant yields leaves for silkworms and edible tubers (2535 MT/ha/year), effectively doubling farm income per acre.
 - **Cocoons:** Spun into premium, thermal-regulating, and hypoallergenic textile fiber (“The Wool of the East”).
 - **Pupae (Nutritional Powerhouse):** Composed of 53.3% dry-weight protein and rich in Omega-3, the edible pupae provide essential food security and require 10 times less water to produce than beef.
- **Market Position and Competitive Edge:** Compared to global alternatives like mulberry silk, organic cotton, and synthetic modals, Eri Silk stands out for its minimal carbon footprint, low water usage, and dual contribution to food security.
 - **The Global Ethical Market:** Out of an \$18 billion ethical textile market, GI-certified Bodoland Eri Silk commands a 2.5× price premium (US\$45/kg) over conventional silk in European and Japanese slow-fashion sectors.
 - **Key Export Hubs:** Major partnerships include Japan (e.g., Adan Co. Ltd), Germany/EU (targeting GOTS-certified requirements), the US, and Australia.
- **Infrastructure and Value Chain in Bodoland (BTC):** The BTC has transformed this backyard tradition into a structured, nationally replicable blueprint through the Bodoland Silk Park in Kokrajhar. The centralized value chain manages everything from seed grain to luxury garments, featuring:

- o India's 1st Vanya Cocoon Bank
- o Eri Spun Silk Mills, a Printing & Processing Unit, and a Knitting Plant
- o A specialized Pupae Processing Unit
- o An annual regional output contributing to a 7,200 MT national production total, with empty cocoons fetching ₹9501,000/kg
- **Future Roadmap (Vision 2030):** In collaboration with the youth-led startup Traditional North East Pvt Ltd, Dr. Deuri outlined a clear economic trajectory:
 - o 2026/Current: Shifting from backyard rearing to standardized, professional cluster farming.
 - o 2027: Launching IP-protected product diversifications, including pupa-based protein powders and Eri-denim textile blends.
 - o 2028: Leveraging geographical indication (GI) tags to fully establish Bodoland Eri Silk as a traceable global luxury brand.
 - o 2030: Scaling the model to provide sustainable, dignified livelihoods to over 40,000 rural families across BTC.

He concluded the address by emphasizing Eri and Muga silk as pillars of Indian heritage on the global stage, summarizing his vision with the industry motto: **“Eri is our Future, Muga is our Hope, Mulberry is our Scope.”**

2.7 Keynote 6: Insects as Assets and Architects of Agro-ecological Transformation in South East Kenya Grasslands

Speaker: Prof. Emeritus Gideon Nyamasyo (AKE Founder and Honorary Fellow, Pollen Glory Farm), Kenya



Summary

This address advocated for the mainstreaming of entomology into societal knowledge and national policy. Using Pollen Glory Farm (PGF) as a living laboratory, the presentation laid out a blueprint for elevating insects from mere ecological elements to foundational economic and agricultural assets.

Key Insights

- **The Epistemology of Entomology:** A question was raised on why entomological knowledge in Kenya has remained largely isolated within academic circles instead of being integrated with indigenous knowledge, citizen science, and broader public decision-making.
- **Insects as Drivers of Ecosystem Energetics:** Insects occupy every single layer of a healthy agro-ecosystem:
 - **Landscape & Sky:** Pollinators and biological control agents.
 - **Tree & Foliage:** Herbivores and predators that regulate plant health.
 - **Soil-Interface & Sub-surface:** Ecosystem engineers, decomposers, and nutrient cyclers (e.g., termites and beetles) that build soil structure and improve carbon retention.
- **Ecosystem-Based Bee Farming at PGF:** To build climate resilience, PGF uses an all-year-round flowering strategy

through irrigated sunflower crops and dry-weather fruit tree management to sustain bee colonies throughout the dry seasons. This is paired with modified Langstroth hives featuring endoscope inspection windows and the utilization of farm-manufactured organic bio-pesticides such as Citrus Shield and fermented rabbit urine liquid fertilizer (RABUR-LF).

- **Socio-Cultural Connection (Totem Insects):** To drive community-level conservation passion, the presentation proposed promoting “Totem Insects” such as the termite and the honey bee through cultural narratives, songs, and national exhibitions.
- **Strategic Call to Action**
 - **Payment for Insect Ecosystem Services (PES):** Transition from measuring insect ecology to auditing insect economics.
 - **National Programs:** Establish a national governance structure for entomologists and lobby for a dedicated “Kenya National Insect Circular Bioeconomy Program” focussing on organic waste management countrywide.
 - **Kavuko Village Agroecology Strategy (2025–2030):** A bottom-up economic transformation agenda aiming for at least 1,000 hives across 11 villages by 2030, supported by a functional Community Agroecology Promotion Centre, a solar-powered weather station, and a community-sunk borehole.

2.8. Keynote 7: Technological Innovation for Protecting Biodiversity in Africa Biodiversity & Conservation in Eastern Africa

Speaker: Prof. Qing-Feng Wang, Director General, Wuhan Botanical Garden, CAS & Sino-Africa Joint Research Center, Chinese Academy of Sciences, China



Summary

This keynote presented Eastern Africa as a globally important biodiversity region, characterized by diverse ecosystems including rainforests, savannas, montane forests and alpine moorlands. The speaker emphasized the region's high plant diversity, significant floristic endemism, and the need to combine field investigation, taxonomic documentation, genomic tools and China-Africa

cooperation to support long-term biodiversity conservation.

Key Insights

- **Rich biodiversity and endemism:** Eastern Africa contains more than 33,000 plant species across 3,918 genera and 332 families, with major endemism in the Eastern Afrotropical, Coastal Forests of East Africa, the Horn of Africa, Madagascar and Indian Ocean islands.
- **Diverse landscapes and alpine flora:** The report highlighted savannas, montane forests, equatorial forests, coastal forests and alpine moorlands, with mountain systems such as Simen, Bale, Kilimanjaro and other highland areas serving as important centers of species differentiation and conservation value.
- **Conservation pressures:** Climate change, habitat destruction, human activities and insufficient biodiversity inventories remain major constraints on the protection of endemic and newly discovered plant species.

- Technology-enabled conservation: Field investigations, genomic research, species discovery, biodiversity databases and monitoring tools were presented as essential means for identifying priority species, assessing risk and guiding conservation action.
- China-Africa cooperation through SAJOREC: The Sino-Africa Joint Research Center was introduced as a key platform for joint research, capacity building and sustainable conservation. The Flora of Kenya project aims to document over 7,000 vascular plant species in 31 planned volumes, with the Rubiaceae and Orchidaceae volumes already completed.

Key Takeaways & Future Directions:

- Strengthen basic inventory work: Continue field surveys, taxonomic research and species documentation in under-surveyed areas of Eastern Africa.
- Link science with conservation practice: Integrate genomic tools, long-term monitoring and ecological data into biodiversity protection and policy planning.
- Deepen collaborative platforms: Use SAJOREC and the Flora of Kenya project to advance China-Africa scientific cooperation, local capacity building and community-oriented biodiversity conservation.

2.9 Keynote 8: How biodiversity conservation, ecosystem services, restoration, and community engagement can support sustainability, livelihoods, resilience, and economic transformation

Speaker: Dr. Dickens Odeny, Wyss Academy for Nature, University of Bern, Switzerland



Summary

The presentation sets out a holistic framework positioning biodiversity conservation not as a barrier to development, but as a primary driver of climate resilience, sustainable livelihoods, and economic transformation. Tracing the evolution of conservation science, the keynote points at a paradigm shift from the exclusionary “Nature for itself” models of the 1960s to

contemporary “People and nature” approaches. This modern framework views humans as intrinsic components of complex socio-ecological systems where healthy biospheres directly underpin the achievement of multiple Sustainable Development Goals (SDGs), including poverty alleviation, food security, and life on land.

Key insights

- **Environmental Governance and Inclusivity**
 - **A central theme of the address highlights the critical question:** “Whose voice counts in decision-making?” Using illustrative examples of global versus local conservation tensions, the keynote argues against top-down strategies that ignore local dependencies on natural resources. Sustainable governance must:
 - i. Build inclusive platforms that integrate local, Indigenous, and scientific knowledge.
 - ii. Bridge the gap between international commitments

(e.g., the CBD Post-2020 Global Biodiversity Framework) and practical, localized action.

- iii. Foster collaborative interventions co-designed by communities, scientists, policymakers, and the private sector to ensure environmental justice and equitable benefit-sharing.

- **Empirical Case Studies & Ecosystem Service Valuations**

To demonstrate the tangible economic and social values of nature's contributions, the presentation highlights multi-disciplinary research and spatial assessment methodologies:

- o **Amazon Mangrove Ecosystems (Brazil):** Integrating ecological data and spatial mapping (via tools like ESRI Survey123), this study maps ecosystem service “flows” to demonstrate how mangroves act as crucial natural assets for food security, blue carbon sequestration, and coastal economies.
- o **Mangrove Provisioning in Lamu (Kenya):** A socio-economic survey of 606 households reveals that 69% of the local population directly depends on mangrove ecosystems for daily sustenance and livelihoods (including fisheries, timber, and fuelwood). The study underscores that resource vulnerability is highly tied to demographic factors such as age and education, linking ecological degradation directly to social decline.
- o **Seagrass Blue Carbon (Lamu, Kenya):** Underwater surveys assess soil carbon stocks and ecosystem conditions, demonstrating that community-managed and protected sites maintain significantly higher carbon storage and biodiversity than open-access areas. These systems offer viable pathways for climate finance and green investments.

- **Restoration Ecology and Innovation**

- o Addressing rapid global biodiversity declines—such as the 47% reduction in natural ecosystems reported by IPBES—the keynote presents restoration as both an environmental necessity and a strategic economic investment.

- o Dryland Restoration in Northern Kenya: In the Ewaso Ng'iro and Naibunga landscapes, the implementation of semi-circular bunds serves as a nature-based solution to combat drought and overgrazing. These structures slow runoff, improve rainwater infiltration, and restore pasture productivity.
- o Monitoring Innovations: The research emphasizes tracking actual ecological processes rather than just green vegetation cover. The integration of cutting-edge environmental DNA (eDNA) metabarcoding allows scientists to detect species directly from soil samples, providing robust, data-driven tracking of biodiversity recovery over time.

Key Takeaway Message

- **Interdisciplinary Synthesis:** Effective conservation requires breaking down institutional silos to merge hydrology, ecology, socio-economics, and governance.
- **Co-Design:** Interventions are only sustainable over time if they are locally relevant, socially acceptable, and co-created with the communities that depend on them.
- **Strategic Natural Capital:** Safeguarding biodiversity and cultural heritage is an active investment in long-term economic resilience, climate adaptation, and green growth.

3.0 Conference Symposia

3.1. Symposium 1: Flora & Fauna Conservation in Kenya

Moderator: Paul Gacheru, Nature Kenya

Panelists: Ann Komen, Josephine Nzilani, George Odera, and Dickens Mujumba; Fauna & Flora; Paul Waweru, Olpejeta Conservancy; Bernard Mwangi, Olpejeta Conservancy; Emmanuel Dhadho, Northern Rangelands Trust



Left: George Odera, Fauna and Flora; **Right:** Bernard Mwangi, Olpejeta Conservancy

Title: Scaling Nature-Based Solutions through Markets Linkages: Ol Pejeta Conservancy (OPC) Livestock-to-Market Scheme

- **Overview and Core Philosophy:** The presentation outlines the community development initiatives and Nature-Based Solutions (NbS) spearheaded by the Ol Pejeta Conservancy (OPC) in collaboration with Fauna & Flora. The overarching vision driving this initiative is that “Conservation succeeds when communities thrive.” By integrating market access with sustainable land management, the project addresses local market failures, enhances value chain access through standardized practices, and utilizes cooperative and Self-Help Group (SHG) models to uplift pastoral communities.

- **OI Pejeta Community Development Programs:** The initiative approaches community resilience and landscape management through four pillars:
 - **Education:** Providing scholarships, developing school infrastructure, and digital learning opportunities.
 - **Livestock Development:** Enhancing marketing opportunities, animal health services, and Artificial Insemination (AI) services.
 - **Agriculture & Food Security:** Introducing climate-smart farming techniques and agricultural extension services.
 - **Water & Natural Resource Management:** Deploying water development projects and structured rangeland management.
- **The Business Model: Livestock-to-Market Scheme:** The scheme operates on a circular, self-sustaining financial framework designed to scale Nature-Based Solutions:
 - **Seed Capital & Buying:** Seed capital is provided to OPC, which acts as the main buyer for livestock from local pastoralists.
 - **Revolving & Conservation Funds:** A subsidiary revolving fund supports water harvesting for resident communities, while a conservation fund helps finance community programs.
 - **Future Autonomy:** The long-term goal is for local cooperatives and SHGs to manage the revolving fund independently and drive value-addition activities.
- **Challenges & Future Scalability:** Operational Challenges
 - **Social:** Navigating residency status, equity issues, and inclusion/exclusion mechanisms tied to local cultural drivers.
 - **Business:** Managing governance during scaling, alongside heavy monitoring burdens and administrative costs.
 - **Nature:** Mitigating livestock disease risks and executing rigorous monitoring of NbS outcomes.

- **Scalability & Long-Term Outlook:** Moving forward, the project emphasizes securing financial sustainability independent of donor funding. Key success indicators for future replication include maintaining enough fund availability to continuously run secondary programs (such as scholarships, livelihood initiatives, and rangeland rehabilitation) and scaling the adoption of standardized production and marketing practices across the wider ecosystem.

3.2. Symposium 2: Sericulture for Biodiversity and Economic Transformation

Moderator: Prof. Linet Gohole, Univeristy of Eldoret

Lead Panelist: Dr. Boniface Ngoka, Insectect Farm Solutions

Panelists: Prof. Suresh K. Raina, Nagpur University; Prof. Esther Kioko, NMK; Dr. Namikoye Samita, Kenyatta University; Dr. Jogesh Deuri, Director of Sericulture, Government of Assam, BTC; National Sericulture Research Centre, KALRO; Ms. Nyokabi Mwangi, Tosheka Textiles Limited

Eri culture (*Samia ricini*) serves as a powerful, climate-resilient engine for both biodiversity conservation and economic transformation, seamlessly linking traditional heritage with modern sustainable development. As a zero-waste, fully domesticated ecosystem, it requires no wild habitat destruction, making it an eco-friendly alternative to conventional textiles. Globally celebrated as cruelty-free “Peace Silk” (Ahimsa Silk), the process allows the moth to emerge naturally from the cocoon, a feature that commands a 2.5× price premium in the lucrative international slow-fashion markets of Europe, Japan, and the US. Furthermore, its unique Triple Income Model optimizes agricultural efficiency by utilizing host plants like castor and tapioca to simultaneously yield premium thermal-regulating textiles, commercial oils, and nutrient-dense edible pupae containing 53.3% dry-weight protein. This multi-stream revenue directly addresses multiple UN Sustainable Development Goals, including climate change adaptation, food security, and responsible consumption.

On a community level, sericulture drives profound socio-economic empowerment and structured industrial growth, particularly for women who comprise roughly 90% of the workforce. By transforming a decentralized backyard tradition into a professional cluster-farming network—as demonstrated by the Bodoland Silk Park blueprint in India and Tosheka Textiles’ “farm-to-fashion” initiative in Makueni County, Kenya—the industry creates sustainable, dignified livelihoods for thousands of rural families. These initiatives bridge the gap for disadvantaged communities by integrating smallholder farmers, spinners, weavers, and designers into a centralized, competitive value

chain. Looking toward Vision 2030, strategic cross-border collaborations and innovations, such as pupa-based protein powders and Eri-denim blends, are set to scale this regenerative model globally, proving that cultural preservation and commercial enterprise can thrive hand in hand.

- **Establish Centralized Production Infrastructure:** Replicate the structural blueprint of the Bodoland Silk Park in emerging regions like Kenya. This includes setting up localized cocoon banks, processing units, and specialized pupae processing facilities to transition the industry from a backyard tradition into a formal, highly efficient value chain.
- **Scale Through Professional Cluster Farming:** Move smallholders away from isolated, baseline rearing into organized, professional cluster farming. Providing standardized training and resources to rural families will help stabilize the year-round, multivoltine harvest cycle and build volume.
- **Maximize the Triple Income Model & Innovation:** Fully commercialize the side-streams of production by investing in R&D for product diversification. Immediate targets include launching pupa-based protein powders for food security, extracting cosmetic/industrial oils from castor seeds, and creating novel textile blends like Eri-denim.
- **Empower Disadvantaged Communities and Women:** Intentionally design local supply chains around women and vulnerable groups—who already make up 90% of the workforce—by expanding access to microfinance, modern spinning equipment, and direct market contracts via social enterprises like Tosheka Textiles.
- **Leverage Ethical Branding & Global Traceability:** Capitalize on the GI (Geographical Indication) certification and “Peace Silk” (Ahimsa) status to target the \$18 billion international slow-fashion market. Establishing strict traceability from “farm to fashion” will secure and maintain the 2.5× premium price point in the US, Europe, and Japan.

3.3. Symposium 3: Flora of Kenya

Moderator: Dr. Beryl Bwong, NMK

Rapporteurs: Gideon Ngenwayo, University of Rwanda and Eliud Kiprono NMK,

Lead Panelists: Dr. Geoffrey Mwachala, NMK & Prof. Qing-Feng Wang, Wuhan Botanical Garden, CAS

Other Panelists: Dr. Paul Kirika, NMK; Mr. Guiyu Yang, Hubei, Science and Technology Press; Dr. Neng Wei; Dr. Caifei Zhang, Wuhan Botanical Garden, CAS; Dr. Itambo Malombe, NMK; Dr. Emily Webuye, Kenyatta University; Dr. Paul Musili, NMK; Dr. Zhuo Zhou; Dr. Lishen Qian, Kunming Institute of Botany, CAS; Dr. Yihua Tong, South China Botanical Garden, CAS



Dr. Geoffrey Mwachala, Chief Research Scientist, NMK



Panel: Left to Right: 1st Row: Dr. Paul Musili, Dr. Paul Kirika, Dr. Itambo Malombe, Dr. Emily Wabuyele, Prof. Qing-Feng Wang

Left to Right: 2nd Row: Dr. Lishen Qian, Dr. Zhuo Zhou, Dr. Yihua Tong, Dr. Caifei Zhang, Dr. Neng Wei, Mr. Guiyu Yang

Summary

The “Flora of Kenya” is a massive joint research endeavor collaborated on by the Wuhan Botanical Garden Chinese Academy of Sciences, and the National Museums of Kenya. Key contributors and authors include Dr. Geoffrey Mwachala, Prof. Qing-Feng Wang, Dr. Itambo Malombe, Dr. Paul Kirika, Dr. Neng Wei, and Dr. Guangwan Hu. Launched in 2015, the project expounds upon the historical Flora of Tropical East Africa (1952–2012). Its overarching objective is to document approximately 7,000 vascular plant species across Kenya, culminating in a comprehensive 31-volume collection. This initiative aims to stimulate further botanical studies and provide vital taxonomic frameworks to inform conservation efforts across Kenya’s 47 counties.

Methodology & Classification Systems

The project utilizes modern field collections, taxonomic revisions, detailed mapping, and colour photography to aid accurate plant identification. Plant classifications adhere strictly to updated international evolutionary and phylogenetic systems:

- **Flowering Plants (Orders/Families):** Follows the Angiosperm Phylogeny Group IV (APG IV) system.

- **Lycopods and Ferns:** Follows the Pteridophyte Phylogeny Group system (PPG I).
- **Gymnosperms:** Follows the system proposed by Yang et al. (2022).

Future volumes will continuously incorporate incoming classification updates. Multiple key ecological zones across Kenya have been actively investigated, including Mt. Kenya, Mt. Elgon, the Aberdare Range, Cherangani Hills, Kakamega Forest, and various coastal and inland forest reserves.

Project Progress & Key Milestones

The project has driven substantial advancements in academic capacity building, species identification, and botanical literature:

1. Academic & Field Metrics

- **New Species Described:** 15 (including *Adenia angulosa*, *Harveya kiangombensis*, and *Dorstenia arachniformis*).
- **Herbarium Specimens Collected:** Over 5,000 specimens.
- **Peer-Reviewed Articles:** 50 published papers.
- **Books Published:** Four.

2. Capacity Building & Education

- **Ph.D. Program:** 10 graduates completed, with 11 currently ongoing.
- **M.Sc. Program:** 20 graduates completed, with 6 currently ongoing.

3. Completed and Upcoming Publications

- Of the 31 planned volumes, two volumes have been officially completed and launched, leaving 29 volumes remaining:
- **Volume 23:** Rubiaceae (launched in 2023 in Nairobi).
- **Volume 4:** Orchidaceae (officially published in June 2025 in Chengdu, China).

Parallel to the main flora volumes, work continues on regional guidebooks, such as the Field Guide to Wild Plants of Africa: Mt. Kenya, Common Plants of Kenya, Guide to the Woody Vegetation of the Coastal Forests, and the Guide to the Plants of the Taita Hills.

Discussion Points & Lessons Learned: During the symposium, several strategic areas were highlighted for ongoing execution and refinement:

- Securing expert participation for the accurate compilation of complex family accounts.
- Standardizing mapping and managing historical/heritage collections effectively.
- Reviewing lessons learned from finished volumes to streamline future family account publications, checklists, and capacity building.

Group photo



Left to Right: 1st Row: Mr. Guiyu Yang, Hubei, Science and Technology Press; Dr. Emily Wabuye, Kenyatta University; Prof. Qingfeng Wang, Wuhan Botanical Garden, CAS; Dr. Geoffrey Mwachala, NMK; Dr. Paul Kirika, NMK; Dr. Itambo Malombe, NMK; Dr. Paul Musili, NMK; Dr. Fredrick Munyao, Wuhan Botanical Garden, CAS

Left to Right: 2nd Row: Mr. Litao Zhu, Hubei, Science and Technology Press; Dr. Neng Wei, Wuhan Botanical Garden, CAS; Dr. Caifei Zhang, Wuhan Botanical Garden, CAS; Dr. Lishen Qian, Kunming Institute of Botany, CAS; Dr. Zhangjie Huang, Xishuangbanna Tropical Botanical Garden, CAS; Dr. Zhuo Zhou, Kunming Institute of Botany, CAS; Dr. Yihua Tong, South China Botanical Garden, CAS

4.0 Association of Kenyan Entomologists Awards

Speaker: Dr. Namikoye Samita, Chairperson, AKE, Kenyatta University

4.1 Recognition of the AKE Governing Council

During the 2nd Joint International Scientific Conference, the Association of Kenyan Entomologists (AKE) held a special Recognition and Award Ceremony to honor individuals whose dedication and contributions have been instrumental in the growth and advancement of the society.

Awards and certificates were presented in four categories: Founder Members; Association of Kenyan Entomologists Fellows (AKEF), Association of Kenyan Entomologists Honorary Fellows (AKEHF), and the outgoing Governing Council. The recognition ceremony highlighted AKE's commitment to celebrating excellence, acknowledging outstanding service, and inspiring current and future members to contribute meaningfully to the advancement of entomology and the society's mission.

Members of the current AKE Governing Council were recognized and acknowledged by the chairperson for their dedication, unwavering commitment, and selfless service in leading the society on a voluntary basis, while providing strategic leadership in overseeing the affairs of the society and ensuring that AKE fulfilled its commitments to members and stakeholders. The society's history since inception up to its current status to date as a nationally recognized professional association was highlighted, emphasizing the invaluable contributions of members. The chairperson commended the Council's collective vision, teamwork, and resilience, acknowledging that their efforts had been instrumental in strengthening the society's governance, expanding its visibility, and transforming AKE into the dynamic professional organization celebrated today.



AKE members with the current and former governing council

4.2 Brief History of AKE

The Association of Kenyan Entomologists (AKE) traces its roots to 1982, when entomologists in Kenya gathered to establish a professional community dedicated to advancing insect science. The Society was formally established on 29 April 1993 as the Entomological Society of Kenya (ESK) and was successfully reactivated on 29 April 2019, ushering in a new era of growth, collaboration, and professional engagement spearheaded by the outgoing governing council, Dr. Muo Kasina, whose vision and leadership laid the foundation for the achievements we celebrate today. Since then, membership has grown remarkably from approximately 40 members in 2019 to 215 members in 2026, comprising scientists, researchers, academicians, technical professionals, industry practitioners, and an expanding student membership. AKE takes particular pride in mentoring young scientists who represent the future leadership of entomology and related disciplines.

4.3 Key Activities and Achievements Since Reactivation

AKE members have actively contributed to science, agriculture, biodiversity conservation, public awareness, and policy engagement through:

Scientific and Professional Activities:

- Conducting public awareness campaigns and media interviews on emerging pest threats such as desert locusts, fall armyworm, and other invasive and economically important insect pests.
- Supporting national pest management initiatives and providing expert guidance to farmers and policymakers.
- Organizing farmer field demonstrations and community outreach programs to promote sustainable pest management practices.
- Mentoring students and early-career scientists through conferences, workshops, and networking opportunities, many of whom have secured overseas opportunities in universities such as Cambridge, Idaho, the University of Pretoria, among others.
- Supporting research collaborations among universities, research institutions, government agencies, and international organizations.
- Enhancing livelihoods through nature-based enterprises.
- Championing Climate Change and Climate Smart Agriculture.

4.4 AKE Honors and Recognition Programme

In accordance with the AKE Constitution (amended in September 2025), the Society established a prestigious honors programme to recognize outstanding contributions to entomology and national development.

AKE Fellow (AKEF), title is conferred for life upon members who have demonstrated exceptional scholarly achievement and made significant contributions to entomological science and the objectives of AKE.

The inaugural AKE Fellows are:



Left: AKEF, Prof. Esther Kioko, OGW and **Right:** AKEF, Dr. Muo Kasina

AKE Honorary Fellow (AKEHF), title recognizes distinguished individuals who have rendered outstanding service to Kenya, science, or entomology globally. Honorary Fellows serve as lifelong senior advisers to the Society.

The inaugural AKE Honorary Fellows are:

1. AKEHF, Dr. Stephen Njoka, OGW
2. AKEHF, Prof. John Nderitu
3. AKEHF, Prof. Florence Olubayo
4. AKEHF, Prof. Gideon Nyamasyo
5. AKEHF, Prof. Elizabeth Kokwaro



Founder members from left to right: AKEF, Prof. Esther Kioko, OGW; Prof. Linnet Gohole; AKEHF, Dr. Stephen Njoka, OGW; Prof. Samuel Kubasu; AKEHF, Prof. Gideon Nyamasyo; Chairman AKE, Dr. Namikoye Samita; Dr. Suleiman Aketch; AKEHF, Prof. John Nderitu; AKEHF, Prof. Elizabeth Kokwaro; Prof. Fred Amimo; AKE Life Member, Prof. Suresh Raina.

Founder Member Awards recognize pioneers who played a critical role in establishing and nurturing the entomological community and the Society prior to or on 4th June 1992.



The AKE Honorary Fellows, from left to right: AKEHF, Prof. John Nderitu; AKEHF, Dr. Stephen Njoka, OGW; AKEHF, Prof. Gideon Nyamasyo; AKE Chairman, Dr Namikoye Samita; Dr. Jane Macharia, NMK; AKEHF, Prof. Elizabeth Kokwaro; Founder Member, Prof. Samuel Kubasu; Dr. Deuri Jogesh; India: AKE Life Member, Prof. Suresh Raina, India.

The other founder members not in the Photo are: AKEHF, Prof. Florence Olubayo; Prof. C.P.M. Khamala; Prof. Vincent Sudoi; Dr. Wanja Kinuthia; Mr. Michael Mungai and the late Dr. John Omollo.

Recognition of the Outgoing Governing Council (2019–2026)

The team was acknowledged and appreciated for their vision, sacrifice, and dedication in steering the Society through its revival, constitutional reforms, financial stabilization, and membership growth.



AKE Members with Part of the Outgoing Governing Council



Part of the former Governing Council, Prof Mary Gikungu, the Director General, National Museum of Kenya, and AKE life member, Prof Suresh Raina, keynote speaker at the conference

Outgoing Governing Council (2019–2026)

Name	Position
AKEF Dr. Muo Kasina	Chairman
Dr. Ruth Kahuthia-Gathu	Vice Chairman
AKEF Prof. Esther Kioko, OGW	Secretary
Dr. Dora Kilalo	Vice Secretary
Dr. Everlyne Samita	Treasurer
Dr. Johnson Nyasani	Editor
Dr. Alexander Muvea	Assistant Editor
Dr. James Odanga	ESK Member Representative
AKEHF Prof. Florence Olubayo	Universities Representative
Dr. Beryn Otieno	Research Institutions Representative
AKEHF Dr. Stephen Njoka, OGW	International Institutions Representative

Name	Position
Eric Muthama	Program Coordinator
Working Group Conveners	
Dr. Mary Guantai	Integrated Pest Management
Dr. Boniface Ngoka	Commercial Insects
Dr. Florah Namu	Insect Biodiversity
Dr. John Kochey	Taxonomy and Biosystematics
Dr. Monicah Waiganjo	Policy and Advocacy

Recognition of the Current Governing Council (2026–2029) Executive Committee

Name	Position
Dr. Namikoye Samita	Chairman
Dr. Boniface Ngoka	Vice Chairman
Dr. Mary Guantai	Secretary
Dr. Beryn Otieno	Assistant Secretary
Ms. Grace Kioko	Treasurer
Mr. Evanson Omuse	Editor
Dr. Alexander Muvea	Assistant Editor
Dr. Eston Mutitu	Research Institutions Representative
Prof. Dora C. Kilalo	Universities & Academic Institutions Representative
Dr. Pamela Olet	Regional and International Organizations Representative
Ms. Nancy Munyoki	Ordinary Members Representative
Working Group Conveners	
Prof. Linnet Gohole	Integrated Pest Management
Ms. Ann Nyandiala	Commercial Insects
Dr. James Odanga	Insect Biodiversity

Name	Position
Dr. John K. Kipyegon	Taxonomy & Systematics
Dr. Dennis Ochieno	Policy and Advocacy
Ms. Makena Murithi	Program Coordinator

Closing Remarks

As we celebrate these remarkable individuals and the tremendous progress made by the Association of Kenyan Entomologists, let us remember that our strength lies in our collective commitment to science, mentorship, innovation, and service to society. We would also like to reach out to like-minded societies, organizations, and institutions that would like to partner with us in taking AKE to the next level.

5.0 Conference Sessions and Sub-themes

1. Biosystematics, Ecology, Evolution, and Biogeography
2. Climate Change Adaptation and Mitigation Strategies
3. Biodiversity-Friendly and Climate-Smart Agriculture
4. Livelihood strategies in Biodiversity-Based Enterprises
5. Conservation of Geo-heritage and Cultural Landscapes
6. Leveraging Digital Technologies
7. One Health Approach
8. Indigenous and Local Knowledge
9. Managing Invasive and Alien Species
10. Policy Frameworks in Heritage Management

5.1 Sub-Theme: Biosystematics, Ecology, Evolution and Biogeography

At the core of biodiversity conservation is a deep understanding of what species exist, how they are related, where they are found, and how they interact with each other and their environments. This sub-theme focuses on the foundational biological sciences that inform all other aspects of conservation, restoration, and sustainable use. The sub-theme highlights the importance of species classification, evolutionary biology, ecological interactions, and the spatial distribution of biodiversity as foundational tools for conservation planning and monitoring.

Session Moderators: Dr. Patrick Malonza, National Museums of Kenya; Dr. Dennis Ochieno, Masinde Muliro University of Science and Technology; Dr. Titus Imboma, National Museums of Kenya; Prof. Neng Wei, Wuhan Botanical Garden, Chinese Academy of Sciences, China; Dr. Laura Martínez-Íñigo Wildlife Works, Kenya

Session Rapporteurs: Marystella Injete, University of Eldoret (PEBCA case study scholar); and Irene Chepng'etich, Technical University of Kenya. Peter Mwangangi, University of Nairobi (PEBCA case study scholar); Nuwagaba Leonidas, University of Eldoret (PEBCA case study scholar); and Esther Mwendu, Chuka University; Wycliff Obara, Kenyatta University; and Naomi Ngeny Chepkemai, Chuka University.

Summary

The presentations spanned a diverse array of biodiversity and conservation topics across Kenya and the broader region. Ecosystem-focused research emphasized the urgency of rapid plant diversity assessments, particularly within the Lake Victoria Basin and the Chyulu Hills. Behavioral and ecological studies ranging from tortoise homing instincts to small mammal community dynamics highlighted the complexity of species interactions. Several papers addressed anthropogenic pressures, examining how land-use practices affect water quality and macroinvertebrates, and how mining impacts herpetofauna. Additionally, investigations into fungal communities, aquatic species in rehabilitated landscapes, and insect pollinators offered critical insights into species richness. Finally, pressing conservation challenges for threatened species, such as the coastal topi and endemic butterflies, underscored the critical need to mitigate habitat loss. Collectively, these findings illuminate complex ecological relationships and reinforce the vital role of biodiversity assessments in driving effective conservation planning and management.

List of Presentations

1. **¹Paul M. Kirika** & Judith W. Nyamai, Rapid Plant Diversity Assessment of Lake Victoria Basin (Kisumu, Migori, and Homabay Counties) in Kenya, **¹National Museums of Kenya.**
2. **¹Zhang-Jie Huang**, Paying Patience Back to Impatiens (Balsaminaceae): Hidden biodiversity in the Qinling-Bashan Mountains, China, **¹Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences.**
3. **¹Jacob Mueti Ngwava**, Fanrong Xiao, Beryl A. Bwong, and Hai-Tao Shi, “Unravelling homing behavior and territoriality in the pancake tortoise, *Malacochersus tornieri* in Kenya,” **¹National Museums of Kenya**
4. **Veronica Onduso**, Denne Reed, Kay Behrensmeyer, Ogeto Mwebi. “Spatial-Temporal Patterns of Small Mammal Communities Revealed by Owl Diet in Amboseli, Kenya.” **National Museums of Kenya**
5. **¹Judith Nyamai** and Paul Musili. Botanical Survey for Carbon

- Biomass in the Chyulu Hills Ecosystem, Kajiado and Makueni Counties.” **¹National Museums of Kenya**
6. **Lovisa Kandenge.** “Red List Assessments and Biodiversity Data as a Foundation for Key Biodiversity Area Identification in Namibia: Insights from Endemic Flora.” **National Botanical Research Institute, Namibia**
 7. **¹Beatrice Mukami** and Laban Njoroge. “Digitizing and Publishing Dytiscidae Specimens from the National Museums of Kenya to GBIF, **¹National Museums of Kenya.**
 8. **Edward Njagi.** “Fishes of the Mara River: Diversity and Threats.” **National Museums of Kenya**
 9. Qing-Feng Wang, Geoffrey Mwachala, **¹Neng Wei**, Diversity and Conservation of Succulent Plants in Kenya, **¹Wuhan Botanical Garden, Chinese Academy of Sciences, China**
 10. **¹Patrick K. Malonza**, David M. Mulwa, Joash O. Nyamache, Nick Okello. “Mining and Biodiversity Conservation: A Case Study on the Impacts of Mine Rehabilitation and Habitat Restoration on Herpetofauna in the Kwale Mine in Kenya, **¹National Museums of Kenya**
 11. **Zedekiah Okwany**, Phylogeographic Relationships of Freshwater Crabs, *Potamonautes macleay*, 1838, in Central Kenya in Relation to Similar Species in Southern Africa Highlands.” *Decapoda: Potamonautidae*, **National Museums of Kenya**
 12. **¹Cai-Fei Zhang**, Guang-Wan Hu, Jing Tian, Wei-Chang Huang, Veronica Mutele Ngumbau, Qing-Feng Wang, Unveiling Kenya’s Orchid Diversity: Volume 4 of the Flora of Kenya, **¹Wuhan Botanical Garden, Chinese Academy of Sciences, China**
 13. **Jane M. Macharia**, Temporal Variation and Community Structure of ground and Canopy-Dwelling Beetles: The role of plant phenology and Ground Cover in a semi-arid floodplain, Ewaso Narok, Kenya.” **National Museums of Kenya**
 14. **¹Nathan Kiboi**, Collins Abonyo, Benson Mwiti, Mathew Piero Ngugi, Domnic Marera, and Tom Were. Morphological and Molecular Characterization of Haloalkiliphilic Fungal Isolates from Hot-Spring Shores of Lake Magadi, Kenya, **¹Masinde Muliro University of Science and Technology, Kenya**

15. **'Simon Musila**, John K. Njueini, Rowan Hadege, Olivia Mukasia, Mercy Ndumia, Lawrence Wagura, Lawrence Lonyil, Raabia A. Hawa & Leo M. Khasoha, Vanishing from Floodplains: Coastal Topi *Damaliscus lunatus topi* Extinction Crisis in Kenya, **'National Museums of Kenya**
16. **Christopher Chesire**, Regeneration Dynamics in Forest Gap Environments of Kenya's Afromontane Forests, Thematic Area, **National Museums of Kenya**
17. **Qian Li-shen**, Plant Diversity in Yunnan. **Kunming Institute of Botany, Chinese Academy of Sciences.**
18. **'Susan Kabacia** and Raphael Githui, Diversity Assessment of Macrofungi in Mt Kenya, Nyeri County, **'National Museums of Kenya**
19. **'Beryl A. Bwong**, Joash Nyamache, and Patrick K. Malonza, Ecological Assessment of *Hyperolius rubrovermiculatus* (Shimba Hills Reed Frog) in Kwale County, Kenya: Distribution, Population Size, and Breeding Patterns. **'National Museums of Kenya**
20. **Yihua Tong**, Taxonomic Revision of the Genus *Sasa*, *Poaceae: Bambusoideae* from China, **South China Botanical Garden, Chinese Academy of Sciences**
21. **'Ernest Uwimana**, Methode Majyambere, Deogratias Tuyisingize, Richard Karangwa, Assessing Forest Landscape Restoration Efforts Using Non-Volant Small Mammal Habitat Modelling Around the Nyandungu Eco-Park, Kigali City, Rwanda, **'Dian Fossey Gorilla Fund, Rwanda**
22. **Juliana Anyango**, Influence of Land Use Practices on Water Quality, Macroinvertebrates, and Mayflies (Ephemeroptera) in the Nzoia River, Kenya, **Kenyatta University, Kenya**
23. **'Julius K. Nguku** and Joseph Gathua, Assessment of fish species along Northern Ewaso Ng'iro River Basin in Laikipia County, Kenya, **'National Museums of Kenya**
24. **'Laura Martínez-Íñigo**, Geoffrey Mwangi Wambugu, Bernard Amakobe and Mwangi Githiru, Altitudinal Range Dynamics of the Understorey Bird Community in Mount Kasigau, Kenya, **'Wildlife Works, Kenya**
25. **'Esther N. Kioko**, Alex M. Musyoki, Duncan K. Mwinzi, Joshua Sese and Oliver Genga, Forest Fragmentation and Elevation

Gradients Shape Hawkmoth (Sphingidae) Communities in the Taita Hills Biodiversity Hotspot, **'National Museums of Kenya**

26. **'Muchai V.**, Atubwa H., Malonza P., and Bwong B. Assessment of Aquatic Herpetofauna Along Upper River Ewaso Ngiro in Laikipia County, Kenya, **'National Museums of Kenya.**
27. **Zhou Zhuo**, Plant Diversity in the Qinghai-Tibet Plateau (QTP) alpine subnival flora, Kunming Institute of Botany, Chinese Academy of Sciences.
28. **'Mary N. Muchane**, Kelvin M. Waithaka, Thuita Thenya, and Jabes Okumu, Unlocking Fungi Communities in the Lake Ol Bolossat Basin and Associated Riparian Ecosystems in Central Kenya; **'National Museums of Kenya.**
29. **'Joseph Mburu** Njogu, Kennedy Wambua Matheka, Emily Wabuyele, Charlotte Sletten Bjorä, Molecular Phylogenetics of Kenyan Aloes, **'University of Oslo**
30. **Yuvenalis Mbuni**, Phylogeny-niche predictive framework for potential medicinal plant discovery in Tropical East Africa, **National Museums of Kenya**
31. **Ronald Mulwa**, Multiple anthropogenic pressures reduce a high-canopy forest to an ecological forest edge: Insights from comparative avifauna studies in South Nandi and North Nandi Forests, **National Museums of Kenya**
32. **'Thierry Ntaganira**, Jean-Claude Twahirwa, Thadee Muhire, and Aime Bruce Ngenzi Nzeyimana, Understanding All Stages of Decomposition Amid Microclimate Variability in the Virunga Massif, **'Dian Fossey Gorilla Fund, Rwanda**
33. **'Gilbert Kosgei**, Dorothy Nyingi, and Ray Schmidt, Taxonomic Study of the Cyprinid Genus *Labeobarbus* in Kenya: Species Delimitation and Conservation Implications, **'National Museums of Kenya,**
34. **'Rahab N. Kinyanjui**, Veronica Muiruri, Rebecca M. Muriuki, Stephen Rucina, From Hive to Habitat: Using Mellisopalynology to Classify Honey and Monitor Land Degradation, **'National Museums of Kenya**
35. **'Thomas Odeyo**, Beryl A Bwong, Patrick K Malonza James Jumbe & Eunice Kairu, Spatial and Seasonal Variation in Abundance and Diversity of Reptiles in Shimba Hills National Reserve, Kwale County, Kenya, **'Kenyatta University. (Virtual)**

36. **Oliver C. Genga**, Namikoye E. Samita, Ruth Kahuthia- Gathu, Esther N. Kioko, Ecology and Conservation of the Kenya Endemic Swallowtail Butterfly, *Papilio desmondi teita*: Old Questions, Challenges, and Opportunities," **University of Pretoria, South Africa. (Virtual)**

Poster Presentations

37. **Varliewin Makena Murithi**, Morphological and Biomechanical Adaptations for Mandibular Attachment: A Case Study of Blue Banded Bee, *Amegilla calceifera* Hymenoptera: Apidae, **National Museums of Kenya**
38. **Joash Nyamache**, The Distribution and Ecology of Chameleons in the Highlands of Kenya, **National Museums of Kenya**
39. **Anne Nyandiala**, Occurrence and Diversity of Edible Termites (Isoptera: Termitidae) Archived in the Natural History Collections of the National Museums of Kenya, **National Museums of Kenya**
40. **Atubwa Howard**, Population Status, Threats, and Community Perceptions of the Endemic Endangered Mount Kenya Bush Viper, *Theris desaixi*, Mt Kenya, Kenya, **National Museums of Kenya**
41. **Kevin Kipngetich**, Herpetofauna Diversity of Naibung'a Lower Conservancy, Kenya **National Museums of Kenya**
42. **John Musina**, Correlates of Abundance of Birds of Lake Nakuru National Park, **National Museums of Kenya**
43. **Anthony Karani**, Butterflies as Indicators of Ecological Processes: Functional Traits, Population Monitoring, and Trophic Interactions in a Restored Forest, **University of Embu**
44. **Faith Jepkemei**, Occurrence of Leopard Tortoise in Tarangire Manyara Ecosystem, Northern Tanzania, **Nelson Mandela African Institution of Science and Technology**

Key Message to Policymakers

- **Prioritize compliance frameworks:** Conservation failures stem from weak field enforcement and implementation, not a lack of frameworks.

- **Formalize buffers, community conservancies, and zoning:** Many species of conservation interest depend on riverine networks, forest fragments, wetlands, and elevational corridors that often lie outside protected areas hence should be considered in conservation plans.
- **Integrate biodiversity into development:** incorporate biodiversity monitoring in Environmental Impact Assessments (EIA) and land-use planning, restricting agriculture near wetlands, retaining deadwood, regulating grazing in forests, and enforcing mine-site rehabilitation.
- **Recognition of ecosystem service providers:** provisioning, regulating, cultural and supporting services are important to the health of the ecosystem, hence the need to include the management plans.
- **Regulate herbal products with mandatory DNA-based authentication:** to curb mislabeling, protect threatened species, and safeguard consumers.
- Indicator species as low-cost, sensitive metrics of forest health and landscape degradation and incorporate them into monitoring plans.

Emerging findings and methods

- **New species records:** amphibian occupancies *Hyperolius rubrovermiculatus*; extensive fungal and macrofungi records; taxonomic resolution in bamboo (split of polyphyletic *Pleioblastus*); high reptile diversity structured by habitat heterogeneity.
- **Emerging technologies and methods:** Combined CMR + Sentinel-2 NDVI + MaxEnt for urban wetland suitability; ddRAD-Seq phylogenomics for aloes; high-throughput DNA metabarcoding exposing 66%+ authenticity failures in herbal products; melissopalynology for honey authentication and land degradation monitoring.
- **Forest health indicator species:** Avifauna guilds (forest specialists/generalists/visitors) track forest integrity; hawkmoth richness increases with elevation, but extreme rarity flags vulnerability.

Research priorities and gaps

- **Molecular technologies:** Expand voucher-backed molecular taxonomies across flora, and fauna to resolve species complexes and develop barcode databases.
- **Ecosystem monitoring:** Long-term monitoring programs for species and ecosystems.
- **Biodiversity Knowledge Gaps:** Incomplete inventories for most ecosystems e.g genetic data for fish; under-sampled fungi; missing/possibly destroyed native species; unclear dispersal/ genetics: limited long-term species trends data.
- **Predictive models:** Scale phylogeny niche models to prioritize medicinal plant discovery while guiding conservation.

Threats and challenges

- **Habitat degradation:** Land use change including drainage of wetlands, forest degradation, mining impacts, and agricultural encroachment beyond reserves leading to important loss of biodiversity habitats.
- **Climate change:** The impact of weather patterns leading to droughts, shifting climate bands endangering alpine flora, forests, and pollinators; lethal river temperatures during low flows and lake shrinkage leads to species loss.
- **Invasive species:** Rainbow trout displace native fish; invasive vegetation in ecosystems.
- **Pollution:** Agricultural/industrial runoff degrading rivers and water bodies.
- **Forensic authentication:** limited resources to identify illegally acquired species, mislabeled herbal products, and protected species.

Interventions and strategies

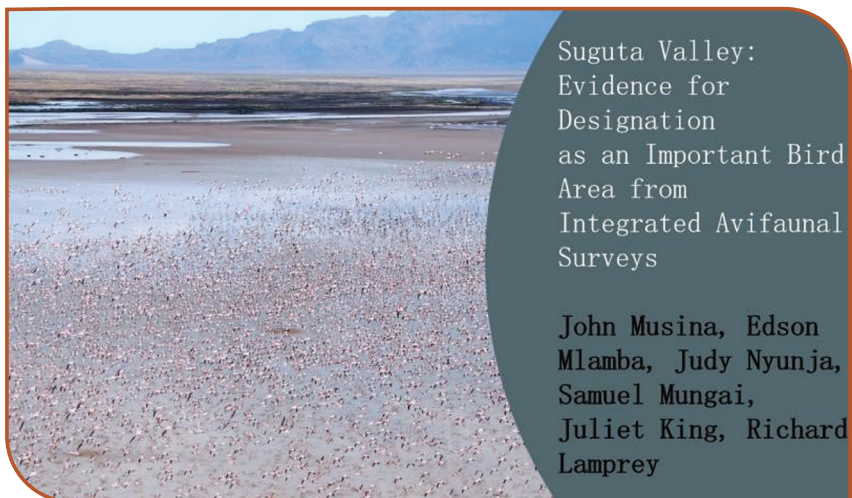
- Create buffer zones, elevational corridors, deadwood retention, wetland filtration parks, indigenous tree restoration, Arbuscular Mycorrhizal Fungi (AMF) to boost soil/plant resilience, and community co-management.

- Monitoring and conservation by use of multi-gear fish sampling along gradients, protection of freshwater habitats and alignment of fish conservation with water policy.
- Species monitoring by use of camera traps, macroinvertebrate protocols, and microclimate logging and biosecurity sentinels (scavengers/decomposers).
- Digitize collections, geo-reference records, and publish to GBIF; standardize protocols (e.g., TLS for herps); open-access indicator toolkits.
- Honey authentication via pollen; incentivize aquaculture over irrigation for zero-net-loss water; alternative livelihoods (mushroom farming); carbon credits and Payment Ecosystem Services (PES).
- Protect Taita Hills forests for biodiversity conservation by establishing sanctuaries and species recovery plan.
- Partnerships and capacity: Tighten links among museums, universities, agencies (KWS, KFS, NEMA), REMA, CAS (Kunming), BirdLife networks, GBIF, Dian Fossey/Karisoke; empower community scientists, trackers, and rangers; build labs for barcoding and taxonomic identification.

Way forward

- Invest in molecular taxonomy, expanded inventories, monitoring networks, specimen digitization, and training.
- Publish standardized restoration and monitoring protocols; integrate indicator outputs into policy (National Water Acts, forest plans).
- Institutionalize DNA authentication for botanicals; conduct supply-chain audits; enforce bans on endangered species trade.
- Launch comparative, cross-border studies
- Standardized monitoring at the microhabitat and landscape levels, backed by real enforcement and community partnerships.

Excerpts from the presentations



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5.2 Sub-Theme: Climate Change Adaptation & Mitigation Strategies

Climate change is one of the most urgent challenges facing the world today, posing serious threats to ecosystems, livelihoods, health, and heritage. Yet, nature itself offers some of the most cost-effective and affordable solutions. By working with nature not against it we can reduce emissions, protect biodiversity, and build resilience for both ecosystems and people. This sub-theme explores innovative and practical ways to adapt to and mitigate the impacts of climate change, with a focus on ecosystem-based approaches that are sustainable, inclusive, and grounded in local realities.

Session Moderators: Vivienne Nandokha, NMK; Dr. Stephen Rucina, NMK.

Session Rapporteurs: Sharon Kemboi, Kabarak University (PEBCA case study scholar); Christine Akware, Chuka University and Christine Chai, Pwani University.

Summary

The presentations in this session highlighted the fact that emerging environmental challenges in Kenya demand the systematic integration of climate science, biodiversity conservation, and ecosystem restoration. By leveraging advanced modelling tools, remote sensing, and paleoenvironmental reconstructions, recent research offers critical insights for evidence-based decision-making. To addressing the dual crises of habitat degradation and climate change requires a two-pronged approach: harnessing innovative circular bioeconomy technologies to build rural resilience, and implementing climate-informed, community-backed frameworks to safeguard vulnerable aquatic and terrestrial ecosystems.

List of presentations

1. **Anthony Karani**, Functionally Diverse but Highly Threatened Herpetofauna: Community-Based Conservation in the Highlands of Central Kenya. **University of Embu, Kenya**

2. **'Brian Odhiambo Ayugi**, Marie-Estelle Demory, Richard Kiaka, Dickens Odeny, & Édouard Davin. Multi-model Intercomparison and Evaluation of Rainfall and Temperature Across the Dryland Region of Ewaso Ngiro Basin, Kenya. **'Wyss Academy for Nature at the University of Bern**
3. **'Dickens Odeny**, Philista Malaki, Titus Imboma, Timothy Mwinami, Agnes Lusweti, Brenda Monchari, Walter Nyamolo, Bernard Agwanda, Ogeto Mwebi, Veronica Onduso, Christopher Odhiambo, Anne Nyandiala, Grace Kioko, Josiah Achieng, Beryl Bwong, Jacob Mueti, Titus Adhola, Stalin Kibet, Emmanuel Miliko, Menito Kupano, Sheila Funnel, Alex Kimiri, Anthony Wandera, Richard Kiaka, Benson Okita, Cornelius Okello, Marie-Estelle Demory, Margaret Owuor, Enhanced Vegetation Index Predicts Biodiversity Responses in Semi-Arid Seasonal Productivity Gradients. **'Wyss Academy for Nature at the University of Bern, Nanyuki, Kenya**
4. **'Eucharia Kenya** & Grace Kinyanjui. Conversion of Agricultural Wastes into Value-added Products: A Climate-Smart Strategy for Adaptation and Mitigation. **'University of Embu, Kenya**
5. **'Joseph Gathua** and Wanja Dorothy Nyingi. Effects of Climate Change on Trout and Mountain Catfish in the Mount Kenya Region: Case Study of Rivers Nyamindi and Sagana, Kenya. **'National Museums of Kenya.**
6. **Miriam Gathogo**. Toward Integrated Termite Management for Climate-Resilient Dryland Restoration in Achieving Kenya's 15 Billion Tree Initiative. **Kenya Forest Research Institute**
7. **'Ronnie Mwangi Kimani**, Chunrong Mi, Patrick Kinyatta Malonza, Beryl A. Bwong, and Weiguo Du. Expanding Protected Areas to Safeguard Kenya's Herpetofauna Under Climate Change (Virtual), **'National Museums of Kenya**
8. **Stephen Kamesa**, "Forest Conversion Alters Taxonomic and Functional Diversity of Oribatid Mite Communities Through Shifts in Environmental Conditions in Taita Hills, Kenya (Virtual). **Chinese Academy of Sciences /National Museums of Kenya**
9. **Titus Imboma**. "Tea plantations as a potential habitat and refuge for avifauna in Kenya, **National Museums of Kenya**
10. **'Veronica Muiruri**, R. Bernhart Owen, Richard Potts, Alan L. Deino, Anna K. Behrensmeyer, Simon Riedl, Nathan Rabideaux,

Emily J. Beverly, Robin W. Renaut, Jessica W. Moerman, Daniel Deocampo, J. Tyler Faith, Anders Noren, Andrew S. Cohen, Kristina Brady Shannon, Ren_e Dommain. Quaternary Diatoms and Palaeo Environments of the Koora Plain, Southern Kenya Rift. **National Museums of Kenya**

11. **Veronica Ngumbau.** Climate change driven distribution shifts of threatened plant taxa in Coastal Forests of Kenya: Implications for Conservation. **National Museums of Kenya**

Key Message to Policymakers

- Promote sustainable management and the utilization of agricultural residues to reduce environmental degradation and pressure on natural ecosystems.
- Develop and implement management plans to monitor introduced species and conserve indigenous biodiversity.
- Strengthen protection and restoration of forest and Afromontane habitats while incorporating community-based conservation approaches into biodiversity management plans.
- Support the documentation and integration of indigenous and local knowledge into sustainable utilization and ecosystem management practices.
- Protect native biodiversity as part of Kenya's natural heritage through ecosystem-based conservation approaches.
- Support paleoenvironmental research to inform understanding of human-environment interactions.
- Develop incentives and regulatory frameworks that encourage agricultural waste valorization, renewable energy production, and circular bioeconomy initiatives.
- Promote sustainable land-use practices and watershed management to reduce habitat degradation and maintain ecological integrity.
- Promote ecosystem-based adaptation strategies that balance biodiversity conservation with sustainable land use and community livelihoods.
- Promote land-use planning that balances agricultural development, urban expansion, and biodiversity conservation.

- Mainstream climate-resilient restoration and sustainable agriculture in development planning.
- Invest in research, innovation, and the commercialization of low-cost biomass conversion technologies suitable for local conditions.
- Strengthen enforcement of environmental regulations governing river protection, water abstraction, and riparian land use.
- Strengthen national biodiversity monitoring systems and support climate-informed conservation decision-making.
- Institutionalize participatory biodiversity monitoring and community mapping in conservation planning and environmental impact assessments.
- Enhance the use of climate models and remote sensing tools in environmental decision-making.

Emerging findings and methods

- Up-scaling of bioeconomy systems through waste-to-value technologies, assessing the environmental and socioeconomic impacts of biomass valorization, and optimizing the production of bioethanol, biochar, and biofertilizers.
- Mapping the distributions of invasive and native fish species, in freshwater systems, to understanding species interactions, and establishing long-term monitoring programs.
- Expansion of species distribution modelling across taxa and ecosystems by focussing on tracking species distribution, identifying climate refugia, and assessing species vulnerability and adaptive capacity.
- In biodiversity research, priorities include long-term monitoring, evaluation of restoration effectiveness, and assessment of ecosystem services.
- Cross-cutting approaches emphasize integrating indigenous and scientific knowledge, improved remote sensing applications, and strengthening climate-resilient conservation planning.
- Landscape restoration efforts prioritize dryland rehabilitation, biodiversity-friendly agricultural systems, and enhanced ecosystem resilience under climate change.

- Circular bioeconomy approaches can contribute significantly to sustainable development goals.
- Indigenous microbial resources found in unique ecosystems such as mangrove forests and tropical rainforests offer valuable opportunities for biotechnology innovation.
- Low-cost enzyme production remains critical for widespread adoption of biomass conversion technologies.
- Healthy river systems depend on the conservation of indigenous forests and riparian vegetation.
- Freshwater biodiversity conservation is closely linked to climate resilience, water security, and sustainable livelihoods.
- Community engagement is essential for effective watershed conservation and biodiversity protection.
- Climate change is emerging as a major driver of biodiversity loss in coastal ecosystems.
- Conservation planning must transition from static approaches to dynamic, future-oriented strategies.
- Predictive ecological modelling provides valuable tools for proactive conservation decision-making.
- Biodiversity conservation contributes directly to ecosystem services, climate resilience, and sustainable development goals.
- Community knowledge can effectively complement scientific approaches in biodiversity conservation.
- Biodiversity conservation directly contributes to ecosystem resilience, sustainable livelihoods, and long-term economic transformation and community well-being.
- Participatory approaches enhance local ownership and the sustainability of conservation interventions.
- Remote sensing and modelling are increasingly important tools for conservation planning.

Research priorities and gaps

- Limited understanding of the large-scale performance and economic viability of bacterial cellulase-based bioconversion systems in bio-based technologies and industrial biotechnology.

- Insufficient evidence exists on the long-term environmental benefits of integrated waste valorization technologies.
- Need for further optimization of enzyme production efficiency and biomass conversion processes, as well as studies on adoption barriers among farming communities and agro-industries.
- In freshwater biodiversity systems, there is inadequate historical and contemporary data on introduced species distribution trends and studies of ecological mechanisms driving the displacement of native fish species.
- Long-term monitoring data linking climate change to freshwater biodiversity change remain scarce, while the recovery potential of indigenous mountain catfish populations is poorly understood.
- For climate change and species distribution, major gaps include limited understanding of species' adaptive capacity under rapidly changing climatic conditions and insufficient long-term ecological datasets for many threatened coastal forest species.
- Uncertainty regarding future interactions between climate change, habitat fragmentation, and land-use change, as well as limited evidence on the effectiveness of adaptive strategies such as assisted migration.
- Shortage of conservation research of herpetofauna in Kenya, highlighting a broader need for expanded long-term ecological monitoring and integrated, interdisciplinary research approaches.
- Integrate community knowledge into formal biodiversity monitoring frameworks and conservation.
- Limited clarity on whether the transition between Acheulean and Middle Stone Age tools coincided with increasing aridity, and uncertainty in selecting appropriate models to reconstruct climatic variability in Kenya's drylands.
- Research on ecofriendly termite control methods without eliminating their ecological functions.
- Limited knowledge of biodiversity thresholds and ecosystem responses to seasonal vegetation dynamics.
- Determine the extent to which agroecosystems, support

breeding, survival, and long-term persistence of forest bird species.

Threats and challenges

- Biodiversity loss has contributed to species decline, and local extirpation of indigenous populations.
- Climate change impacts as a result of increasing greenhouse gas emissions from agricultural waste mismanagement and shifts in temperature and rainfall patterns. These changes are altering river flows, water temperatures, and habitat suitability, leading to species range shifts, increased drought frequency, expansion of invasive species and reduced ecosystem resilience.
- Climate-induced environmental changes enhance the establishment and spread of Invasive species thereby compromising the ecological integrity of ecosystems.
- Habitat degradation linked to riverine vegetation clearing, agricultural encroachment, catchment degradation, forest destruction, urbanization, and unsustainable land-use practices leading to reduced habitat quality and ecosystem resilience.
- Pollution pressures including air and soil pollution, water contamination, increased sedimentation from land disturbance, and potential impacts on biodiversity collectively degrade ecosystem health and water quality.
- Termite-related seedling mortality presents a challenge to restoration success in some landscapes.

Interventions and strategies

- Promote the conversion of agricultural residues into bioethanol, biochar, and liquid biofertilizers.
- Support research and commercialization of bacterial cellulase technologies.
- Encourage sustainable waste management practices within agricultural value chains.
- Develop incentives for the adoption of climate-smart agricultural innovations.

- Conduct comprehensive surveys to determine the current distribution of indigenous species.
- Restore and protect riverine vegetation and critical freshwater habitats and promote sustainable water resource management practices.
- Strengthen environmental awareness among local communities.
- Incorporate climate projections into conservation planning and protected area design.
- Prioritize conservation of habitats predicted to remain suitable under future climate scenarios.
- Strengthen the restoration of degraded coastal forests to improve ecosystem resilience.
- Enhance conservation and monitoring of threatened species.
- Application of remote sensing technologies to enhance ecosystem surveillance and decision-making at scale.
- Increased public awareness and stakeholder engagement in conservation activities.
- Protection of habitats that support species of conservation importance.
- Expand and optimize protected area networks.
- Adopt integrated termite management.
- Improve habitat connectivity.
- Strengthen ecosystem restoration in ASALs.
- Develop climate-smart conservation strategies targeting vulnerable species and habitats.
- Restoration of degraded Afromontane forests and associated habitats.
- Conservation of ecological corridors linking fragmented habitats.
- Community-led identification and rehabilitation of priority restoration sites.
- Integration of local ecological knowledge into restoration planning and implementation.

Way forward

- Optimize bacterial enzyme production systems.

- Scale up biomass conversion research and pilot demonstrations.
- Strengthen stakeholder engagement and technology transfer mechanisms.
- Develop pathways for commercialization and adoption of climate-smart waste valorization technologies.
- Strengthen catchment protection and river restoration efforts.
- Enhance public awareness of freshwater ecosystem conservation.
- Establish long-term monitoring programs for aquatic biodiversity.
- Foster partnerships among researchers, policymakers, and local communities.
- Update conservation priorities using future habitat suitability projections.
- Establish monitoring systems to track species distribution changes.
- Strengthen habitat protection and restoration efforts.
- Enhance research on species adaptation and resilience mechanisms.
- Foster stakeholder collaboration to implement climate-smart conservation strategies.
- Prioritize conservation of threatened amphibian and reptile species identified in the study.
- Strengthen interdisciplinary research collaborations.
- Translate research findings into policy and management actions.
- Enhance biodiversity monitoring and conservation planning.
- Long-term monitoring of freshwater biodiversity and fish distribution dynamics.
- Climate vulnerability assessments and species distribution modeling for threatened taxa.
- Documentation and the application of locally relevant bioresource management knowledge and practices.
- Documentation and conservation of endemic freshwater species and ecosystems.
- Documentation and conservation of rare and threatened plant diversity within coastal forests.

- Documentation and conservation of Kenya's unique herpetofaunal diversity.

Excerpts from the presentation



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5.3 Sub-Theme: Biodiversity-Friendly and Climate-Smart Agricultural Practices

Agriculture plays a critical role in our economy yet also contributes to both biodiversity loss and climate change. Transitioning to biodiversity-friendly agriculture is essential not only for protecting nature but also for ensuring long-term food security, rural livelihoods, and climate resilience. This subtheme focuses on transforming agricultural systems to become more sustainable, resilient, and inclusive, while enhancing food security and conserving ecosystem. It highlights success stories, innovations, and policy tools that empower communities to farm in harmony with the environment, securing both people and the planet.

Session Moderators: Dr. Mary Muchane, National Museums of Kenya; Evanson Omuse, International Centre of Insect Physiology and Ecology (ICIPE), Dr. Veronicah Ngumbau, NMK.

Session Rapporteurs: Kevin Kipngetich, National Museums of Kenya; Betsy Alice, University of Nairobi (PEBCA case study scholar); and Ian Theuri, Pwani University.

Summary

The session highlighted practical, biodiversity-friendly livelihood models crucial for protecting nature while securing long-term food security, rural livelihoods, and climate resilience. These models are actively demonstrated in community conservancies, where locals benefit from premium pricing, technical support, financial literacy training, and revenue reinvestment, and through the commercialization of indigenous crops like *Cleome gynandra* (Spider plant). Turning this traditional African leafy vegetable into a commercial asset that empowers smallholders to protect agrobiodiversity while maximizing profits.

Additionally, the session offered clear pathways for policymakers on:

- Sustainable dryland management and restoring riparian areas
- Community-led seasonal monitoring of vegetation cover
- Protecting critical pastoral landscapes and improving soil-microbial health

- Controlling river pollution and implementing integrated pest management

Ultimately, the findings prove that sustainable agriculture in Kenya is best achieved through ecological approaches that integrate indigenous knowledge, conserve biodiversity, and utilize nature-friendly tools. This shift is vital for building climate resilience and aligns perfectly with the conference's core theme: harnessing biodiversity for economic transformation.

List of presentations

1. **'Komen A**, Nzilani. J. M., Ojwang, L., Odera, G., Mujumba, D, Kiptum. J, Mwangi. B, Waweru. P, Njoki. C, Gikunda. D, Marigi. E. Biodiversity Friendly and Climate Smart Livelihoods for Resilient Landscapes and Seascapes. **'Fauna & Flora**.
2. **'Christine Chai**, Joyce Jefwa, Edith Muwawa, Paul Seward, Justus Koech. The Effects of Management Practices on the Conservation of Beneficial Symbiotic Microbes in Agro-Ecosystems in Coastal Kenya. **'Pwani University**
3. **'Charity Nafuna Barasa**, Gelas Simiyu Muse, Judith Ashindu Khazenzi. Riverine Ecosystem Health and Potential for Sustainable Restoration: A case of the River Kiminini, Trans-Nzoia County, Kenya. Department of Environmental Sciences, **'University of Eldoret**.
4. **Kahuthia Ruth**. Leveraging Wild Crucifer Diversity for Ecologically Based Management of Diamondback Moth *Plutella xylostella* in Kenya. **Kenyatta University, Nairobi, Kenya**. (virtual)
5. **'Amran Ali Issack**, Elizabeth Kokwaro, and James Odanga. Potential of Aloe vera Peel Extract in Management of Aphids on Kales in experimental garden at Kenyatta University. **'Kenyatta University, Kenya**
6. **Eric Muthama**, Hamish Symington, Charlotte Apsey, John Carl, Alex Murphy, Lorraine Archer, Beverley J Glover. Fragrant Function: Floral Cues for Pollinator Attraction and Yield Enhancement in Broad Beans *Vicia faba*. L, **University of Cambridge**. (virtual)
7. **'Muga Moses**, Julius Ochuodho, Victoria Anjichi. To Determine

the Effect of Seed Pelleting on Germination Percentage and Viability of Spider Plant *Cleome gynandra* L. Seeds.¹**University of Eldoret, Kenya.**

8. ¹**Muriithi D. Gicheha**, Mwende Ngie, Kahuthia Gathu Ruth, Nawiri Mildred, Mwaura Mburu, Obuya James, Moore Pamela, and Namikoye Samita. Enhancing Pulses Yield and Quality through Climate-Smart Technologies and Integrated Pests' Management in Ithanga, Murang'A County, Kenya. **'Kenyatta University, Kenya. (virtual)**
9. ¹**Walter Nyamolo**, Agnes M. Luswet, Brenda Monchari, Henry Saitabau, Geoffrey Oduor, Naserian Silvana, Agnes Manyas, & Staline Kibet. Semi-Circular Bunds and Restoration of Rangeland Vegetation in Naibunga, Laikipia, Kenya.¹ **National Museums of Kenya, Kenya.**
10. ¹**Albight Mutugi**, Collins Mweresa, Alfred Ochieng, and Joseph Aguk. Locust and Cricket Frass as a Biofertilizer for Cowpea *Vigna unguiculata*. ¹**Jaramogi Oginga Odinga University of Science and Technology, Kenya**
11. Martin Onsiro, Ronald, & ¹**Victoria Mwendwa Njogu**. Linking Eco-Adventure Enterprises with Community-Led Conservation: Insights from Fourteen Falls and Manga Hills in Kenya. **'Mount Kenya University.**
12. ¹**Maranga Wycliff Obara**, Namikoye Everlyne Samita, Ruth Kahuthia Gathu, Muo Kasina. Effects of Mealybug Control Strategies on Silkworm Survival and Development in Semi-Arid Mulberry Sericulture in Kenya. **'Kenyatta University, Kenya.**
13. ¹**Jilande Matere N.**, Mwende Ngie, Mwaura Mburu, Nawiri Mildred, Obuya James, Moore Pamela, and Namikoye Samita. Cereal Production Under Selected Climate-smart and integrated pest management approaches in Ithanga, a semi-Arid Area in Murang'a County. **'Kenyatta University.**

Poster Presentations

14. ¹**Esther Wasike** and Brian Gideyi. Azolla Farming: A Sustainable Protein Source for Livestock and Aquaculture. **'Department of Livestock, Trans Nzoia County.**
15. **Esther Mwende**. Molecular Breeding of Common Bean *Phaseolus vulgaris* L. for High Yield, Anthracnose Tolerance,

- and Low Flatulence to Enhance Food Security. **Chuka University, Chuka, Kenya.**
16. **Chepkemoi, Naomi Ngeny.** Biomonitoring of Species Using DNA Technology. **Chuka University, Kenya.**
 17. **Irene Chepngetich,** Daniel Green, & Simon Musila. Water Quality, Microbial Diversity, and Microplastic Pollution in Aquatic Habitats in Watamu, Kenya. **Technical University of Kenya, Kenya.**
 18. **Faith Cheronoh.** Container based butterfly caterpillar rearing as a Tool for enhancing wild butterfly populations for ecosystem restoration at Bamburi Haller Park. **Pwani University, Kenya.**

Key Messages to Policy Makers

- **Conservation-Linked Livelihoods:** Scale up and duplicate community-based livestock to market models (e.g., Naibunga Lower Community Conservancy) that connect pastoral income to rangeland stewardship and promote women's inclusion.
- **Biomechanical Restoration:** Incorporate structural dryland mandates, such as manual excavation of low-tech semi-circular bunds and native perennial grass reseeding, to halt desertification loops.
- **Riparian Protection:** Enact and enforce strict regulations governing land use in riparian zones to safeguard water quality and aquatic biodiversity.
- **Indigenous Crops:** Standardize and incorporate traditional crops like *Cleome gynandra* (spider plant) into national agricultural heritage and seed policies to guarantee certified, pre-treated, and pelleted cultivars for smallholders.
- **Soil Microbial Health:** Shift agricultural input policies away from heavy synthetic reliance (like DAP) toward microbe-friendly bio-inputs, organic amendments, and insect-frass fertilizers.

- **Climate & Pest Management Frameworks:** Establish national policy frameworks that support and incentivize Integrated Pest Management (IPM) alongside water harvesting to secure smallholder cereal systems in semi-arid regions (e.g., Murang'a/Ithanga).
- **Pesticide Regulation:** Strictly regulate and prohibit hazardous neonicotinoid-pyrethroid pesticide mixtures in registered sericulture (silk farming) zones to protect non-target beneficial insects and silkworms.

Emerging Research and Scientific Findings

- **Seed & Crop Enhancements:** Gibberellin-based treatments successfully break seed dormancy in *Cleome gynandra*, while advanced seed pelleting improves precision planting, handling, and storage safety.
- **Circular Organic Inputs:** Rearing insects like crickets generates frass by-products that function as highly scalable organic biofertilizers, with medium application rates maximizing legume vegetative growth.
- **Low-Tech Hydrology:** Semi-circular bunds actively slow surface water runoff, mitigate soil erosion, increase vegetation cover, and reverse sub-surface water stress.
- **Bioindicators:** Freshwater macroinvertebrates (specifically EPT taxa: *Ephemeroptera*, *Plecoptera*, *Trichoptera*) serve as accurate, low-cost biological indicators of river health when combined with chemical water monitoring.
- **Eco-Friendly Crop Protection:** Combining IPM with water conservation consistently yields better cereal outputs than standalone methods. Wild crucifer species act as valuable environmental refugia for beneficial predatory insects.
- **Biopesticide Thresholds:** Commercial low-dose azadirachtin (neem) and *Aloe vera* peel extracts provide a safe "IPM sweet

spot” for managing pests like mealybugs without causing the high silkworm mortality or environmental harm seen with synthetic chemicals.

- **Floral Scent Chemistry:** Harnessing floral volatile organic compounds (floral cues) has emerged as a novel mechanism to systematically boost pollinator attraction and maximize broad bean (*Vicia faba*) yields.

Research Priorities and Gaps

- **Scaling & Validation:** Evaluating the replication capacity of livelihood-based conservancy models across diverse landscapes/seascapes and examining the physiological impacts of seed pelleting across multiple cultivars.
- **Input Optimization:** Conducting long-term evaluations of organic vs. synthetic inputs on soil microbiomes, determining ideal frass nutrient formulations, and analyzing the active chemical compounds in *Aloe vera* extracts.
- **Targeted Environmental Studies:** Establishing River basin baselines for EPT taxa, investigating structural bund stability under extreme weather, mapping wild crucifer diversity, and leveraging floral scents to increase crop resilience.
- **Socio-Economic Barriers:** Lack of comprehensive data on women’s inclusion in value chains and the logistical bottlenecks of engaging highly mobile, dispersed pastoralist communities.
- **Technical Thresholds:** Limited knowledge on the shelf-life/vigor of gibberellin-primed seeds under rural conditions, how pelleting materials behave across varying soil moistures, and the specific siltation rates of structural bunds over time.
- **Ecotoxicology in Sericulture:** Insufficient research regarding the sublethal impacts of biopesticides and synthetic chemicals on long-term silk production, cocoon quality, and alternative silkworm species.

Threats and Challenges

- **Rangeland & Riverine Decay:** Widespread soil erosion, gully formation, and the destruction of riparian vegetation drastically reduce ecosystem carrying capacities, causing resource competition between wildlife and pastoral herds.
- **Genetic & Microbial Loss:** Genetic erosion of indigenous food systems due to an over-reliance on uniform commercial crops, alongside a depletion of vital soil microbes (mycorrhizal fungi/ rhizobia) caused by intensive synthetic fertilizer applications.
- **Climatic Vulnerabilities:** Arid weather shifts and erratic rainfall lead to seed desiccation, delayed germination, and high plant water stress.
- **Invasive Species & Resistance:** Devastating crop damage driven by invasive pests like the Fall Armyworm (*Spodoptera frugiperda*), paired with pest resistance and chemical residues from an over-reliance on chemical pesticides.
- **Industrial Risks:** Fatal exposure of silkworms and native pollinators to neonicotinoid-pyrethroid mixtures, threatening the economic viability of rural sericulture.

Intervention and Strategies

- **Biomechanical Rehabilitation:** Large-scale deployment of semi-circular bunds paired with the re-seeding of hardy native perennial grasses to anchor fragile soils.
- **Rotational Catchment Systems:** Implementing rotational grazing boundaries around newly banded fields to protect vulnerable grass seedlings, alongside catchment-level strategies linking upstream land management with downstream river health.

- **Microbe-Conscious Input Plans:** Implementing manure-plus-bio-input strategies, utilizing frass fertilizers, and establishing mandatory soil microbial baseline assessments before deciding on chemical inputs.
- **Holistic IPM Deployment:** Combining low-dose azadirachtin, *Aloe vera* extracts, and wild crucifer preservation with comprehensive farmer training programs to manage key pests sustainably.
- **Value-Chain Support:** Pairing premium livestock-to-market systems with localized veterinary support, uniform seed-pelleting technologies, and financial literacy training.

Way Forward

- **Technology Prototypes:** Develop optimized, low-cost seed-pelleting units suited for rural farms and equip local community scouts with mobile monitoring tools to track soil moisture and bund structural stability.
- **Capacity Building:** Fund grass-roots training for extension agents, farmers, and youth groups regarding EPT identification, bio-input application, uniform seed storage, and sustainable sericulture.
- **Policy Briefings:** Design targeted policy briefs for parliamentary committees to institutionalize indigenous vegetable seed standards, organic biofertilizer frameworks, and national IPM incentives.
- **Strategic Research Alliances:** Form multi-institutional research partnerships (e.g., KALRO, Kenyatta University, National Museums of Kenya, University of Cambridge) to lead cross-conservancy livelihood studies, regional multi-river biomonitoring networks, and regional East African IPM transferability trials.

- **Community Seed & Vendor Hubs:** Connect local market vendor operations, Water Resource Users Associations (WRUAs), and insect-farming cooperatives to build decentralized community seed preservation banks and expand climate-smart cereal field trials.

Excerpts from the presentations



Fauna & Flora
Saving Nature Together

Scaling Nature-Based Solutions through Markets Linkages: Ol Pejeta Conservancy (OPC) Livestock-to-Market Scheme

Biodiversity-Friendly and Climate-Smart Livelihoods for Resilient Landscapes

8th – 12th June 2026

National Museums of Kenya
2nd Joint International conference

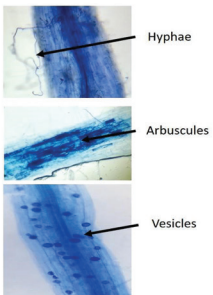
Authors: Paul Waweru (OPC); Ann Komen; Dickens Mujumba (Fauna and Flora)

The Effects of Management Practices on the Conservation of Beneficial Symbiotic Microbes in Agro-Ecosystems in Coastal Kenya, Christine Chai, Pwani University

Data collection and Assessment

➤ **Root assessment (AMF % colonization)**

- Root clearing and staining (Koske & Gemma, 1989)



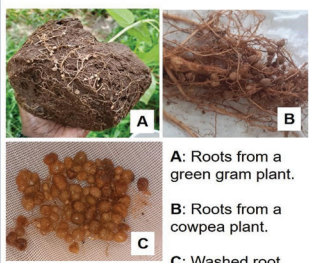
Hyphae

Arbuscules

Vesicles

➤ **Nodule assessment**

- Counting of live nodules
- Pinkish in color
- A. Bala *et al.*, (2019)



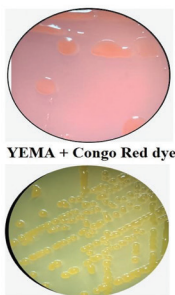
A: Roots from a green gram plant.

B: Roots from a cowpea plant.

C: Washed root nodules on a sieve.

➤ **Rhizobia species assessment**

- Morphological, biochemical and molecular characterization.



YEMA + Congo Red dye

YEMA + Bromothymol Blue

©Christina Chai, Pwani, University

5.4 Sub-Theme: Livelihood Strategies in Biodiversity-Based Enterprises

Biodiversity is not only essential for ecosystem health. It is also a powerful engine for local economies. Sustainable use of biodiversity can be a win-win for conservation and development. Biodiversity-based enterprises provide meaningful income, especially in rural areas, while incentivizing the protection of ecosystems. This subtheme explores how individuals and communities are transforming natural capital into economic opportunities by building sustainable, conservation-friendly enterprises that both protect nature and improve livelihoods. The subtheme invites participants to share models, experiences, and innovations that transform natural heritage into sustainable prosperity.

Session Moderators: Prof. Eucharía Kenya, University of Embu, Edward Njagi, NMK

Session Rapporteurs: Stephene Burudi Shirengo, Masinde Muliro University of Science and Technology (PEBCA case study scholar), and Faith Cheronoh, Pwani University; Eliud Kiprono, NMK

Summary

This session highlighted biodiversity as a vital catalyst for rural livelihood enhancement through nature-based enterprises. Farm, and forest-based sericulture emerged as high potential sectors capable of generating meaningful rural income, while creating direct incentives for ecosystem protection. Case studies from Tosheka Textiles Limited in Makueni County and various forest sericulture initiatives underscored the immense, underutilized investment potential within the silk industry. Similarly, the elephant dung mushroom initiative in Naibunga Conservancy demonstrated how innovative, community led enterprises can foster human–wildlife coexistence, secure wildlife corridors, and economically empower women and youth. To fully realize these benefits, future strategies must focus on deepening community participation, scaling biodiversity-based enterprises, improving market access, and advancing policies that seamlessly integrate conservation with sustainable economic development.

List of presenters

1. **'Muga Moses**, Stacy Singer. Enhanced Livelihoods to Smallholder Farmers and Rural Communities through Seed Pelleting Technique on Seed Germination in Okra *Abelmoschus esculentus* L. Bungoma County, Kenya. **'University of Eldoret, Kenya.**
2. **James Galandi**. Effects of Agroforestry System Attributes on Farm Performance among Smallholder Farmers in Mbale and Iganga Districts, Eastern Uganda. **University of Eldoret, Kenya.**
3. **'Antony Wandera**, Victor Otieno, Susan Njuguni, Benson Okita, Sheila Funnell, Brian Ayugi, Dickens Odeny, and Richard Kiaka. Elephant Dung Mushrooms: Co-creating Co-benefits for Human– elephant and Corridor Protection in Naibunga Conservancy, Kenya. **'Wyss Academy for Nature at the University of Bern,**
4. **Boniface M. Ngoka**. Forest-Based and its Potential Role in community livelihood enhancement and Biodiversity Conservation.” **Insectech Farm Solutions, Kenya.**
5. **'Nyokabi Mwangi**, Lucy Lau Birgham, and Boniface Ngoka. Eri Silk Farming and Textiles Production in Makueni, Kenya. **'Tosheka Textiles Limited.**
6. **Suresh K. Raina**. Global Sericulture: From Soil to Silk. Ambavihar, Centre of Sericulture and Bioresource Management Research, **RTM Nagpur University, India.**
7. **Philista Malaki**. The Plight of the Grey Crowned Crane *Balearica regulorum* Amidst Conflicts in Its Key Hotspot Areas in Kenya. **National Museums of Kenya.**
8. **'Fredrick Awuor**, Timothy Mwinami, and Christopher Owino. Community Composition, Abundance, and Foraging Guilds of Waterbirds in Sewerage Treatment Ponds of Ruai, Nairobi City, Kenya. **'National Museums of Kenya**
9. **Aziza Zuhura**. Assessment of Dietary Adaptation of Sykes Monkey *Cercopithecus mitis albogularis* in a Peri-Urban Environment: A Case Study of City Park, Nairobi – Kenya. **National Museums of Kenya.**

Poster Presentation

10. **Boniface Kariemu Kirago**, Assessing the Nutritional Impacts of Biodiversity-Friendly Climate-Smart Agriculture in Semi-Arid Kenya: A Baseline-Endline Study from Makueni County and Taita-Taveta County. **Solidaridad Organization**.

Key Messages to Policy Makers

- **National Sericulture Framework:** Establish a comprehensive national policy to support silkworm production (both wild and domesticated), downstream textile value addition, domestic processing infrastructure, and targeted farmer training.
- **Economic & Ecological Synergy:** Formally recognize that conservation and economic development are interdependent. Biodiversity-based enterprises (like sericulture and mushroom farming) can directly reduce poverty, drive rural employment, and incentivize conservation when backed by appropriate policy.
- **Direct-Benefit Enterprise Models:** Support and subsidize community-owned businesses that link household income to ecosystem protection (e.g., Eri silk farming in Makueni County and elephant dung mushroom production in Naibunga Conservancy).
- **Inclusion of Women and Youth:** Actively mandate the participation of women and youth in conservation budgets; women excel in production roles, while youth drive monitoring and restoration activities.
- **Corridor & Habitat Protection:** Strengthen the legal protection and community-led restoration of critical wildlife corridors to mitigate habitat loss and protect threatened species of high conservation concern, such as the Grey Crowned Crane.

Emerging Research and Scientific Findings

- **Value Chain Integration:** Kenyan research demonstrates that Eri silk farming can be seamlessly integrated into local textile value chains, providing environmentally friendly, ethical income from the farm level to finished design products.
- **Agronomic Opportunities:** Studies indicate significant potential for expanding domesticated silk production by improving mulberry and castor cultivation, alongside scaling up local processing capacity.
- **Forest-Based Commercialization:** Wild silk moth species (*Gonometa postica*, *Argema mimosae*, *Anaphe panda*, and *Epiphora mythimnia*) occur naturally in Kenyan forests, presenting a major unexploited opportunity to generate forest-based income without degrading natural resources.
- **Wildlife Waste Valorization:** The production of mushrooms using elephant dung serves as a proven circular bioeconomy model, turning a wildlife waste product into a tangible community livelihood while securing vital elephant migration corridors.
- **Global Technological Trends:** International data highlights that sericulture supports millions globally, with modern advances in biotechnology and automation driving massive leaps in silk crop productivity and textile quality.

Research Priorities and Gaps

- **Economic & Market Assessments:** Conducting rigorous financial assessments of Kenyan silk value chains and optimizing market development pathways for biodiversity-derived products.
- **Applied Ecology & Zoology:** Mapping, conserving, and sustainably utilizing wild silkmoth species, alongside

implementing long-term monitoring programs for species highly vulnerable to human-induced habitat change.

- **Conflict & Enterprise Dynamics:** Evaluating the explicit effectiveness of community conservation enterprises as functional tools for reducing human-wildlife conflicts.
- **Macro-Economics & Feasibility:** A distinct lack of operational data regarding the production economics, scalability, and long-term profitability of these enterprises at a commercial scale.
- **Value Chain & Demand Data:** Insufficient market demand analytics for Kenyan-specific silk products.
- **Indigenous Knowledge:** Poor documentation of traditional skills and indigenous knowledge systems associated with historical sericulture practices.
- **Impact Metrics:** Inadequate long-term longitudinal data measuring the exact ecological and socio-economic impacts of community businesses on conservation outcomes.

Threats and Challenges

- **Habitat Fragmentation:** Severe degradation and fragmentation of natural landscapes, which actively disrupt ecological connectivity and drive down populations of specialized species like the Grey Crowned Crane.
- **Human-Wildlife Friction:** Intense human-wildlife conflicts occurring in high-value zones where traditional wildlife corridors directly overlap with expanding human settlements and livestock systems.
- **Underdeveloped Value Chains:** The growth of high-potential sectors like sericulture is severely restricted by low technical skills among farmers, weak downstream market linkages, and a lack of supportive policy.

- **Underutilized Natural Capital:** Valuable Forest resources—specifically wild silk moths—remain completely uncommercialized despite their clear capacity to support local livelihoods.

Intervention and Strategies

- **Incentivized Corridor Recovery:** Restoring and protecting critical wildlife corridors by tethering land connectivity to immediate livelihood incentives (e.g., matching corridor protection with mushroom farming).
- **Sustainable Wild Harvesting:** Implementing regulated, community-led management frameworks for the sustainable utilization of wild silk moth populations within natural forests to reduce pressure on wood resources.
- **Circular Ecosystem Models:** Deploying circular bioeconomy strategies that leverage locally available biological waste resources to create alternative household revenue streams.
- **Capacity Building & Training:** Expanding grass-roots training initiatives focused on advanced silkworm rearing, silk thread processing, and textile value addition.
- **Climate-Smart Integration:** Embedding climate-smart agricultural techniques directly into biodiversity-based business workflows to protect local food and economic systems from shifting climate pressures.

Way Forward

- **Model Documentation:** Formally document successful community enterprise case studies to share operational lessons learned across counties.
- **Resource Mobilization:** Cultivate funding streams and mobilize capital to scale up and expand proven pilot projects (e.g., replicating the Naibunga and Makueni models).

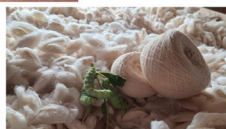
- **Grassroots Capacity Scaling:** Intensify technical business development and ecological monitoring training for community-based groups.
- **Cross-Sector Partnerships:** Build deep collaborative research and operational loops linking agricultural scientists, ecologists, economists, the private textile industry, conservation practitioners, and community organizations.
- **Regional Technical Cooperation:** Foster regional and international cooperative networks to share technological breakthroughs, seed stock, and processing methodologies for sericulture.
- **Development Agenda Advocacy:** Actively lobby to mainstream biodiversity entrepreneurship and green businesses directly into county and national socio-economic development agendas.

Excerpts from presentations

Why Eri Silk in Makueni

Eri silk farming was introduced in Makueni county by Tosheka textiles in 2016 to

- support our textile production
- uplift communities' livelihoods,
- preserve culture and conserve the environment



Our Objective

To promote textiles from farm to fashion and build a supply and value chain that promotes farmers, spinners, weavers and designers to serve a broad spectrum of customers.



5.5 Sub-Theme: Conservation of Geo-heritage and Cultural Landscapes

Geo-heritage and cultural landscapes are not just remnants of the past they are living legacies that shape community identity, ecological integrity, and national pride. While, modern development offers opportunities for economic growth and social transformation, it also poses threats to irreplaceable heritage sites, natural wonders, and cultural landscapes. When development is harmonized with heritage conservation, we build resilient, inclusive, and culturally rich societies. This subtheme invites interdisciplinary approaches and real-world examples that show how to protect what matters most while building for the future. The subtheme explores how infrastructure, urbanization, and land use can be designed and managed to respect and protect geo-heritage and culturally significant places, ensuring that progress enhances rather than erodes our collective identity.

Session Moderators: Dr. Wanja Kinuthia and Dr. Rahab Kinyanjui, National Museums of Kenya.

Rapporteurs. Anthony Karani, University of Embu; Esther Wasike, Farmers Educator; Christine Maroma, National Museums of Kenya (PEBCA case study scholar) and Scholar Irungu, Chuka University.

Summary

The presentations in this session revealed a profound truth: biodiversity and cultural heritage are not merely untapped resources, but living systems that already sustain communities, identities, and economies. Lasting transformation requires institutions and governments to fundamentally shift how they engage with local knowledge and landscapes. From the Coastal Kaya Forests to the Lake Victoria Basin, and from Perm to Nairobi, the evidence is clear durable economic progress occurs when communities lead, science listens, and policies protect natural heritage. Museums must carry this reorientation forward, proving they are not just passive custodians of the past, but active engines of urban regeneration, cultural restoration, and economic development.

List of Presentations

1. **Albert Otieno.** Tracing our ancestors: bringing the classroom to life through the Ileret footprint Site education programs in Marsabit county, Kenya. **National Museums of Kenya.**
2. **Anna Makarchuk.** Emotional Resilience and Intercultural Dialogue as Elements of Sustainable Community Development: The Role and Responsibility of Museums. **Jewish Museum and Tolerance Center, Russia**
3. **Dimitri Papavasiliou.** The Microarchaeology of Ogiek Hearths and the Importance of Traditional Fire-Making in Paleoanthropology **Rutgers University, Russia**
4. **Emmanuel Ndiema,** David R Braun, Purity Kiura, Jonathan Reeves, and Sylvia Wemanya, Rahab N. Kinyanjui, Paul Musili, Jane Macharia, Benard Agwanda, Peris Kamau, Taita Terer. Mapping the Research Footprint of the National Museums of Kenya: A Field-Wide Bibliometric Assessment. **National Museums of Kenya**
5. **Ian Mwaniki Theuri,** Rebecca Njeri, Christine Schmitt, Rose Kigathi. Seed and Seedling Function Traits Assessment to Improve Ex-situ Conservation and Ecological Restoration of the Kenyan Coastal Forest. **Pwani University and Centre for Ecosystem Restoration Kenya.**
6. **Irina Prokhorova.** The Experience of the School of ICOM Russia: Module “Museums and Sustainable Development. I. S. Shemanovsky **Museum and Exhibition Complex, Yamal, Russia**
7. **John Musina.** Suguta Valley: Evidence for Designation as an Important Bird Area from Integrated Avifaunal Surveys. **National Museums of Kenya**
8. **Lydia Nafula.** Socio-Economic Impacts of Cultural Landscapes in the Lake Victoria Basin, Kenya. **National Museums of Kenya**
9. **Moses Esekoni,** Digitization of Archaeological and Paleontological Photo Slides: A Step Toward Long-Term Preservation and Accessibility. **National Museums of Kenya**
10. **Olga Surikova.** “The Eco-Trail as an Effective Way to Reduce Human Impact on a Protected Area: The Vassily Polenov. **Fine Arts Museum and National Park, Russia**”

11. **Olga Guseva.** The Museum as a Starting Point for Restoring Historical Memory and Shaping the City's Identity. **Perm State Art Gallery, Russia**
12. **Yuliya Glazyrina & Tatyana Vostrikova.** The Permian Period Museum: Geological Heritage a Resource for Cultural and Tourist Development. **Perm Regional Museum, Russia**

Key Message to Policymakers

- Cultural institutions/infrastructure can serve as powerful drivers of urban renewal, strengthening local identity while also stimulating economic growth.
- In protected and natural landscapes, the development of eco-trail networks is recommended as a dual strategy for conservation and education.
- Geological and natural heritage sites should be formally recognized not only for their scientific importance but also for their potential to support tourism, local economies, and community identity.
- Cultural landscapes, should be managed as integrated socio-ecological systems that support both biodiversity conservation and livelihoods.
- Conservation and heritage legislation should be reformed to embed genuine community consent, benefit-sharing, and governance authority.
- Policies governing heritage tourism, infrastructure expansion, and land markets in and around sacred forests require stronger legal enforcement mechanisms to prevent speculative encroachment and cultural erosion.
- National heritage institutions should embrace systematic bibliometric frameworks to quantify their research impact, thereby enhancing their visibility in global science networks.
- A data-driven strategy should be adopted by the Museum to safeguard cultural heritage in a digital era, to strengthen the science-to-policy pipeline and support Kenya's 'Home of Human Origins' agenda.
- Integrate museum-based cultural heritage initiatives into environmental education and biodiversity awareness

programmes to strengthen public engagement in conservation.

- Strengthen national and county-level restoration policies in Kenya by requiring the use of species-specific functional trait data to guide the conservation and recovery of threatened species, ensuring evidence-based and ecologically appropriate restoration interventions.
- Support the relocation and expansion of museums to historical centers to enhance access to cultural and educational resources.
- Governments and international bodies should reform heritage governance frameworks to guarantee community-led stewardship, equitable benefit-sharing, and enforceable legal protections for sacred and ancestral landscapes.
- National and institutional-level actors should recognise geoheritage, cultural landscapes, and museum-based social programmes as integral pillars of socio-economic resilience, directing dedicated funding and cross-sector partnerships towards eco-cultural tourism infrastructure and environmental education.

Emerging findings and methods

- Evidence that museums can reshape city identity and restore historical memory.
- Bibliometric mapping of NMK's research output that can inform future directions.
- The use of a geological stratotype framework, symbolically, for museum and heritage site designation is a novel approach to place-based geo-heritage communication.
- The Eco trail design is a promising research approach for the reduction of habitat disturbance in protected museum-park settings.
- Museums can be powerful tools for both cultural restoration and economic growth.
- Expansion of museums to historical centers enhances community pride and identity.
- Museums are emerging as underutilised platforms for

biodiversity communication, social resilience, and science-policy translation.

- Climate change cuts across geo-heritage, sacred forests, and coastal ecosystems but lacks a dedicated research focus.
- Traditional knowledge, cultural memory, and spiritual significance are systematically undervalued in both conservation and tourism frameworks.

Research priorities and gaps

- Long-term studies on the socio-economic impact of museums and eco-cultural tourism.
- Scaling up functional trait databases to cover indigenous species.
- Longitudinal monitoring of restored forest plots to assess long-term survival rates.
- Comparative bibliometric analyses across other African natural history institutions.
- Documentation and digitisation of intangible geo-heritage industrial and cultural connections between geology and local history.
- Quantitative assessment of visitor impact on eco-trails
- Community-based participatory research into traditional ecological knowledge systems in forest governance
- Need for comparative studies across different regions.
- Characterize indigenous seed and seedling functional traits to enhance ecologically informed restoration.
- Develop systematic framework for translating the geopark concept of geo-heritage representation into natural history museum practice.
- The relationship between climate change, land degradation, and the loss of culturally significant landscapes in the Lake Victoria Basin has not been examined.
- Long-term ecological data on biodiversity trends in eco-trail areas remain sparse.

Threats and challenges

- Potential risks identified for heritage buildings and associated infrastructure, particularly in relation to increased weather variability and extreme events.
- Areas previously influenced by industrial activity remain underutilized, affecting the optimal land and landscape restoration potential.
- Historical industrial activities may present residual environmental risks that warrant further assessment.
- Inadequate parking facilities and infrastructure constraints within the new museum area.
- Gradual loss of cultural heritage and the marginalization of indigenous communities, threatening the continuity of traditional knowledge systems.

Interventions and strategies

- Collaboration between urban planners, economists, and cultural heritage experts.
- Partnerships with sociologists to study community identity shifts.
- Sacred forest governance requires collaboration between legal scholars, community representatives, and conservation biologists.
- Bibliometric specialists need to partner with natural heritage departmental researchers, data analysts, geo-heritage specialists, museum curators, and tourism planners.
- Eco-trail design benefits from integrated teams spanning ecologists, landscape architects, educators, and tour guides.
- Improve infrastructure around the new museum sites.
- Integrate cultural heritage with sustainable urban planning.
- Community-led conservation frameworks to replace top-down heritage governance.
- Legal reforms to include community benefit-sharing in heritage designations.
- Understanding functional traits for endangered coastal forest species.

- Eco-trail networks to channel and reduce visitor impact in protected areas.
- Bibliometric and research intelligence systems for national heritage institutions.
- ESG policy learning exchanges between museums and private-sector organisations.
- Tourism Linking geo-heritage, Community Identity, and Economic Development
- Use museums as anchors for restoring historical memory.
- Promote adaptive reuse of industrial spaces.
- Plant functional traits to guide phased ecological restoration.
- Ex-situ conservation of rare species using species-specific propagation protocols.
- Integration of traditional ecological knowledge into forest governance and restoration.
- Cultural landscape protection.
- Place-based museum narratives anchoring community identity to geo-heritage.
- Intercultural competence building in diverse workplaces to strengthen social cohesion.
- Encourage eco-friendly museum operations.
- Link museum development with sustainable tourism.
- Eco-cultural tourism as a revenue model that incentivizes landscape protection.
- Landscape planning to balance biodiversity conservation and recreational value
- Multilayered museum exhibitions combining tangible collections with digital data
- Cross-sector partnerships (museums, private sector, NGOs) to build long-term institutional sustainability.
- Inclusive restoration programmes that prioritise ecologically important species.

Way forward

- Explore cultural biodiversity preservation.
- Functional trait databases and longitudinal monitoring for endangered coastal forest species.
- Protect historical sites linked to museums.

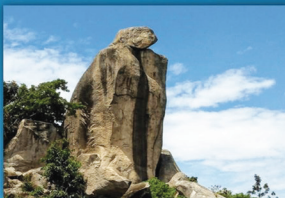
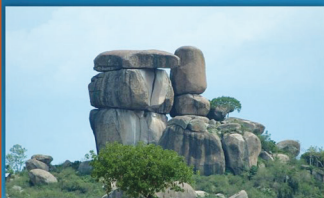
- Community-led sacred forest governance, legal enforcement, and coastal forest ecological restoration.
- Document museum relocation impacts.
- Bibliometric research infrastructure at national museums; geo-heritage documentation and geo-cultural tourism development.
- Strengthen the museum role in shaping the city identity.
- Mobilize resources for infrastructure around the new museum.
- Foster partnerships to sustain museum-led development.
- Secure funding for cultural infrastructure.
- Advocate for functional trait-based restoration mandates in Kenya's national biodiversity and forest policies
- Push for legal reform of heritage governance frameworks to enforce community rights in UNESCO-designated sites
- Engage county governments in Lake Victoria Basin to mainstream cultural landscapes into land-use planning
- Position NMK bibliometric findings as evidence base for increased research funding and science-policy dialogue
- Joint studies on museum-driven economic growth.
- Functional trait mapping of understudied coastal forest species.
- Cross-institutional sacred forest governance study combining legal, anthropological, and ecological expertise.

Excerpts from the presentations



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SOCIO-ECONOMIC IMPACTS OF CULTURAL LANDSCAPES IN THE LAKE VICTORIA BASIN, KENYA



By Lydia Nafula
Cultural Heritage Department



ICOM international
council of museums
Россия

The ICOM Russia School is a series of field schools held in six regions of Russia



✓ This ensured the transfer of relevant approaches and knowledge throughout the entire country.

© Irina Prokhorova, The I. S. Shemanovsky Museum and Exhibition Complex, Yamal, Russia



© Olga Guseva, Perm State Art Gallery, Russia

5.6 Sub-Theme: Leveraging Digital Technologies

In this digital age, technology is transforming how we understand, monitor, protect, and communicate about biodiversity. Digital technologies are revolutionizing conservation not by replacing people, but by amplifying their efforts. They enable faster, more accurate, and inclusive biodiversity management, bringing real-time insights into the hands of scientists, communities, and decision-makers. This subtheme explores the growing role of digital innovations in advancing conservation goals, enhancing data accessibility, empowering communities, and informing environmental decision-making. The subtheme invites contributions that showcase how technology is bridging gaps between data, people, and nature.

Session Moderators: Dr. Simon Musila, National Museums of Kenya; Dr. Dickens Odeny, Wyss Academy for Nature, University of Bern, Switzerland

Session Rapporteurs: Maxwell Abugri, University of Ghana (PEBCA case study scholar); and Charity Barasa, University of Eldoret, Moses Muga, University of Eldoret, and Reuben Kipkorir, Chuka University.

Summary

The session demonstrated that digital technologies are transforming biodiversity conservation, cultural heritage preservation, public health surveillance, and sustainable development. Innovations such as artificial intelligence (AI), automated biodiversity monitoring, remote sensing, citizen science, digital databases, and open-access information systems are improving data collection, analysis, and evidence-based decision-making. However, the discussions emphasized that digital technologies are most effective when integrated with indigenous knowledge, community participation, ethical governance, and inclusive policies. Strengthening digital infrastructure, promoting responsible AI, protecting indigenous knowledge, and investing in research and capacity building were identified as critical for maximizing the benefits of digital innovation for conservation and sustainable development.

List of Presentations

1. **David Mbutia**, Towards Optimizing Digital Technology for Safeguarding and Promotion of Natural and Cultural, **National Heroes, Council, Monuments & Research**
2. **Alex Musyoki**, Laban Njoroge, Jane Macharia, Anthony Kuria & Esther Kioko, Advancing moth biodiversity monitoring in Kenya through automated machine imaging (AMI) and AI-based taxonomic identification, **National Museums of Kenya**
3. Nussbaumer, R., Nussbaumer, A., **Guchu, S.**, Hatfield, R. S., M. Kanga, E., Kung'u, G. N., Kuria, A., Miller, E., Ndang'ang'a, P. K., Njoroge, P., Malaki, P., Ogada, D., Shema, S., & Jackson, C. Historical Bird Atlas and Contemporary Citizen Science Data Reveal Long-Term Changes in Geographic Range of Kenyan Birds, **National Museums of Kenya**
4. **John O. Opiyo**, P.K Malonza Dennis W. Ochieno, Remote Sensing Assessment of Structural Habitat Dynamics and Implications for Forest-Dependent Herpetofauna of the Cherangani Hills, **National Museums of Kenya**
5. **Immaculate M. Mungai**, Evans Mwangi, Dorcus A. O. Sigana, Vincent Obanda, Charles Kimwele, Elizabeth Archie, Microhabitat complexity as a driver of rodent community structure in the Amboseli Ecosystem, Kenya, **National Museums of Kenya**
6. **Morris Nzioka Mutua**, Development of a Digital Database for Dung Beetle (Scarabaeidae) Based on the National Museums of Kenya Reference Collection, **National Museums of Kenya**
7. **Timothy Mwinami**, Henry Ndithia, Peter Njoroge, James Kimaru, Edson Mulamba, Aloise Carvey, Micheal Kimeli, Titus Imboma, Faith Achieng, and Joseph Edebe, Microsatellite GPS Tracking Movement and Distribution of the Near Threatened Lesser Flamingo *Phoeniconaias minor* within the East African Rift Valley Lakes **National Museums of Kenya**
8. **Alexander Mereskin**, Beyond the Artifacts: Leveraging Digital Technology to Document the Intangible Heritage of Exhibitions, **Moscow Transport Museum, Russia**
9. **Nahashon Kiania**, Leveraging citizen science for zoonotic disease surveillance in wildlife and arthropods of Kenyan national parks. **National Museums of Kenya**

10. **Vivienne Nandokha**, Transforming Economies through Digital Heritage and Biodiversity Information Services, **National Museums of Kenya**
11. **Emmanuel Were**, Eco-Intelligence in Africa: Merging Ancestral Intelligence and Artificial Intelligence for Climate Resilience, **Kenyatta University**
12. **Wilondja Mubake**, Assessing the Role of Digital Technologies in Managing Risks to Architectural Heritage in Bukavu, DR Congo, **Institut Supérieur des Arts et Métiers Isam, Bukavu, Congo Virtual**
13. **Ann Mwaura**, DNA metabarcoding unravels illegal substitution and contamination of herbal mixtures from selected markets in Kenya. **National Museums of Kenya**

Key Messages to Policymakers

- Promote ethical, inclusive, and community-centered digital transformation strategies.
- Invest in digital infrastructure for biodiversity monitoring, cultural heritage documentation, and open-access information systems.
- Develop national AI governance frameworks with transparency, ethical safeguards, and public participation.
- Integrate citizen science into biodiversity conservation and public health surveillance systems.
- Strengthen One Health approaches using AI and digital surveillance for early detection of biodiversity loss and zoonotic diseases.
- Protect indigenous knowledge through intellectual property rights, data sovereignty, controlled access, and benefit-sharing mechanisms.
- Support digital innovation hubs, museums, research institutions, and biodiversity databases.
- Foster collaboration among governments, researchers, communities, museums, and technology developers in policy formulation.

- There is a strong consensus on the need for national AI policies that mandate ethical safeguards, transparency, and community participation to prevent the exploitation of indigenous knowledge.

Emerging Research Findings and Methods

- AI-assisted interpretation is improving cultural heritage documentation and visitor engagement.
- Automated machine imaging combined with AI enhances biodiversity monitoring and species identification.
- Citizen science is proving effective in zoonotic disease surveillance and biodiversity monitoring.
- Digital knowledge platforms are increasing access to biodiversity and cultural heritage information.
- Remote sensing technologies are improving habitat monitoring and ecosystem assessment.
- Integration of indigenous knowledge with AI offers innovative approaches to climate resilience and conservation.
- Digital databases are enhancing biodiversity documentation and research accessibility.

Research Priorities and Gaps

- Limited understanding of how AI can effectively integrate indigenous knowledge systems.
- Insufficient evidence on the long-term conservation impacts of digital technologies.
- Limited research on the contribution of open-access information systems to economic transformation.
- Inadequate knowledge of data governance, intellectual property protection, and digital data sovereignty.
- Need for standardized biodiversity monitoring protocols using digital technologies.
- Limited assessment of long-term impacts of citizen science initiatives.
- Underrepresentation of African biodiversity and cultural heritage data in global digital research systems.

Threats and challenges

- Continued biodiversity loss and pollinator decline.
- Emerging and re-emerging zoonotic diseases.
- Weak biodiversity monitoring systems.
- Limited access to scientific information and digital resources.
- Erosion, loss, and misappropriation of indigenous knowledge.
- Unequal access to digital technologies.
- Weak governance and regulation of AI systems.
- Exclusion of local communities from conservation and digital decision-making processes.

Interventions and Strategies

- Expand AI-enabled and automated biodiversity monitoring systems.
- Strengthen citizen science networks and community participation.
- Promote open-access biodiversity and cultural heritage information platforms.
- Improve digital literacy and technical capacity.
- Enhance wildlife-human disease surveillance systems.
- Develop policy frameworks for ethical AI use.
- Increase investment in indigenous knowledge documentation and preservation.
- Integrate indigenous knowledge with scientific and technological innovations.
- Strengthen ecosystem resilience through digital monitoring, early warning systems, and locally driven conservation.
- Invest in biodiversity informatics, digital heritage platforms, machine learning, and institutional capacity development.

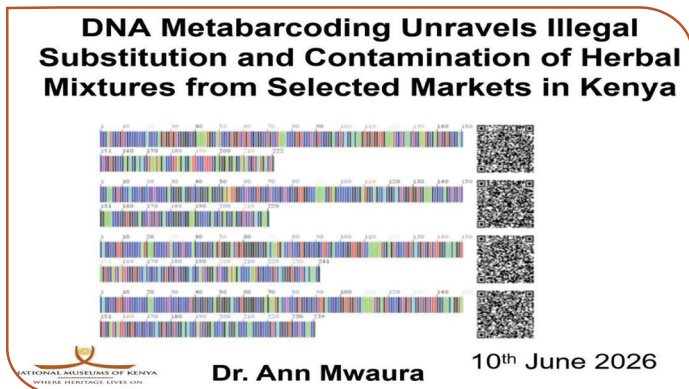
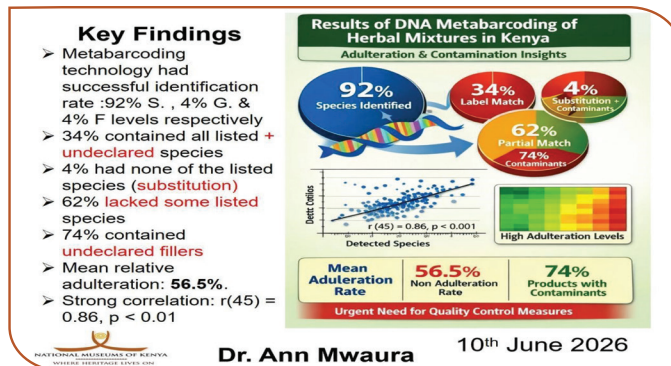
Way Forward

- Scale up digital innovations for biodiversity conservation and cultural heritage preservation.
- Strengthen national digital infrastructure and open-access information systems.

- Expand citizen science programmes and AI-assisted biodiversity monitoring.
- Improve public access to scientific information.
- Support indigenous knowledge preservation through digital platforms.
- Develop national guidelines for ethical AI use in biodiversity and heritage management.
- Increase investment in research, training, and capacity building.
- Enhance community engagement and ownership of digital conservation initiatives.

Promote inclusive, transparent, and collaborative governance to maximize the benefits of digital technologies for sustainable development.

Excerpts from the presentations



© Dr. Ann Mwaura, Senior Research Scientist, NMK

Practical Pathways

This paper proposes a collaborative model:

1. **Digitizing Ancestral Knowledge**—Use AI² to document oral traditions, ecological practices and environmental knowledge.
2. **Visualizing Indigenous Systems**—Map grazing cycles, water access and seasonal patterns using community-led data.
3. **Integrating Climate Knowledge**—Combine indigenous indicators—animal behavior, stars, plants—with AI-driven climate models.



Presenter: Were Mbogo (Historian).

Closing Message

Africa does not lack intelligence for climate resilience—it has always had it.

The challenge is not to replace ancestral knowledge with artificial systems, but to ensure that technology learns to listen.

By aligning AI² with AI¹, Africa can build climate solutions that are:

- technologically advanced
- culturally grounded
- socially just

❖ This is not just adaptation.

❖ It is transformation.



©Were Mbogo, Kenyatta University

5.7 Sub-Theme: One Health Approach

In an era marked by global health crises and environmental degradation, protecting nature is protecting life. The One Health approach offers a path forward where human well-being, animal health, and ecological integrity are treated not as separate issues, but as interconnected priorities. The health of humans, animals, and ecosystems is deeply interlinked. This subtheme focuses on the One Health concepts holistic framework that promotes cross-sector collaboration to tackle complex challenges at the interface of public health, veterinary science, environmental conservation, and sustainable development. It underscores the interconnectedness of human, animal, and environmental health and offers integrated solutions to shared challenges such as disease outbreaks and habitat loss.

Session Moderators: Brian Odhiambo Ayugi, Wyss Academy, University of Bern, Paul Gacheru, Nature Kenya,

Session Rapporteurs: Nathan Kiboi, Masinde Muliro University of Science and Technology; Nancy Matere, Kenyatta University

Summary

The studies emphasized the importance of integrated One Health approaches in addressing the links between biodiversity, environmental health, and infectious diseases. Advances in genomics, bioinformatics, and immuno informatics are improving pathogen surveillance and malaria vaccine development, although important knowledge gaps remain regarding zoonotic spillover and maternal immunity. Research was constrained by computational demands and limited sample sizes, highlighting the need for greater investment in research capacity and long-term studies. Overall, the findings demonstrate that environmental and ecological conditions, alongside maternal health, play a critical role in shaping disease risk and immune development, reinforcing the need for strengthened surveillance, biodiversity conservation, and multidisciplinary collaboration.

List of presentations

1. **Catherine W. Mbuthia**, Rael J. Too, Alexandra Mzula, Titus S. Imboma, John Kiiru, Samuel Kariuki, Abubakar S. Hoza; Global Sentinels: The Palearctic-Afrotropical Flyway as a Conduit for Antimicrobial Resistance in Wintering Little Stints *Calidris minuta*. **Sokoine University of Agriculture, Morogoro, Tanzania.**
2. **Bernard Agwanda**, Vincent Obanda, Olivia Wesula, Harold Ocheing', Victor Ofula and Sheila Ommeh Zoonotic Spill-Over Risk Assessment: Reasons for Places, Species and Viruses to Watch. **National Museums of Kenya**
3. **Joan Amban Chick**, Mary Kioko, Robert Adamu Shey, Jesse Gitaka & Jelili Oyelade, A One Health immunoinformatics approach in designing a Multi-Epitope Vaccine Targeting Plasmodium falciparum and Anopheles gambiae. **Covenant University, Ota, Nigeria**
4. **Kimani, N. Mark** Anti-infectives from Kenya's biodiversity. Department of Physical Sciences, **University of Embu**
5. **Mary Kioko**, Racheal Wachuka, Samuel N. Mbugua, Francis M. Kobia, Eizo Takashima, Jesse Gitaka, Bernard N. Kanoi, A One Health Perspective on Maternal Neonatal Passive Immunity: Socio-Environmental Correlates of Malaria Antibody Transfer in Western Kenya. **Mount Kenya University.**
6. **Njeri Kiigo**, Waste Management in peri urban areas. **Kenyatta University**
7. **Vivian Kathambi**, Moses Langat, Ana-Rita Simoes, Lars Chartou, Itambo Malombe; Finding Glory in East African Morning Glories (Convolvulaceae). **National Museums of Kenya**

Poster Presentations

8. **Christine Akware**, Molecular and Biochemical Characterization of Antidiabetic Compounds from Western Kenya Medicinal Plants Using In Vitro Assays and Docking. **Chuka University**
9. **Eunice Muthee**, Phytochemical Constitution and Antiproliferative Activity of Carrisa spinarum stem bark extracts. **National Museums of Kenya**

10. **¹John Muturi**, A. M. Fulano, E. N. Samita and K.S. Akutse; Efficacy of Selected Natural and Synthetic Adjuvants in Improving the Pathogenicity of *Metarhizium anisopliae* against *Spodoptera frugiperda*. ¹Department of agricultural Science and Technology, School of agriculture and Environmental Sciences, **¹Kenyatta University**
11. **¹J. Kerubo** and E. N. Samita; The Effect of *Sitophilus zeamais* and *Prostephanus truncatus* on Stored Maize Grain Damage and the Efficacy of Actellic Dust. Department of Agricultural Science and Technology, School of Agriculture and Environmental Sciences, **¹Kenyatta University, Kenya.**
12. **Yanic Justin**, Assessment of heavy metals contamination in water, sediments, and Macroinvertebrates in two Kenyan Rivers. **Egerton University**

Key Messages for Policymakers

- Adopt integrated one health approaches that address the interconnectedness of human, animal, environmental, and socioeconomic health.
- Strengthen biodiversity conservation to reduce the risk of emerging infectious diseases.
- Scale up wildlife pathogen surveillance, particularly in bats and other reservoir species, to improve pandemic preparedness.
- Integrate socioeconomic indicators (e.g., income, education) into maternal health and malaria prevention policies.
- Ensure equitable access to insecticide-treated nets (ITNs) for pregnant women and vulnerable populations.
- Promote sustainable waste management by combining modern technologies with indigenous knowledge.
- Increase investment in the development of diagnostics, therapeutics, and vaccines for malaria and emerging infectious diseases.

Emerging Findings and Methods

- Wildlife studies confirmed that bats harbor diverse viruses with zoonotic potential.

- Genomic sequencing is proving valuable as an early warning tool for emerging infectious diseases.
- Immunoinformatics is facilitating the development of multi-epitope malaria vaccines targeting multiple parasite life stages and mosquito antigens.
- Placental malaria impairs maternal antibody transfer, potentially reducing immunity in newborns.
- Mosquito salivary antibodies show promise as biomarkers for vector exposure.
- Ecological and statistical modelling is improving the identification of zoonotic spillover hotspots.

Research Priorities and Gaps

- Expand genomic surveillance of wildlife pathogens to improve early detection of emerging infectious diseases.
- Validate dual-target malaria vaccines targeting both parasite and mosquito antigens.
- Investigate mosquito salivary proteins as potential vaccine targets and biomarkers for vector exposure.
- Determine the pathogenic potential of newly discovered wildlife viruses and assess their zoonotic risk.
- Elucidate the biological mechanisms underlying selective maternal antibody transfer during placental malaria.
- Generate more evidence on fungal diversity, beneficial microorganisms, and their roles in ecosystem and human health.
- Improve understanding of the ecological and biological mechanisms driving wildlife-to-human pathogen spillover.
- Strengthen multidisciplinary and translational research to accelerate the development of diagnostics, therapeutics, and vaccines.
- Increase community participation in scientific research and disease surveillance to improve data collection, intervention uptake, and policy implementation.
- Conduct larger, long-term studies to validate emerging findings and address limitations associated with small sample sizes.

Threats and Challenges

- Biodiversity loss resulting from non-target impacts of insecticides on pollinators and other beneficial organisms.
- Increasing insecticide resistance in mosquito populations.
- Limited taxonomic knowledge and documentation of fungal diversity.
- Environmental degradation caused by mining, cave disturbance, settlement expansion, and poor waste management.
- Increased human-wildlife interactions that elevate zoonotic disease spillover risks.
- Rising incidence of emerging infectious diseases.
- Reduced neonatal immunity associated with placental malaria.
- Computational limitations affecting structural prediction analyses.
- Small sample sizes limiting the robustness of some research findings.

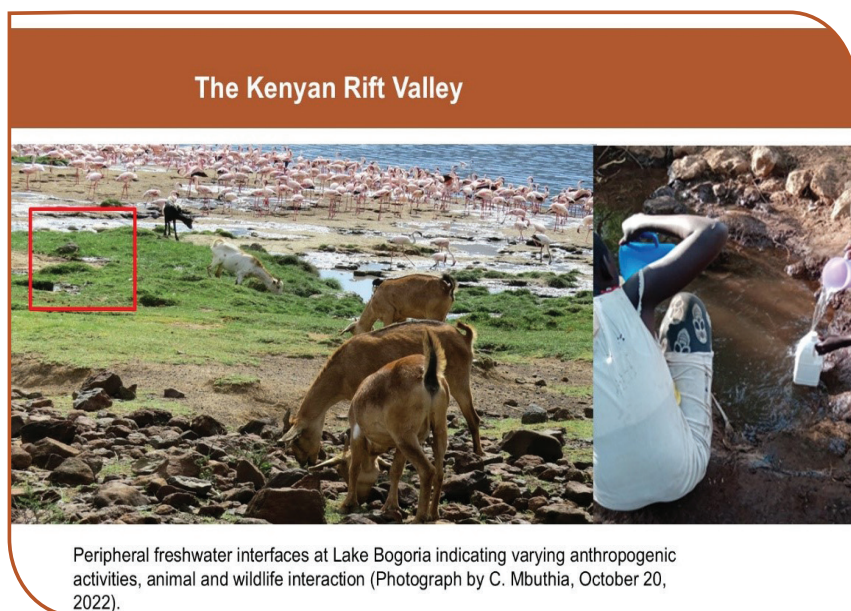
Interventions and Strategies

- Invest in integrated One Health surveillance systems for wildlife-human interfaces.
- Strengthen biodiversity conservation and ecosystem monitoring.
- Implement integrated malaria prevention through vector control, vaccination, environmental management, and improved maternal healthcare.
- Promote the correct and consistent use of insecticide-treated nets.
- Enhance community participation in biodiversity conservation and sustainable waste management.
- Expand environmental education and public awareness programmes.
- Promote ecosystem restoration to reduce disease transmission pathways.

Way Forward

- Build research and technical capacity through specialized training and community field schools.
- Increase national and international funding for biodiversity and one health research.
- Strengthen multidisciplinary collaboration among biological, medical, environmental, and social scientists.
- Foster international partnerships for validation and implementation of research findings.
- Translate computational and laboratory findings into clinical applications through protein expression studies, immunological assays, and preclinical/clinical trials.
- Conduct large-scale, long-term longitudinal studies on maternal-fetal antibody transfer and zoonotic spillover dynamics.
- Strengthen continuous monitoring and evaluation systems to inform evidence-based policy and practice.

Excerpts from the presentations



Problem Statement, Research Gaps & Study Justification

Problem Statement

- ✓ 10 million annual deaths from AMR by 2050 if left unaddressed

Research Gaps

- ✓ Neglect of environmental and wildlife dimensions on resistance epidemiological circuit
- ✓ Extensive literature on other global migratory flyways, but none on the Kenyan Rift Valley

Justification & Rationale

- ✓ Generation of empirical data on the One Health-AMR paradigm at the wildlife–livestock–human interface in the Kenyan Rift Valley flyway
- ✓ Uncovering resistance profiles at this interface- empirical foundation needed to:
 - I. Mitigate risks to livestock health & Safeguard community economic resilience
 - II. Protect human populations from AMR waterborne infections

Discussion & Conclusion

- **Anthropogenic pressures/Environmental contamination-primary catalysts for proliferation of AMR**
 - ✓ More AMR strains from *C. minuta* & goats at the heavily impacted (L. Magadi) than at the less disturbed (L. Bogoria)
 - ✓ Shared freshwater hubs as critical interfaces for AMR amplification & transmission
- **One Health-AMR paradigm**
 - ✓ Migratory wild birds- transcontinental vectors for AMR
 - ✓ Livestock-stationary nodes for the environmental maintenance and amplification of AMR
 - ✓ Fresh aquatic hubs-conduits of AMR transmission
 - ✓ Presence of clinical AMR strains esp ESKAPE pathogens in wildlife-worrying

©Catherine Mbutia, Sokoine University of Agriculture, Morogoro, Tanzania

Ergot Alkaloids Applications in Medicine

Royal Botanic Gardens
Kew



Migraines



Parkinsonism



Uterine Hemorrhage

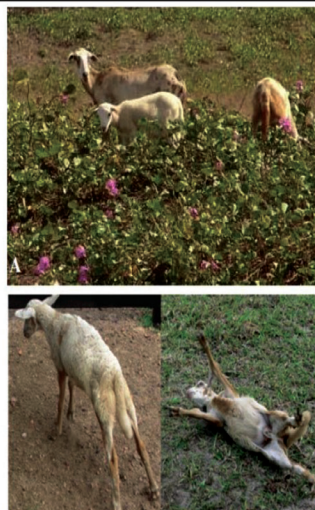
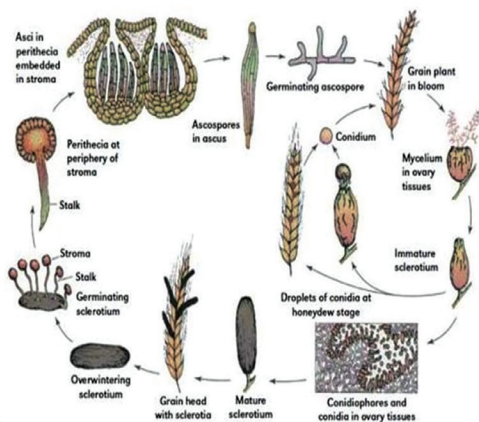


Hallucinogenic



Applications in Agriculture

Royal Botanic Gardens
Kew



©Vivian Kathambi, Research Scientist, NMK

5.8 Sub-Theme: Indigenous and Local Knowledge

Biodiversity conservation is strongest when it respects and uplifts the wisdom of those who live closest to the land. Across generations, Indigenous Peoples and local communities have cultivated rich, place-based knowledge systems that guide the sustainable use, protection, and restoration of biodiversity. Indigenous and local knowledge not only enhances ecological resilience but also embodies a worldview that honors balance, reciprocity, and sustainability. This subtheme highlights the value of indigenous and local knowledge (ILK) in conservation and calls for its equitable recognition, inclusion, and protection within mainstream environmental frameworks. Acknowledging the role of traditional knowledge systems in biodiversity stewardship, the subtheme invites participants to present case studies, and frameworks that promote genuine collaboration between traditional knowledge holders and formal science and policy arenas.

Session Moderators: Evanson Omuse, International Centre of Insect Physiology and Ecology (ICIPE), Veronicah Ngumbau, NMK

Session Rapporteurs: Betsy Alice, University of Nairobi (PEBCA case study scholar), and Ian Theuri, Pwani University

Summary

The session demonstrated that Indigenous knowledge and cultural heritage are indispensable to biodiversity conservation, ecosystem management, climate adaptation, and sustainable agriculture. Traditional ecological knowledge complements scientific research by providing locally grounded insights into species conservation, environmental change, and sustainable resource use. However, rapid socio-cultural change, language loss, inadequate documentation, and declining intergenerational knowledge transfer threaten the survival of these knowledge systems. Strengthening the recognition, documentation, validation, and integration of Indigenous knowledge into conservation policy, research, education, and community-based natural resource management will be essential for conserving both biodiversity and cultural heritage for future generations.

List of presentations

1. **'Fortunate M. Phaka**, Jean Hugé, Maarten P. M. Vanhove, Louis H. Du Preez, "Frog and Reptile Conservation Through the Lens of South Africa's Nature-based Cultural Practices," **'North-West University, South Africa**
2. Donna J. Sheppard, Danica J. Stark, **'Solomon Wachiuri Muturi**, Peter Hannington Munene, and Christian Lambrechts, "Traditional ecological knowledge is key to species recovery when scientific inference is limited by small remnant populations." **'Rhino Ark, Kenya.**
3. **'Mulwa J.M**, Samita E. N., Gathu R.K., Mungube G.W." Guantai M.and Kasina M. Managing Fall Armyworm in Maize: Farmer Knowledge and Practices from Masii Ward, Kenya." **'Kenyatta University, Kenya.**
4. **'Jane Macharia** and Davies Matthew. How Swahili Heritage Landscapes Serve as Living Repositories of Indigenous Ecological Knowledge for Insect Pollinator in Coastal Kenya." **'National Museums of Kenya**
5. **Philemon Nyamanga**, The Indigenous Herbal and Navigation Knowledge of the Peoples of Kenya: Critical Assessment of Its Relevance. **National Museums of Kenya**
6. **Baroswa FK Talam**. Indigenous Knowledge Systems and Ecological Stewardship: The Kalenjin Community's Approach to Biodiversity Management and Cultural Preservation. **National Museums of Kenya**
7. **Benson Ojwang**. Linguistic Conceptualizations of sustainable resource conservation by the Luo of the Lake Victoria Basin Ecosystem in Kenya. **Kaimosi Friends University**
8. **Khadija Issa Twahir**. Harnessing Biodiversity and Cultural Heritage for Economic Transformation through Indigenous and Local Knowledge. **Lamu Fort Museum Library**
9. **'Ochieng' Jeff**, John Bosco Nkurunungi, and Esther Kioko, Diversity, Habitat Threats and Indigenous Knowledge of Local Community on Hawkmoths (Lepidoptera, Sphigidae) in and around Ruma National Park, Kenya. **'Mbarara University, Uganda. (Poster)**

10. **John Kasaya.** Conservation Ecology of Raptors in and around Cross River National Park: Ecological Trends and Local Knowledge. **National Museums of Kenya**

Key Messages to Policymakers

- Formally recognize Indigenous Knowledge (IK) as a credible evidence base for biodiversity conservation and sustainable natural resource management.
- Integrate Indigenous knowledge holders into species recovery programmes, ecosystem restoration initiatives, and environmental decision-making processes.
- Incorporate customary laws, sacred sites, clan totems, and traditional resource management practices into national and local conservation policies.
- Mainstream Indigenous knowledge and local languages within biodiversity conservation frameworks and heritage management plans.
- Develop national programmes to document, preserve, and revitalize Indigenous knowledge systems and ecological vocabularies.
- Promote indigenous crops, traditional farming systems, and community seed systems to strengthen food security, climate resilience, and agrobiodiversity conservation.
- Enhance community participation by empowering Indigenous Peoples and local communities to contribute to conservation planning and environmental governance.

Emerging Findings and Methods

- Indigenous knowledge continues to provide valuable ecological information, particularly where scientific data are limited.
- Traditional ecological knowledge successfully identified historical bongo habitats and explained species declines linked to poaching, habitat degradation, and disease.
- Combining Indigenous knowledge with scientific approaches, such as camera trapping, improves biodiversity monitoring and conservation outcomes.

- Cultural landscapes, including sacred forests and heritage sites, function as bio-cultural systems that conserve both biodiversity and cultural heritage.
- Traditional beliefs, clan totems, and cultural taboos contribute to the protection of wildlife, including reptiles, amphibians, and other species.
- Indigenous ecological observations, such as amphibian behaviour as an indicator of seasonal rainfall, complement scientific understanding of ecological processes.
- Indigenous crops and traditional farming systems continue to enhance food security, nutritional diversity, and the conservation of local crop varieties.

Research Priorities and Gaps

- Document and digitize Indigenous ecological knowledge, oral traditions, ecological vocabulary, and cultural conservation practices.
- Scientifically validate Indigenous conservation practices and assess their effectiveness in biodiversity conservation and climate adaptation.
- Evaluate the contribution of bio-cultural landscapes to ecosystem conservation and resilience.
- Investigate the relationship between Indigenous language retention and biodiversity conservation.
- Develop conservation communication tools using local languages.
- Address the limited documentation of Indigenous ecological knowledge and the declining intergenerational transfer of traditional knowledge.
- Generate evidence to support the integration of Indigenous knowledge into national conservation policies and programmes.

Threats and Challenges

- Rapid urbanization, modernization, and changing socio-cultural values are contributing to the erosion of Indigenous knowledge systems.

- Declining use of Indigenous languages is weakening the transmission of ecological knowledge across generations.
- Limited documentation of traditional ecological knowledge and specialized environmental vocabulary increases the risk of permanent knowledge loss.
- Ageing Indigenous knowledge holders and reduced reliance on oral traditions threaten the continuity of traditional ecological knowledge.
- Reduced youth engagement in Indigenous cultural practices is limiting knowledge transfer and long-term conservation stewardship.

Interventions and Strategies

- Establish national programmes for documenting, preserving, and revitalizing Indigenous knowledge systems and languages.
- Create digital archives of Indigenous languages, ecological knowledge, and oral traditions.
- Integrate Indigenous knowledge into biodiversity conservation, ecosystem restoration, and sustainable resource management programmes.
- Promote interdisciplinary collaboration among ecologists, linguists, anthropologists, and local communities.
- Develop local-language environmental education and conservation communication materials.
- Train conservation practitioners on the effective integration of Indigenous knowledge into conservation planning.
- Promote youth engagement in preserving Indigenous knowledge and cultural heritage.
- Strengthen community-based conservation initiatives that integrate traditional and scientific knowledge systems.

Way Forward

- Institutionalize Indigenous knowledge within national biodiversity, climate change, and sustainable development policies.
- Increase investment in documenting and digitizing Indigenous knowledge and endangered languages.

- Strengthen partnerships among governments, research institutions, Indigenous communities, and conservation organizations.
- Expand research to validate Indigenous conservation practices and their contributions to ecosystem resilience.
- Promote long-term community-led programmes that support intergenerational knowledge transfer.
- Recognize cultural landscapes as bio-cultural conservation areas that safeguard both biodiversity and cultural heritage.
- Foster greater youth participation to ensure the continuity of Indigenous knowledge systems and sustainable conservation practices.

Excerpts from the presentations

Donna J. Sheppard¹, Daniela J. Stark², Solomon Wachiuri Muturi³, Peter Hamington Munene⁴, and Christian Lambrechts⁵

Benefits of Traditional and Local Ecological Knowledge for Species Recovery when Scientific Inference is Limited

2nd Joint International Scientific Conference
2026 – The National Museums of Kenya,
Nairobi

Presentation by:
Wachiuri Muturi – Rhino Ark / Wilder Institute
Calgary Zoo Mountain Forest Conservation
Partnership, Kenya



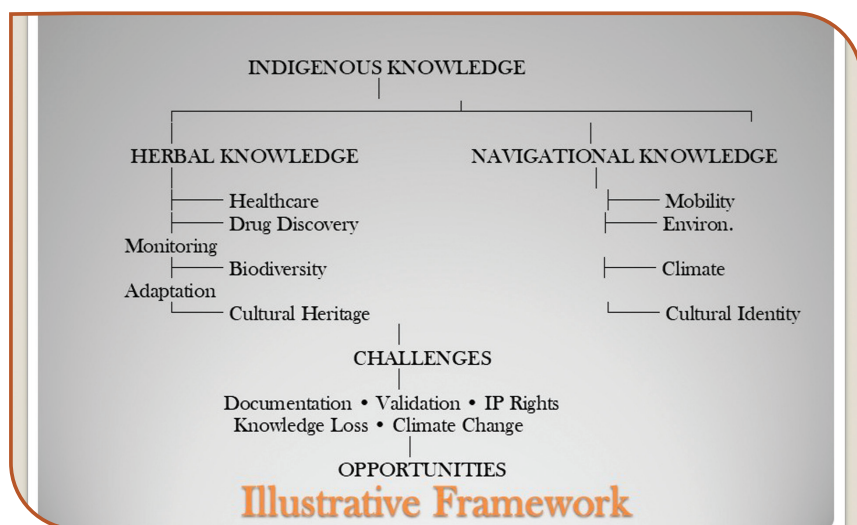
Photo credit: John David

RHINO ARK **Wilder INSTITUTE** **Calgary Zoo**

Problem Statement

- Many critically endangered species persist in remnant populations so small that ecological information required to assist recovery can be difficult to acquire based on science alone.
- Traditional ecological knowledge (TEK) can fill information gaps and provide additional understanding. This expertise does not last forever and often overlooked.
- Our study focused on the critically endangered mountain bongo (*Tragelaphus eurycerus isaaci*) antelope, endemic to Kenya with a wild population of less than 80 individuals in four separated montane forests

© Solomon Wachiuri, RhinoArk



Illustrative Framework 2			
IK Area	Key Objectives	Scope	Examples
Herbal Knowledge	Promote health, Treat diseases, Support primary healthcare, Conserve medicinal plants	- Identification of medicinal plants - Preparation and administration of remedies - Preventive healthcare practices - Veterinary medicine - Conservation of medicinal species - Spiritual and cultural healing traditions	- Aloe species for skin conditions. - Neem for pest control and medicinal use. - Traditional remedies used by Maasai, Luo, Samburu, and coastal communities (Bajuni, Mijikenda, Swahili).
Navigational Knowledge	Facilitate movement, Resource location, Environmental awareness, Disaster avoidance	- Reading stars and celestial bodies - Interpretation of winds and weather - Knowledge of landmarks and topography - Animal behaviour indicators - Seasonal movement patterns - Water-source identification	- Maasai and Samburu tracking seasonal grazing routes. - Coastal communities navigating using stars, currents, and winds. - Indigenous prediction of droughts and rainfall.
Combined Objective	Strengthen cultural continuity, resilience, and sustainable use of natural resources	All relevant areas	As above

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5.9 Sub-Theme: Managing Invasive and Alien Species

Invasive and alien species are among the top drivers of biodiversity loss worldwide. They disrupt native ecosystems compromising on their integrity and resilience, thus threatening species survival, degrading habitats, and consequently affecting agriculture, fisheries, health, and tourism. By tackling them head-on Through research, collaborations, and practical action, we can come up with practical ways of protecting native ecosystems, support food systems, and safeguard cultural and natural heritage. This subtheme invites contributions that inspire innovative and scalable solutions for managing biological invasions in a changing world. This subtheme focuses on detecting, preventing, controlling, and restoring areas habitats impacted by invasive species.

Session Moderators: Paul Gacheru, Nature Kenya; Dr. Paul Kirika, National Museums of Kenya.

Session Rapporteurs: Nancy Matere, Kenyatta University; John Opiyo, National Museums of Kenya; and Howard Atubwa, National Museums of Kenya.

Summary

The session highlighted invasive and alien species as a major threat to biodiversity, ecosystem functioning, agricultural productivity, food security, and livelihoods. Presentations emphasized that effective management requires integrated approaches combining scientific research, policy support, community participation, and sustainable agricultural practices. Particular focus was placed on invasive species such as Fall Armyworm (*Spodoptera frugiperda*) and *Parthenium hysterophorus*, with Integrated Pest Management (IPM), biological control, climate-smart agriculture, and ecosystem-based management identified as sustainable solutions. The session concluded that strengthening surveillance, early detection, rapid response, research, capacity building, and policy implementation is essential for reducing the impacts of invasive species and enhancing ecosystem resilience.

List of Presentations

1. **'Mutuku, D.;** Kamiri, H.; Behn, K.; Becker, M., Next Generation of the fungal biota associated with the invasive insect pest *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae). **'Bonn University German**
2. **Ocholla A. Jemimah,** The interaction of Invasive Tree Species (*Prosopis juliflora*) with Insect Pollinators Across an environmental gradient in Baringo County, Kenya. **Egerton University**
3. **'Evanson R. Omuse,** Honest Machekano, Daniel M.Mutyambai, Sevgan Subramanian, Frank Chidawanyika. Arthropod assemblages and ecological balance in intensified push-pull technology. **'International Centre of Insect Physiology and Ecology (ICIPE), Kenya**

Poster Presentations

4. **C. Mogiti,** E.N. Samita' Evaluation of Pest Abundance and yield performance of Four Cowpea Varieties. **Kenyatta University, Kenya.**

Key Messages to Policymakers

- Strengthen national and county-level invasive species management frameworks.
- Mainstream Integrated Pest Management (IPM) into agricultural extension services.
- Promote environmentally friendly pest management to reduce dependence on synthetic pesticides.
- Invest in surveillance, early detection, monitoring, and rapid-response systems.
- Support farmer training and awareness programmes on invasive species identification and management.
- Develop and implement policies that promote biological control and biodiversity-friendly farming practices.
- Enhance collaboration among government agencies, research institutions, farmers, and conservation organizations.

- Strengthen enforcement of existing invasive species policies and management strategies.
- Integrate climate change adaptation into invasive species management plans.

Emerging Findings and Methods

- Invasive alien species remain major drivers of biodiversity loss and ecosystem degradation.
- Fall Armyworm continues to significantly reduce maize and sorghum production.
- Farmers still rely heavily on synthetic pesticides despite their ecological impacts.
- Adoption of Integrated Pest Management (IPM) remains low due to limited awareness and training.
- Agrovets significantly influence farmers' pest management decisions.
- Excessive pesticide use reduces populations of pollinators, natural enemies, and beneficial soil organisms.
- Climate-smart agriculture combined with IPM improves crop productivity and resilience.
- Water conservation practices reduce pest vulnerability in semi-arid farming systems.
- *Parthenium hysterophorus* continues to spread due to its high ecological adaptability.
- Biological control and ecosystem-based approaches provide environmentally sustainable alternatives to chemical pesticides.
- Climate change is likely to accelerate the spread and establishment of invasive species.

Research Priorities and Gaps

- Limited long-term ecological monitoring of invasive alien species.
- Insufficient understanding of invasion pathways and ecological impacts.
- Limited evaluation of the long-term effectiveness of Integrated Pest Management strategies.

- Inadequate research on biological control agents for major invasive species.
- Limited understanding of pesticide resistance development and alternative control measures.
- Need for predictive models of invasive species spread under changing climate conditions.
- Limited assessment of ecosystem services affected by invasive species.
- Insufficient evidence on biodiversity outcomes of sustainable agricultural innovations such as push-pull technology and climate-smart farming.

Threats and challenges

- Rapid spread of invasive alien plant and animal species.
- Biodiversity loss through competition with native species.
- Habitat degradation and disruption of ecosystem functioning.
- Reduced agricultural productivity and food security.
- Increased dependence on synthetic pesticides and environmental contamination.
- Decline of pollinators, beneficial insects, and natural enemies.
- Climate change facilitating the spread and establishment of invasive species.
- Increased production costs for farmers.
- Emergence of pesticide-resistant invasive pest populations.

Interventions and Strategies

- Strengthen long-term invasive species surveillance and monitoring programmes.
- Promote Integrated Pest Management (IPM) as the primary pest management strategy.
- Expand the use of biological control agents and ecosystem-based management approaches.
- Encourage climate-smart agriculture and sustainable farming practices.
- Improve early detection and rapid-response mechanisms.
- Strengthen farmer, extension officer, and agrovet capacity on sustainable pest management.

- Promote community-based surveillance and reporting systems.
- Increase public awareness on invasive species prevention and management.
- Foster interdisciplinary research involving ecologists, entomologists, agronomists, social scientists, and policymakers.
- Improve risk assessment frameworks and understanding of invasion pathways.
- Strengthen collaboration among researchers, policymakers, conservation organizations, and local communities.

Way Forward

- Establish comprehensive long-term invasive species monitoring programmes.
- Scale up farmer training and extension services on Integrated Pest Management.
- Increase investment in biological control research and sustainable pest management technologies.
- Develop predictive models to anticipate invasive species spread under climate change.
- Strengthen national and regional surveillance and rapid-response systems.
- Promote community participation in invasive species detection and management.
- Enhance policy implementation and institutional coordination across sectors.
- Invest in biodiversity-friendly agricultural innovations, including push-pull technology and climate-smart farming.
- Strengthen partnerships among research institutions, governments, farmers, and conservation organizations to improve invasive species management and safeguard biodiversity, food security, and ecosystem resilience.

Apparent density and spatial distribution of *Stomoxys* flies in Busia County, Western Kenya, Stephen Burudi Shirengo, Kenya Agricultural and Livestock Research Organization, Veterinary Science Research Centre,



DISCUSSION



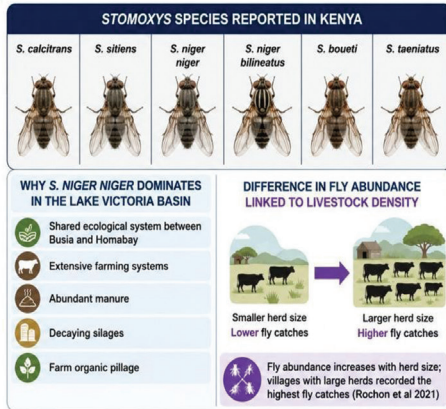
The study reported three *Stomoxys* species: these species are part of the 6 species (*S. calcitrans*, *S. siliens*, *S. niger niger*, *S. niger bilineatus*, *S. boueti*, and *S. taeniatus*) previously reported in the country (Muita et al 2025).



In this study, *Stomoxys calcitrans* was documented as the most prevalent but in Homabay with similar ecological conditions as Busia *Stomoxys niger niger* was the dominant species at 70% (Muita et al 2025); this may be explained by shared ecological system btwn Busia and Homabay and the ability of *Stomoxys niger niger* to consistently dominate the lake Victoria basin region due to extensive farming systems, abundant manure, decaying silages and farm organic pillage (Rochon et al 2021)



Difference in fly abundance; due to livestock density amongst study villages, highest fly catches were in the villages with large size of herd; varying herd size influenced fly abundance (Rochon et al 2021)



Our findings highlight the influence of **ecological factors** and **livestock management** on *Stomoxys* species composition and abundance in the study area.



@Stephen Burudi, MMUST

5.10 Sub-Theme: Policy Frameworks in Heritage Management

Effective policies are the scaffolding that holds conservation efforts together. Without enabling legal environments, even the best scientific and community initiatives may falter. Heritage and biodiversity conservation depend not only on science and community effort but also on robust, inclusive, and forward-looking legal and policy frameworks. This subtheme focuses on examining how national, regional, and global policies influence the stewardship of natural and cultural heritage, and how reforms can enhance their impact offering insights on legal reforms, community rights, and governance mechanisms that support sustainable heritage and biodiversity management. This subtheme also invites policymakers, legal scholars, practitioners, and advocates to contribute policy solutions that safeguard our heritage while enabling sustainable development for present and future generations.

Session Moderators: Dr. Veronicah Ngumbau, National Museums of Kenya; Prof. Eucharika Kenya, University of Embu; Dr. Simon Musila, NMK

Sessions Rapporteurs: David Mwanzia, South Eastern Kenya University (PEBCA case study scholar); Jane Njagi, Kenyatta University (PEBCA case study scholar) and Eliud Kiprono, NMK

Summary

Effective policy framework is vital for all conservation efforts. While scientific research and community led initiatives are expanding across Africa, their long-term success depends heavily on enabling legal environments. The true challenge lies not in a lack of research on climate adaptation, water scarcity, or biodiversity, but in translating this knowledge into actionable, inclusive, and forward-looking policy. To transform heritage and biodiversity into drivers of economic resilience, governance must shift away from coercive enforcement toward collaborative, community centered, and legally harmonized approaches.

Key Pillars for Sustainable Action

1. Governance Quality and Community Rights

- **Prioritizing collaboration over coercion:** As demonstrated in the Amboseli Ecosystem lion conservation study, enforcement models rooted in dialogue, monitoring, and social/financial capital yield far better outcomes than coercive compliance.
- **Empowering Youth Advocates:** Kenyan youth agroecologists and climate champions possess the technical skills and drive to transform food systems. However, they remain sidelined by financial barriers and exclusion from formal policy channels. Unlocking their potential requires targeted investments, mentorship, and inclusive digital engagement.
- **Securing Community Benefits:** True sustainability is achieved only when local communities are legally recognized as primary stakeholders and direct beneficiaries of conservation resources.

2. Regional Policy Harmonization and Enforcement

- **Managing Transboundary Resources:** The exploitation of valuable transboundary bioresources, such as East African Sandalwood (*Osyris lanceolata*), is currently undermined by discordant policies and weak enforcement across Kenya, Uganda, and Tanzania.
- **Standardizing Mechanisms:** To safeguard these resources for global and local markets, regional states must prioritize policy harmonization, robust traceability systems, and commercial domestication.

3. Institutional Alignment with Global Frameworks

- **Strategic Institutions:** National bodies, such as the National Museums of Kenya, play a crucial role in advancing global mandates like the **Kunming-Montreal Global Biodiversity Framework** through ex-situ collections, plant conservation, and biodiversity research.

- **Resource Mobilization:** Meeting the 2030 global targets will demand enhanced funding, rigorous accountability mechanisms, and cross-border collaborative implementation.

The Path Forward: Bridging the “Research-to-Uptake” Gap

To ensure that research on water-climate heritage solutions and biodiversity is successfully implemented, future strategies must move beyond academic publication and focus on the following actionable mechanisms:

Action Area	Strategic Requirement
Policy Integration	Embedding scientific innovations and traditional heritage knowledge directly into national development agendas.
Capacity Building	Providing continuous training and practical tools for local communities, researchers, and practitioners.
Long-Term Partnerships	Fostering sustained alliances among governments, conservation organizations, researchers, and grassroots communities.
Implementation Planning	Designing projects with long-term financial backing and clear pathways for policy uptake from the outset.

This thematic area invites policymakers, legal scholars, advocates, and practitioners to co-create inclusive policy solutions that rigorously safeguard natural and cultural heritage while driving sustainable development for present and future generations.

List of Presentations

1. **'Agnes M. Luswet**i, James M. Mwamodenyi, Solomon Kyalo, Peter Gachie, Beatrice N. Khayota, Trade, Management, and Conservation of *Osyris lanceolata* in East Africa: A Semi-Systematic Review, **'National Museums of Kenya**.

2. **'Boniface Ushie** & James Mushori, Co-creating Innovation Pathways for Water–Climate–Cultural Heritage Resilience: Evidence from Multi–Regional Stakeholder Engagement, **African Academy of Sciences.**
3. Chitechi Wemali, Macharia John, Nekesa Caren, Monique Wambui, and **'Namikoye Samita**, From Participation to Policy Influence: Youth Agroecologists and Climate Advocates in Kenya's Food Systems Transformation.¹ **Kenyatta University**
4. **Dennis M.W. Ochieno**, Rescuing the Insect from the Grinding Core of Conflicting Sustainable Development Goals. Department of Biological Sciences, **Masinde Muliro University of Science and Technology, Kenya.**
5. **Faith Achieng**, Martin Odino, and Darcy Ogada; The Coexistence Co-op: Alleviating the Threat of Poisoning through Community–Based Training. **The Peregrine Fund.**
6. **'Gacheru, P**, Sese, J., Mulwa, R., Kariuki L., Ngoru, B., Wanjohi, H., Mwang'ombe, J., Mwinami, T., Mutunga, J., Matiku, P.; Monitoring Kenya's Key Biodiversity Areas for Conservation Priority Setting. **'Nature Kenya, Nairobi.**
7. **'Itambo Malombe**, Veronicah Ngumbau, Taita Terer; The Role of the National Museums of Kenya in the Implementation of the Global Biodiversity Framework Targets by 2030, **'National Museums of Kenya.**
8. **'James Mushori** and Boniface Ushie; From Research to Uptake: Stakeholder Perspectives on Implementing Water–Climate–Heritage Solutions in Africa. **'African. Academy of Sciences.**
9. **'Margaret Muriuki**, Thuita Thenya, and Jane Mutune; The Inter–relationships Between Community–Based Conservation Governance Arrangements and Lion Conservation in the Amboseli Ecosystem, Kenya, **'Karatina University.**
10. **'Nimrod Sidon**, Community–Based Approaches to Biodiversity and Heritage Management for Socio–Economic Development in African Rural Area, **'Maseno University.**
11. **Salim Abubakar**, From Recognition to Power–Sharing: Analyzing the Effectiveness of Institution Mechanisms for Incorporating ILK in National Biodiversity Strategy and Action Plans (Nbsaps), **Federal College of Education Gidan Madi, Sokoto, Nigeria.**

Poster Presentations

12. **’Eliud Kiprono**, Schmidt Ray, Henry Bart, Dorothy Nyingi, Joseph Gathua; The Role of International Research Experience for Students (IRES) in Capacity Building in Aquatic Biodiversity Research in Kenya. **’National Museums of Kenya.**

1. Key Messages and Policy Recommendations

- **Strengthen youth participation in governance**
 - Youth remain underrepresented in food systems and biodiversity governance due to limited access to finance, information, and decision-making platforms.
 - Governments should establish youth advisory councils, expand digital engagement platforms, and provide targeted funding and capacity-building opportunities.
- **Improve governance for biodiversity conservation**
 - Conservation outcomes depend on transparent, participatory, and locally relevant governance systems.
 - Strengthen implementation of the Kunming-Montreal Global Biodiversity Framework (KMGBF) and National Biodiversity Strategy and Action Plans (NBSAPs), while improving accountability and enforcement.
- **Integrate climate resilience into heritage conservation**
 - Cultural heritage policies should incorporate climate adaptation measures to address increasing floods, droughts, and other hydroclimatic risks.
 - Community-led and nature-based approaches should be prioritized to enhance resilience while preserving cultural identity.
- **Enhance biodiversity monitoring and conservation planning**
 - Key Biodiversity Areas (KBAs) should guide protected

area expansion, infrastructure planning, and monitoring of biodiversity targets.

- Strengthen the role of institutions such as the National Museums of Kenya (NMK) in biodiversity monitoring, public awareness, and conservation.
- **Promote sustainable financing and regional collaboration**
 - Establish long-term financing mechanisms that extend beyond project lifecycles.
 - Harmonize regional conservation policies, strengthen joint enforcement, improve traceability systems, and support sustainable value chains.
- **Mainstream plant and insect conservation**
 - Integrate plant conservation and ecosystem services into national biodiversity policies.
 - Develop insect-sensitive policies to address declining insect populations and their importance for food security, biodiversity conservation, and climate resilience.

2. Emerging Scientific Findings

- Governance quality is one of the strongest determinants of successful conservation outcomes.
- Capacity building, stakeholder engagement, and co-design significantly improve the adoption of research findings and policy tools.
- Digital technologies and informal networks are increasingly effective in engaging youth and supporting collaboration.
- Ex situ conservation, including botanic gardens and living collections, is becoming increasingly important for plant conservation.
- Indigenous knowledge, when combined with modern

technologies, offers innovative and sustainable conservation solutions.

- Key Biodiversity Areas provide an effective framework for linking biodiversity assessments with conservation planning and action.
- Global declines in insect populations and increasing pest outbreaks highlight the urgency of integrating insect conservation into development policies.

3. Research Priorities and Knowledge Gaps

- Develop effective models for meaningful youth participation in environmental governance.
- Evaluate the long-term impacts of community-based conservation and climate adaptation initiatives.
- Assess the sustainability and scalability of research and innovation projects.
- Strengthen biodiversity monitoring, including insects, plants, and Key Biodiversity Areas.
- Improve understanding of ecosystem services and their economic value.
- Advance research on restoration, species domestication, sustainable harvesting, and regional biodiversity value chains.
- Explore better approaches for integrating Indigenous knowledge into climate adaptation and conservation strategies.
- Strengthen research on human-wildlife conflict mitigation and ecosystem resilience.

4. Major Threats and Challenges

- Habitat degradation caused by unsustainable agricultural practices, overharvesting, and land-use change continues to reduce biodiversity.

- Climate change is increasing ecosystem stress through droughts, floods, and extreme weather events that affect both biodiversity and cultural heritage.
- Pollution and invasive species are degrading ecosystems and reducing their resilience.
- Weak governance, poor policy implementation, and inadequate monitoring limit conservation effectiveness.
- Declining populations of birds, carnivores, insects, and other key species indicate growing ecosystem deterioration.
- Limited youth participation, insufficient funding, and weak institutional coordination continue to undermine sustainable conservation efforts.

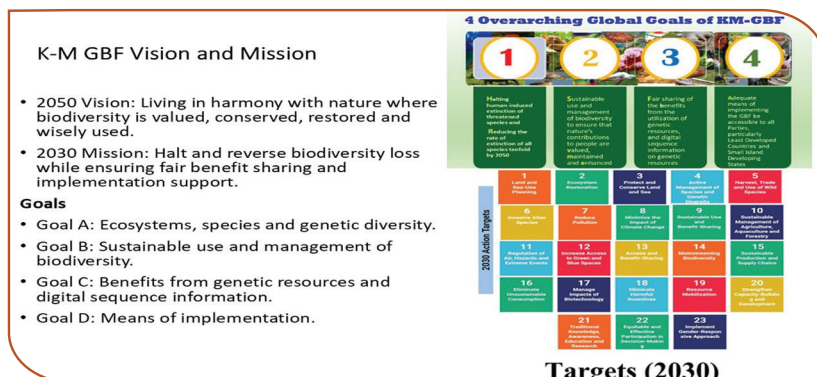
5. Recommended Interventions and Strategies

- Promote participatory governance by involving communities and youth in planning, implementation, and decision-making.
- Expand agroecological education, training, and awareness programmes to encourage sustainable farming practices.
- Increase access to funding, information, and digital platforms for youth-led conservation initiatives.
- Strengthen biodiversity monitoring systems and improve enforcement of conservation regulations.
- Integrate heritage conservation into climate adaptation and ecosystem restoration programmes.
- Support Indigenous knowledge systems alongside scientific innovations to improve resilience and sustainable resource management.
- Improve implementation of NBSAPs and KMGBF targets through stronger institutional coordination and monitoring.
- Encourage regional policy harmonization and collaborative conservation initiatives across countries.

6. Way Forward

- Institutionalize youth participation through permanent advisory structures and inclusive digital engagement platforms.
- Embed research outputs into policy development and implementation from the beginning of projects.
- Strengthen long-term partnerships among governments, researchers, communities, conservation organizations, and development partners.
- Mobilize sustainable financing to support biodiversity conservation, ecosystem restoration, and climate adaptation beyond short-term projects.
- Enhance monitoring of Key Biodiversity Areas and biodiversity indicators to improve accountability and measure progress.
- Build resilient conservation systems by integrating biodiversity protection, cultural heritage conservation, climate adaptation, and sustainable development into a single coordinated framework.
- Invest in continuous capacity building, leadership development, advocacy, and digital communication to sustain conservation efforts over the long term.

Excerpts from Presentations



©Dr. Itambo Malombe, Senior Research Scientist, NMK

TRADE DYNAMICS & EXPLOITATION of *O. lanceolata* in EA

Kenya

- Licensing gaps, illegal trade, community harvesting.
- Harvest ban 2007

Uganda

- Karamoja high exploitation intensity, regional importation, low population regeneration.
- Harvest ban 2006

Tanzania:

- Contrasts between protected vs. unprotected areas, small scale trade.

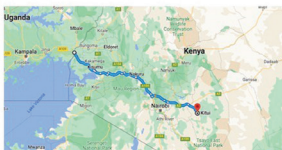
- Harvest ban 2016

Overall EA trend

- Unsustainable harvesting and weak regulation of trade in *O. lanceolata* -causing See-saw effect
- Cross border smuggling through regional trade networks



Source: SEEJ-AFRICA.ORG

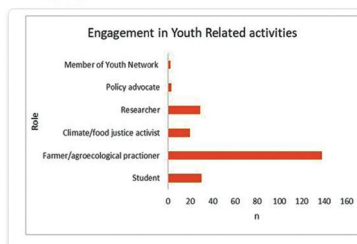


Source: The Standard, 2024

©Agnes Lusweti, Research Scientist, NMK

RESULTS • ENGAGEMENT

Engagement in Youth-Related Activities



- Engagement in youth-related activities shapes perspectives, skills, and impact on community development, and can guide tailored interventions.

Thematic Map of Youth Engagement in Agroecology & Climate Action



Qualitative themes (thematic map)

- Environmental conservation & climate action; farming & livelihood education, training & knowledge sharing; and civic participation through chiefs' barazas, village meetings, and clean-ups.

Youth in Agroecology, Climate & Food Systems Policy - Multi-County Study, Kenya

3

@Dr. Namikoye Samita, Senior Lecturer, Kenyatta University

6.0 Pathway for Emerging Biodiversity Changemakers (PEBCA) Student Case Study Presentations

Session Moderators: Dr. Namikoye Samita, Kenyatta University; Dr. Beryl Bwong, National Museums of Kenya

Session Rapporteurs: Margaret Wangare, Pwani University; and Gedeon Ngenerwanayo, University of Rwanda

Brief preview of Pathways for Emerging Biodiversity Changemakers in Africa (PEBCA)

The Pathways for Emerging Biodiversity Changemakers in Africa (PEBCA) program was conceived as a strategic capacity-building initiative to strengthen the next generation of African biodiversity scientists and practitioners. It emerged from the recognition that while Africa hosts immense biodiversity and rich cultural heritage, there remains a critical need to empower early-career researchers with the skills, networks, mentorship, and practical opportunities necessary to translate scientific knowledge into impactful biodiversity conservation and sustainable development outcomes.

PEBCA was developed as a flagship pre-, during-, and post-conference engagement program linked to the Second Joint International Scientific Conference 2026 in Nairobi, Kenya. The program responds to the growing demand for stronger biodiversity leadership, evidence-based policy engagement, and locally driven solutions to challenges such as biodiversity loss, climate change, invasive species, food insecurity, and heritage conservation across Africa.

Designed as a one-year phased program, PEBCA seeks to bridge the gap between academic research and real-world application by supporting Master's and PhD students to undertake locally relevant biodiversity case studies, develop policy and knowledge products, and engage with mentors, policymakers, and communities. Through this approach, the initiative aims to transform selected Emerging Biodiversity

Changemakers into biodiversity champions capable of driving capacity development and knowledge transfer within their home institutions and countries.

The program embodies a transdisciplinary vision by fostering collaboration to co-create biodiversity solutions and strengthen data-to-decision pathways. By investing in young scientists and supporting innovative case studies across Africa, PEBCA contributes to building a resilient network of biodiversity leaders who will help shape the continent's environmental sustainability, economic transformation, and heritage conservation agenda for now and the future.



The PEBCA Case Study Scholars, JRS Representative Program Officer and the Conference Secretariat

Progress Report

The session on PEBCA brought together scholars from Kenya, Zambia, Uganda, and Ghana to present emerging scientific evidence on biodiversity conservation, climate resilience, environmental health, sustainable agriculture, and cultural heritage preservation. The presentations highlighted the interconnected nature of biodiversity loss, climate change, pollution, and socio-economic development, while demonstrating the importance of community participation, indigenous knowledge, and innovative nature-based solutions in addressing these

challenges. Discussions emphasized the need for integrated, evidence-based policies that strengthen ecosystem resilience, promote inclusive governance, and support sustainable livelihoods across Africa.

PEBCA session showcased fifteen innovative case studies undertaken by Master's scholars from leading universities across Africa. The presentations reflected the diversity of biodiversity-related research being conducted by emerging scientists and highlighted solutions addressing climate change, sustainable agriculture, environmental health, wildlife conservation, biodiversity management, cultural heritage preservation, and community resilience.

The scholars were supported through a structured mentorship framework involving experienced researchers, practitioners, and academic supervisors drawn from universities, research institutions, government agencies, and conservation organizations both locally and internationally. Their studies demonstrated the importance of interdisciplinary approaches and collaborative partnerships in generating evidence that informs policy, strengthens biodiversity conservation, and contributes to sustainable development across Africa.

Key Messages and Policy Recommendations for Policymakers

The scientific evidence presented during the session underscores the urgent need for policymakers to adopt integrated and inclusive approaches to biodiversity conservation and climate adaptation. The studies collectively demonstrate that biodiversity, environmental health, cultural heritage, and community livelihoods are closely interconnected and should therefore be addressed through coordinated policies that promote sustainable development while strengthening resilience to climate change.

Key Messages

- Climate change is increasingly threatening biodiversity, cultural heritage, wetlands, agriculture, and community livelihoods across the continent.

- Biodiversity conservation requires integrated approaches that combine ecosystem protection, climate adaptation, and heritage conservation.
- Community participation, particularly involving youth, women, indigenous peoples, and local institutions, is essential for successful conservation and adaptation initiatives.
- Nature-based solutions, agroforestry, bio-insecticides, and indigenous knowledge provide practical, cost-effective strategies for improving ecosystem resilience and sustainable agricultural production.
- Emerging threats such as antimicrobial resistance (AMR) and heavy metal contamination require immediate policy attention because of their environmental and public health implications.

Policy Recommendations

- Mainstream climate adaptation into biodiversity conservation, heritage management, and national development planning.
- Strengthen environmental monitoring systems, particularly for AMR, water quality, and wetland health.
- Invest in scaling up nature-based solutions, sustainable agriculture, and locally developed bio-insecticides.
- Strengthen legal protection of wetlands, coastal ecosystems, and heritage sites through enforcement of buffer zones and anti-encroachment regulations.
- Institutionalize Public-Private-Community Partnerships (PPCPs) for sustainable heritage conservation and tourism.
- Increase financial and institutional support for youth- and women-led climate adaptation programmes.
- Integrate traditional ecological knowledge into agricultural extension, education, and climate adaptation policies.
- Promote research commercialization and evidence-based policymaking to accelerate adoption of innovative biodiversity conservation technologies.

Emerging Scientific Findings, Research Priorities, and Identified Knowledge Gaps

The session presented several emerging scientific findings that contribute to understanding biodiversity conservation, ecosystem health, climate adaptation, and sustainable resource management. While important progress has been made, presenters identified significant research gaps that require further investigation to strengthen scientific evidence and inform policy and practice.

Emerging Scientific Findings

- Climate change is simultaneously degrading coastal biodiversity and cultural heritage sites.
- Indigenous edible plants possess considerable nutritional, medicinal, and economic potential.
- Nature-based agricultural practices improve soil health and increase on-farm biodiversity.
- Community-based adaptation strategies strengthen resilience among agro-pastoral households.
- Preliminary evidence confirms the presence of antimicrobial-resistant bacteria in major Kenyan river basins.
- Heavy metals, particularly lead, are accumulating in wetland sediments because of urbanization and agricultural activities.
- Plant-derived bio-insecticides have demonstrated promising effectiveness as environmentally friendly alternatives to synthetic pesticides.
- Youth-led agroforestry contributes significantly to biodiversity conservation, ecosystem restoration, and climate resilience.

Research Priorities

- Long-term biodiversity and climate adaptation monitoring.
- Expanded AMR surveillance across African river systems.
- Economic valuation and commercialization of indigenous plant species.
- Optimization and large-scale evaluation of bio-insecticides.
- Comparative studies of climate adaptation strategies across ecosystems.

- Longitudinal assessment of PPCP models for heritage conservation.
- Multi-season monitoring of wetland restoration and pollution control interventions.
- Research on integrating indigenous knowledge into formal conservation and climate adaptation frameworks.

Identified Knowledge Gaps

- Limited baseline information on antimicrobial-resistant microbial communities.
- Insufficient long-term data on ecological impacts of heavy metal contamination.
- Limited understanding of optimal application rates and mechanisms of plant-based bio-insecticides.
- Inadequate evidence on the long-term effectiveness of community-based adaptation strategies.
- Limited research on socio-cultural factors influencing adoption of nature-based practices.
- Insufficient evidence on scaling youth-led agroforestry initiatives.
- Limited economic data supporting the commercialization of indigenous edible plant species.

Biodiversity Threats, Proposed Interventions, and Resilience Strategies

Across all presentations, biodiversity was shown to be under increasing pressure from climate change, pollution, unsustainable land use, and socio-economic challenges. The session highlighted a range of practical interventions and resilience strategies capable of protecting ecosystems while simultaneously supporting sustainable livelihoods and community well-being as shown in the table below:

Biodiversity Threats	Proposed Interventions	Resilience Strategies
Climate change (sea-level rise, drought, erratic rainfall)	Integrate climate adaptation into conservation planning	Climate-smart ecosystem management
Coastal ecosystem degradation	Integrated biodiversity–heritage management	Coastal ecosystem restoration
Wetland pollution and heavy metal contamination	Strengthen pollution control and wetland protection	Riparian buffer zones and continuous monitoring
Antimicrobial resistance in water bodies	Establish routine AMR surveillance and regulate effluent discharge	One Health environmental management
Habitat encroachment and urbanization	Improve land-use planning and enforce environmental regulations	Protected areas and sustainable land management
Excessive reliance on synthetic pesticides	Promote bio–insecticides and integrated pest management	Environmentally sustainable agriculture
Declining soil health and biodiversity	Expand nature-based agricultural practices	Soil restoration and ecosystem conservation
Limited participation of youth and women	Increase financing, capacity building, and inclusive governance	Community-led adaptation and agroforestry
Underutilization of indigenous knowledge	Integrate traditional knowledge into policy and extension services	Community-based adaptation and co-management
Human–wildlife conflict around heritage sites	Establish and enforce ecological buffer zones	Public–Private–Community Partnerships (PPCPs)

Summary Statement

The session demonstrated that strengthening biodiversity conservation in Africa requires integrated governance, inclusive participation, and evidence-based decision-making. By combining scientific innovation with indigenous knowledge, community engagement, sustainable agriculture, and effective environmental governance, policymakers can build resilient ecosystems and communities while advancing sustainable development goals across the region.

Strategic Way Forward

The PEBCA programme should evolve into a sustained biodiversity leadership platform that supports scholars beyond the fellowship period through mentorship, networking, publication support, and collaborative research opportunities. By strengthening technical, leadership, and policy engagement capacities, PEBCA can nurture a new generation of African biodiversity changemakers capable of translating scientific knowledge into practical solutions for biodiversity conservation, climate resilience, sustainable livelihoods, and heritage preservation across the continent.

PEBCA Case Studies Scholar Profiles (See Appendix 1)

7.0 Pre-Conference Training



Pre-Conference Workshop Trainees During the On-Site Training at NMK

7.1 Directorate of National Repository and Research (DNRR)

The National Museums of Kenya (NMK) is a multidisciplinary state corporation and a centre of excellence in research, heritage conservation, and management. Its research mandate is vested in the Directorate of National Repository and Research (DNRR), whose core function is to conduct research on Kenya's cultural and natural heritage while collecting, preserving, and managing the national scientific reference collections. The Directorate traces its origins to the early twentieth century when pioneering naturalists and researchers traversed East Africa in search of scientifically valuable specimens and artefacts, which were deposited at the Museum of the East Africa Natural History Society and subsequently became part of the National Museums of Kenya.

Today, DNRR is endowed with specialized research facilities, laboratories, and internationally recognized collections that support biodiversity assessment, molecular studies, taxonomy, ecological monitoring, and heritage conservation. These collections, accumulated through decades of scientific exploration and research, constitute invaluable

national and global scientific resources and have established NMK as a premier centre for research, learning, and scientific discovery, attracting learners from pre-primary institutions to Technical and Vocational Education and Training (TVET) institutions and universities.

In line with its mandate for research, capacity building, and knowledge dissemination, DNRR played a central role in supporting the pre-conference training sessions during the 2nd Joint International Scientific Conference. The pre-conference training provided an important platform for students, early-career researchers, conservation practitioners, and other participants to acquire practical skills, gain exposure to emerging scientific methodologies and technologies, and engage with experts across diverse disciplines. By leveraging its specialized laboratories, scientific collections, and technical expertise, DNRR contributed to strengthening research competencies, promoting interdisciplinary collaboration, fostering mentorship, and advancing evidence-based conservation and sustainable development.

The pre-conference training therefore exemplified DNRR's commitment to nurturing the next generation of scientists and heritage professionals while reinforcing its position as a leading institution in research, innovation, and scientific capacity development in Kenya and beyond.

7.2 Pre-Conference Training Workshops Overview

Capitalizing on the DNRR strength in research, education and capacity building, a two-day pilot post-conference training workshops were held during the 1st. Joint International Scientific Conference held at the National Museums of Kenya on 6th and 7th June 2024. Guided by the lessons learned and opportunities missed from the inaugural training workshop, the Second Joint International Scientific Conference (JISC) secretariat organized for 2nd training session to coincide with the conference which was held in June 2026. The training aimed at ensuring sustainable capacity building/mentorship program. The Courses were designed with a focus on creating 'Pathways for Emerging Biodiversity Changemakers in Africa (PEBCA)'. PEBCA is structured into three interconnected phases, for the period Feb 2026–April 2027.

- i. Pre-conference capacity building that comprised of online sessions that took place from February – May 2026.
- ii. Pre-conference physical training workshop held at NMK, Nairobi from 3rd – 6th June 2026.
- iii. Post-conference capacity building/mentorship that takes a year and commenced in April 2026 to April 2027.

The following courses were offered during the 2026 pre-conference training workshops;

- i. Advances in freshwater assessment using invertebrates
- ii. Approaches to Plant Ecology, Mycology and Herbarium techniques
- iii. Biomonitoring of species using DNA Technology course
- iv. Fundamentals of sampling and monitoring insect pollinators
- v. Modelling Landscape to Reframe our Understanding of Past Socioecological Change

These courses attracted 100 trainees from Kenya, Tanzania, Rwanda and Namibia out of which, 42 submitted abstracts and participated in the conference through poster and oral presentations.

In addition to the above five courses, crosscutting lectures were offered to enhance trainees' competencies and skills in a changing world. The

lectures included; scientific Writing and publishing, communication and presentation skills, statistical analysis, GIS, Use of citizen science tools for biomonitoring technology and innovation among others. These lectures, were conducted mostly by NMK staff and our collaborators from AKE, University of Nairobi, Nature Kenya, Wyss Academy of Science, University of Bern.

These courses were conducted by three research departments within DNRR and they include:

Botany Department

The East African Herbarium (EAH), established as the Department of Botanical Sciences at the National Museums of Kenya (NMK) in 1982, is the largest herbarium in tropical Africa, housing over one million preserved plant and fungal specimens. It serves as a national and regional repository and reference center for plant and fungal biodiversity, providing specimen identification, taxonomic verification, and biodiversity information. The department maintains extensive collections, including type specimens, lower plants, fungi, botanical illustrations, and living plants in the National Botanic Garden. Built through more than a century of scientific expeditions and collaborations, the EAH conducts research in plant taxonomy, biodiversity conservation, and natural resource management, supporting environmental impact assessments, wildlife and forest conservation, water resource management, food security, and climate change adaptation. Its key units include Mycology, Ex Situ Conservation, Ethnobotany, the National Botanic Garden, In Situ Conservation and Ecology, Information and Documentation, and Education, Outreach, and Dissemination. With more than 114 years of specimen collection through scientific expeditions and international collaborations, the EAH has well-established expertise in plant taxonomy, biodiversity assessment, conservation, ecological monitoring, and environmental management.

These resources and specialist staff provide an excellent environment for delivering postgraduate courses through lectures, laboratory practicals, field demonstrations, specimen-based learning, and supervised research.

Centre for Biodiversity

The Centre for Biodiversity was set up by the Government of Kenya in 1994, following a recommendation by United Nations Environment Programme (UNEP) for a coordinated approach to implement the Rio Convention (Convention on Biological Diversity, CBD). The role of the centre was to coordinate country biodiversity studies and direct its subsequent operations in consultation with relevant government agencies. Over the years, the Centre has not only coordinated multi-disciplinary projects in Kenya, but has also been designated as a National Scientific Authority for various Multilateral Environmental Agreements (MEAs). In addition to liaison with other NMK research centers, the Centre brings together five main research units as follows: Marine and wetlands Programme, Kenya Resource Centre for Indigenous Knowledge (KENRIK), Molecular Genetics Laboratory, Coastal Biodiversity Conservation Unit, Phytochemistry Section.

Departmental of Earth Sciences

The Department of Earth Sciences a core research division comprising four sections: Paleontology, Archaeology, Palynology/Paleobotany, and Geology. The department conducts extensive field and laboratory research to document and conserve paleontological, archaeological, and geological collections. Renowned for its contributions to prehistoric studies, it holds one of the largest fossil collections in the world. The department also plays a pivotal role in training local and international students, disseminating scientific findings, and supporting interdisciplinary research projects that span from the Precambrian to the present.

Zoology Department

The Zoology Department conducts research on animals (including invertebrates, fish, amphibians, reptiles, birds and mammals) through taxonomic and ecological studies. Core functions of the department include; research and monitoring, documentation and dissemination of information; education, training and awareness and collection management. These functions are implemented through six research sections namely: Herpetology, Ichthyology, Invertebrate zoology, Ornithology and Osteology.

7.2.1. Advances in freshwater assessment using invertebrates



Course contact: nnlaban@yahoo.com

Brief course introduction:

Kenya is a water scarce country. As such, any available clean water is precious. There is need to constantly monitor the health status of our rivers and streams which are our main source of water for domestic and industrial use. The main purpose of monitoring is to maintain the status of the clean rivers, restore the polluted ones or even identify the sources and kinds of pollution.

Aim of the course:

- Basic taxonomy of macro-invertebrates
- Introduction to river health assessments using macro invertebrates (**Lecture**)
- A practical comparison of scores from two rivers of varying pollution levels

Course Outline

		Date	Time	Course offered	Facilitator
Virtual lectures		23 rd Feb 2026		General orientation for all participants to all courses	Course Organizers
	Day 1	26 th Feb 2026	10.00 am–11.00 am	Course specific Orientation for participants	Mr. Laban Njoroge

		Date	Time	Course offered	Facilitator
	Day 2	26 th Mar 2026	10.00 am – 11.00 am	Introduction to macro invertebrates Q&A	Mr. Laban. Njoroge
	Day 3	27 th Mar 2026	10.00 am – 11.30 am 3.00 pm – 4.30 pm	Basic macro invertebrates taxonomy (Mayflies, Stoneflies & Caddisflies) Q&A	Mr. Laban. Njoroge
	Day 4	2 nd April 2026	10.00 am – 11.30 am 3.00 pm – 4.30 pm	Basic macro invertebrates taxonomy (Dragonflies and True flies) Q&A	Mr. Laban. Njoroge
	Day 5	3 rd April 2026	10.00 am – 11.30 am 3.00 pm – 4.30 pm	Basic macro invertebrates taxonomy (Aquatic bugs) Q&A	Mr. Laban. Njoroge
	Day 6	16 th April 2026	10.00 am – 11.30 am 3.00 pm – 4.30 pm	Basic macro invertebrates taxonomy (Aquatic beetles) Q&A	Mr. Laban. Njoroge
	Day 7	17 th April 2026	10.00 am – 11.30 am 3.00 pm – 4.30 pm	Basic macro invertebrates taxonomy (Other macro invertebrates) Q&A	Mr. Laban Njoroge
	Day 8	14 th May 2026	10.00 am – 11.30 am	Introduction to river health assessment Q&A	Mr. Juan Tedder

		Date	Time	Course offered	Facilitator
	Day 9	15 th May 2026	10.00 am – 11.30 pm	Hypothetical calculation of the SASS Scores Q&A	Mr. Juan Tedder
Hands on activities at NMK	Day 1	3 rd June 2026	9.00 am – 4.00 pm	• Visit and sample river 1 • Fill SASS sheets • Sort and preserve samples	Mr. Laban. Njoroge & Mr. Juan
	Day 2	4 th June 2026	9.00 am – 4.00 pm	• Visit and sample river 1 • Fill SASS sheets • Sort and preserve samples	Mr. Laban. Njoroge & Mr. Juan
	Day 3	5 th June 2026	9.00 am – 4.00 pm	• Sort and identify samples from the two rivers	Mr. Laban. Njoroge & Mr. Juan
	Day 4	6 th June 2026	9.00 am – 4.00 pm	• Calculation and comparison of the SASS Scores from the two rivers • Discussions • Training evaluation	Mr. Laban. Njoroge & Mr. Juan

Facilitator Profiles



Mr. Laban Njoroge

Mr. Laban Njoroge is a Research Scientist at the Section of Invertebrates Zoology at the National Museums of Kenya. He is both a conservation and medical entomologist with a big passion also for commercial and forensic entomology. He has a BSc. in Botany and Zoology and MSc. in Medical Entomology and Parasitology.

	He is a former curator of invertebrates at the Museums in Nairobi. He has extensive knowledge and experience accumulated for over 15 years working with invertebrates and especially the aquatic invertebrates. Within conservation, he is very keen about insects as bio-indicators of ecosystem health while within the medical arena, his main interest is the mosquitoes.
 Mr. Juan Tedder	Juan is an ecologist with over 17 years' experience in the environment and water sector in aquatic ecosystem functioning and water resource and quality management. He was fortunate in his early career to discover a passion for aquatic ecology and has not looked back since. He is a jack of all trades, with experience in water quality assessments, wetland assessments and delineation, riparian assessments and delineation, chemical spills, GIS, etc. However, his main role has been related to the application of biological monitoring techniques, using fish, benthic diatoms, dragonflies and aquatic invertebrates to assess river health and functioning as well as the application of the South African River Eco-Classification, tools for eco-status determination. In this role he has had the privilege of being part of the teams involved in the 2015 and 2021 multinational Joint Basins Surveys assessing the health and functioning of the Orange River basin across South Africa, Lesotho, Namibia and Botswana and had the opportunity to do the first aquatic macroinvertebrate assessment of the Azraq Wetland Reserve in Jordan. Juan plays a major role in running SASS5 and citizen sciences training courses. Juan is an accredited SASS5 regional auditor, and member of the South African Society of Aquatic Scientists.

List of trainees

No.	Name	Gender	Level of Education	Nationality	Institution (If student)
1	Bonaventure Iradukunda	M	BSc	Rwandan	Dian Fossey Gorilla Fund
2	Charity Barasa	F	PhD Ongoing	Kenyan	University of Eldoret
3	Fidelis Lupia	M	MSc Ongoing	Tanzanian	University of Dar es Salaam
4	Kevin Sudi	M	BSc	Kenyan	Chuka University
5	Muga Moses	M	MSc	Kenyan	University of Eldoret
6	Eliud Kiprono	M	MSc Ongoing	Kenyan	Jomo Kenyatta University of Agriculture and Technology
7	Ian Theuri	M	MSc Ongoing	Kenyan	Pwani University
8	Peter Kangethe	M	Diploma	Kenyan	National Museums of Kenya
9	Andrew Charo	M	BSc	Kenyan	Kisii University
10	Peter Kimani	M	BSc	Kenyan	Rongo University
11	Anthony Muhoro	M	MSc	Kenyan	Chuka University
12	Jedidah Kariuki	F	Msc ongoing	Kenyan	Chuka University
13	Justin Ibrahim	M	MSc Ongoing	Kenyan	Egerton University

No.	Name	Gender	Level of Education	Nationality	Institution (If student)
14	Erakiel Moraa	F	MSc	Kenyan	Egerton University
15	Ken Gitonga	M	MSc Ongoing	Kenyan	Chuka University
16	Samson Chabari	M	PhD ongoing	Kenyan	Chuka University
17	Truphena Koech	F	MSc	Kenyan	Chuka University
18	Brian Okeyo	M	BSc ongoing	Kenyan	Egerton University
19	Catherine Amutebi	F	Diploma	Kenyan	Kipsaina Crane wetland
20	Gideon Kuluo	M	MSc	Kenyan	Sondu River Basin

Trainees Post Training Evaluation Report

1. Brief overview of skills acquired as outlines by the trainees

- Knowledge and skills in freshwater ecosystem assessment for macroinvertebrates as bioindicators to evaluate water quality.
- Hands-on experience was gained in field sampling methods in various biotopes: vegetation, rocks, and gravel-sand-mud (GSM).
- Taxonomic skills of macro-invertebrates i.e., sorting, identification and classification to order and family, identifying key indicator groups such as Ephemeroptera, Trichoptera and Plecoptera (ETP). This included the recognition of distinct morphological characteristics of different taxa using a microscope.
- Use of the South African Scoring System (SASS) and Average Score Per Taxon (ASPT) biological indices. This included

determination of water quality by preparing and calculating the SASS score for different macro invertebrates in different rivers and using the score to identify and explain the status of the river to monitor diversity and sensitivity of freshwater health.

- Technical skills, teamwork, scientific observation, communication, networking, leadership and public speaking skills.
- Technical skills including sample collection, laboratory identification, sorting, preservation and storage; and basic ecological data analysis and interpretation and publications skills.
- Designing sampling strategies, standard and procedural sampling methods of aquatic invertebrates including using D-nets, kick-sampling, sweep netting, and manual picking and subsequent preservation while in the field.
- Acquired skills to distinguish pollution-tolerant species such as Chironomidae from sensitive EPT taxa like mayflies, stoneflies, and caddisflies.
- Gained skills in habitat assessment, field data recording, and safe handling of contaminated water.
- Use of technology such as GIS for mapping and wildlife monitoring, and R programming for delivering valuable analysis that can be communicated in publication.
- Development of competitive grant proposals for projects in conservation.
- Learned how to take in-situ water quality measurements using a multi-probe meter and the importance of observing the river habitat when sampling aquatic invertebrates.
- Molecular and Genomic Approaches; Understanding of modern techniques such as DNA barcoding, environmental DNA (eDNA), and metabarcoding for biodiversity monitoring and species identification.
- Research and scientific communication to enhance capacity, formulate research questions, review scientific literature, prepare technical reports, data analysis and communicate effectively to scientific and non-scientific audiences.

- Knowledge of how biomonitoring results inform freshwater conservation, environmental policy, and sustainable water resource management.
- Use of digital and analytical tools in the invertebrates training laboratory to familiarize themselves with diverse software and computational methods used in freshwater ecological assessment, data management, and visualization.

2. Training objectives and their achievement

- Competency in macroinvertebrates sampling techniques, identification and classification of aquatic invertebrates and application of biotic indices: SASS and ASPT.
- Introduction to different freshwater assessment way, learning the value and uniqueness of aquatic organisms and basic identification of life under water.
- Bridge knowledge gaps between theoretical online research concepts and practical, hands-on field applications.
- The training aims at ensuring a sustainable capacity-building/mentorship program that can create a pathway for emerging biodiversity changemakers in Africa.
- Introduce modern biomonitoring techniques, including DNA barcoding, environmental DNA (eDNA), and digital tools for species identification and ecological assessment.
- Strengthen research, reporting, and scientific communication skills related to freshwater ecology and environmental monitoring.
- Promote understanding of the role of biomonitoring in environmental management, conservation, and policy formulation.
- The training objectives were successfully achieved. The course provided a comprehensive hand-on field and laboratory experience enabling participants to effectively collect, identify and analyze aquatic macroinvertebrates and apply bioassessment tools for freshwater quality evaluation.

3. Most interesting task/exercise/procedure during the training

- The most interesting and effective part of the training was the field sampling and comparative analysis of macroinvertebrates in Nairobi River and Getathuru River. The real-life example of the less diverse macroinvertebrates found in the Nairobi River compared to that of the Getathuru River, revealed significant pollution in the former and excellent ecological health in the latter; a compelling example of the principles of ecology at work. This provided a practical understanding of freshwater ecosystem assessment. Lifting net from the polluted river revealed only dark, wriggling Chironomidae and other worms while the cleaner river yielded delicate mayfly and caddisfly larvae
- Field work to Karura forest was the most exciting. It gave a different picture of aquatic system to compare a disturbed ecosystem, Nairobi River and a moderately disturbed ecosystem, river Gathitha in Karura forest.
- The concept of bioindication became very concrete and understandable on this exercise and gave a better insight into theoretical knowledge
- Sampling, identification using digital microscopes and classification of macroinvertebrates in different biotopes. The trainer took the trainees step by step on how to sort samples in a tray, taking into consideration the standard time and effort needed when collecting insects for a study.
- Networking and getting knowledge from people of different academic level, cultures and race
- Computation of the SASS and ASPT scores further demonstrated the practical application of biological monitoring in assessing of the health ecosystem. This was most interesting due to its simplicity and its easy interpretation of the water quality status.
- Interesting reminiscing childhood memories of traditional beliefs in my community regarding role of water beetle in breast development. It was fascinating to revisit these organisms from a scientific perspective and learn ecological importance. Family name: Gyrinidae; Common name: Whirligig bottle; Local name (Kalenjin): "*Chepkina*".

4. Tasks or processes that required more elaboration

- Field sampling so that we can collect samples on every biotope and also to give a chance for everyone to do the sample collection.
- Advanced taxonomic identification and classification of macroinvertebrates could have been covered in greater detail. Additional time for distinguishing closely related taxa and understanding their ecological significance would have been beneficial, example use of electron microscope and eDNA.
- Online training, they needed more lecture hours.
- Process of integrating macroinvertebrate biotic scores with predictive climate-change modeling and chemical parameter mapping had been more elaborate.
- Sampling additional rivers outside the city, particularly a pristine reference site in the Ngong Hills or upper Athi River, to establish a true baseline for comparison.
- Detailed scoring systems for not only rivers but also extend the scope to freshwater lakes.

5. Application of the acquired skills in work/studies

- Training students and professionals on practical attachment, especially those who undertake freshwater biology, environmental science and ecological research.
- The techniques can be used in assessment of freshwater, water quality, ecosystems; performing EIA activities; Promoting conservation and pollution control efforts; Research on biodiversity and ecosystem health.
- As a curator of the National Museum of Tanzania, sampling and identifying invertebrates is a valuable skill in specimen collection as the trainee strives to enhance their biological specimen database.
- In enhancing academic research and data Modeling; upgrading fieldwork and stream biomonitoring protocols; and bridging science and policy for regional catchment management.

- Applied in trainees MSc research by assessing river health within Laikipia rangelands using macro-invertebrate indices. The student will evaluate whether PGMS improves riparian management and water quality for wildlife and livestock.
- The skills will also be used in training pastoral communities in simple participatory water monitoring while the SASS score system can be adapted for Kenyan rivers to support policy advocacy at county level.
- Biomonitoring is valuable for the sustainable conservation of endangered species like mountain gorillas and golden monkeys, an everyday task to monitor them both on the ground and also using GIS and R skills from the training to develop a standard map and analysis for stakeholders for example the biodiversity program at the Dian Fossey Gorilla Fund,
- Acquired skills will be used in grant application to conduct aquatic research, participate in research projects involving assessment of freshwater quality using macroinvertebrates and nurture other young upcoming scientists on how to sample and identify aquatic invertebrates.
- The sampling and SASS scores skills will be applied in a trainee's project on river health in Trans Nzoia.
- As a researcher and a laboratory instructor, the skills in macroinvertebrates sampling, identification, habitat assessment and calculation of biotic indices namely SASS and ASPT will be useful in generation of reliable data for evaluating the impact of land-use change, pollution and training of students.
- In Ecosystem Restoration, the acquired SASS (South African Scoring System) methodology will be applied to assess rivers within project sites.
- In aquaculture and water quality.

6. Trainees feedback on training content

- Yes. the training content provided a well-balanced combination of theoretical knowledge and practical experience in freshwater quality assessment using aquatic invertebrates.

The course covered key topics such as macroinvertebrates sampling, identification, habitat assessment, application of biotic indices SASS and ASPT; and interpretation of ecological data all of which are highly relevant to academic and professional interests of the trainees.

7. Content delivery, practical demonstrations, and replicability

- Phase 1: Virtual Content Delivery: structured online lectures and interactive webinars. These sessions focused heavily on the conceptual frameworks of freshwater biology, standard bio assessment protocols, and the theoretical baseline of macroinvertebrate pollution-sensitivity scales.
- Phase 2: Expert-Led Laboratory Demonstrations: onsite delivery shifted to intimate, small-group lab demonstrations. Senior taxonomists and entomologists walked through the explicit diagnostic features of key benthic indicator families (such as distinguishing sensitive Ephemeroptera from tolerant Diptera) using physical museum specimen plots and stereomicroscopes.
- Phase 3: Interactive Field Practical: The core of the training culminated in interactive field practical. Trainees actively executed the SASS5 rapid bioassessment protocol, physically sweeping separate stream biotopes (Stones, Vegetation, and Gravel/Sand/Mud) using standard nets. We then conducted live, on-site taxonomic sorting, scoring, and calculations of Average Score per Taxon (ASPT) on sorting trays based on the families we sampled.

Some feedback: The trainee will recommend and replicate this blended approach in their institution because it promotes both conceptual understanding and practical competence.

- The practical sessions were beneficial, as they encouraged active learning and experiential learning a method that the trainee will propose in their institution as it boosts understanding and skill retention.
- Some online training, were hard to follow and understand due

to limited training time and ineffective delivery particularly for topics that needed hands-on approach in teaching for instance GIS. However, the practical training, was exquisite, as it had ample time and resources to learn and do the work, hence easy to replicate this methodology at my institution and/or personal work

- The sixty percent field and forty percent classroom ratio were ideal including the peer learning in groups which worked well for quality control. This model is replicable at using photo identification guides and mobile apps to supplement expert availability.
- The integration of demonstrations and practical exercises provides valuable experiential learning opportunities, making the training highly relevant and applicable to research, teaching, and environmental management activities. Adopting a similar training model would contribute significantly to capacity building and skills development within the institution.
- The delivery of the content was exemplary. The tutor maintained excellent punctuality and fostered an actively engaging learning environment. Every participant was encouraged to contribute to class discussions and hands-on practicals. I would unequivocally replicate this highly effective instructional approach within my own institution

8. Feedback on time allocation and areas recommended for improvement

- Time allotted for the training was satisfactory but some of the areas needed more time to further reinforce participant's competence in the techniques.
- These include:
 - o Identification of macroinvertebrates to family level
 - o Analysis and interpretation of the SASS scores
 - o More extended fieldwork sessions for additional practice and participate in sampling more sites
 - o For online training, none of the general courses had enough time to deliver the desired outcome.
 - o Hands-on training on GIS

- o Environmental DNA (eDNA) and molecular techniques is recommended, because its emerging and highly relevant technologies.

9. Networks created during the training for future professional collaboration

- The training was an excellent opportunity to network with the other participants, trainers, environmental scientists, researchers and ecologists enabling contacts with people from all disciplines and occupations. These networks offer potential for further collaboration in research projects, environmental monitoring efforts, professional mentorship and knowledge exchange.
- During the training, deliberate and strategic networks of professional contacts were built in other areas other than the trainings attended. This included contacts with NMK mammalogist, entomologists, and botanists spanning distinct professional pillars, laying a strong foundation for future collaborative research, data sharing, and policy advocacy.
- Regional Freshwater Researchers and Peer Cohorts the Network: Connected with fellow early-career scientists, postgraduate researchers, and field officers from various East African institutions who are also working on water quality and ecosystem health.
- Future Collaboration: a peer-group network was established to facilitate cross-border data sharing, comparative watershed studies, and joint academic publications. This network will allow comparative studies on SASS5 scoring matrices performance across different geographical river basins and varying regional climate gradients.
- Technical Expert Networks; Relationships established with specialists in aquatic invertebrate taxonomy, biomonitoring, molecular ecology, and environmental DNA (eDNA) techniques. These contacts will be valuable for technical guidance, mentorship, and future scientific collaborations.
- Established numerous meaningful connections during the training. A key objective was to identify potential referees

and was successful in finding several excellent doctors and professors. Furthermore, forged strong connections with peers, which is anticipated to lead to future professional collaborations.

10. Reasons for recommend this training / technology to your colleagues and friends

- Practicality and effectiveness. Macroinvertebrates are a cost effective, reliable and scientifically sound way to measure water quality.
- It is useful for students, researchers and professionals in the field of environmental science, conservation and related areas in particular.
- The training was conducted by very experienced professionals.
- Provides practical and marketable skills in freshwater ecosystem assessment.
- Creates opportunities for networking with professionals and researchers.
- Supports environmental conservation and sustainable management of freshwater resources.
- High Accessibility and Low Cost: Unlike chemical water analysis that requires expensive laboratory infrastructure, automated probes, and recurring reagent costs, SASS5 relies on basic, low-cost equipment like standard nets and sorting trays. This makes it an incredibly practical tool for researchers working within tight institutional budgets or remote field locations.
- Immediate, Comprehensive Results: Chemical water testing only provides a fleeting “snapshot” of water quality at the exact moment of sampling. In contrast, macroinvertebrates live in the water continuously; using SASS5 allows us to read the community structure as a living chronicle that reflects the cumulative impact of historical, long-term pollution events over weeks or months.
- Allows early-career researchers to produce empirical, high-integrity data frames that local governments and watershed managers can immediately trust to shape water protection policies.

- Researchers should attend because it offers hands-on tropical African river experience directly applicable to environmental impact assessment work.
- Hands-On Learning Experience; The inclusion of fieldwork, laboratory exercises, and practical demonstrations allows participants to apply theoretical concepts in real-world situations, making the learning process more effective and engaging.
- Exposure to Emerging Technologies; Participants gain knowledge of modern approaches such as environmental DNA (eDNA), DNA barcoding, digital identification tools, and advanced biomonitoring techniques that are increasingly being adopted worldwide.
- Supports Research and Academic Development; The training strengthens research capacity by improving participants' abilities in scientific investigation, data interpretation, report writing, and evidence-based decision-making.
- Promotes Environmental Conservation; It increases awareness of freshwater ecosystem health and provides practical tools for monitoring and protecting aquatic resources, thereby contributing to sustainable environmental management.
- The training provided practical solutions and innovative approaches for tackling issues such as water pollution, biodiversity loss, and ecosystem degradation.
- Recommendable in environmental assessment and restoration.

Photo Gallery





Trainees in the field and during laboratory analysis sessions

7.2.2. Approaches to Plant Ecology, Mycology and Herbarium Techniques



26th February – 6th June 2026

Course contacts: gmwachala@gmail.com; pmkirika@gmail.com; mmurethi@yahoo.com; verrozngumbau@gmail.com & susannjuguni@gmail.com

Brief Course introduction

The course “*Approaches to Plant Ecology, Mycology and Herbarium Techniques for Biodiversity conservation*” is designed to provide participants with both theoretical knowledge and practical skill crucial for understanding, documenting and conserving plants and fungi diversity. Plants and fungi form the foundation of most terrestrial ecosystems, playing a critical role in maintaining ecological balance and supporting livelihoods. Effective conservation of these resources requires a deep understanding of their diversity, ecological interactions, and the tools used to study and preserve them. This course integrates key disciplines in modern biodiversity science. Participants will learn **herbarium techniques**, including plant and fungal collection, preservation, identification, databasing, and curation. The **plant ecology** component will introduce methods for studying species interactions, community structure, and ecosystem processes in natural habitats. The **mycology**

segment will explore fungal diversity, their ecological roles, and their significance in ecosystem health and applied uses in food production.

By the end of the course, participants will have the knowledge and technical capacity to:

- Conduct field surveys and collect high-quality plant and fungal specimens.
- Apply herbarium methods for long-term preservation and research.
- Analyze plant-fungus-environment interactions to inform conservation strategies.
- Contribute to biodiversity databases and conservation planning initiatives.
- Understanding of key ecological drivers (biotic, abiotic and their interaction) influencing plant/fungi diversity and distribution in ecosystem in Kenya
- Knowledgeable in bio-indicators (plant/fungi) and biological indexes in assessing health status of an ecosystem for plant/fungi diversity
- Understanding of ecosystem degradation, and possible mitigation measures
- Knowledge in viable strategies of sustaining an ecological healthy ecosystem for rich plant/fungi diversity.
- Understand mycorrhizal fungi and soil health
- Mushroom cultivation techniques

Course Outline

		Date	Time	Course Offered	Facilitator
Virtual lectures	Day 1	26 th Feb. 2026	10.00 am – 12.00 noon	Ecological approaches and application for conservation Q&A	Dr. Mary Muchane

		Date	Time	Course Offered	Facilitator
	Day 2	16 th Mar. 2026	10.00 am – 12.00 noon	Plant taxonomy and nomenclature of Angiosperms Q&A	Dr. Geoffrey Mwachala
	Day 3	17 th Mar.	10.00 am – 12.00 noon	Citizen tools in plant collection and application Q&A	Dr. Itambo Malombe
	Day 4	20 th Mar. 2026	10.00 am – 12.00 noon	Use of natural sciences data for forensic application Q&A	Dr. Peris Kamau
	Day 5	2 nd Apr. 2026	10.00 am – 12.00 noon	Overview of Fungi and Lichens Q&A	Dr. Paul Kirika
	Day 6	8 th April 2026	10.00 am – 12.00 noon	Mobilization of biodiversity data for conservation and policy Q & A	Ms. Brenda Nyaboke
	Day 7	15 th April 2026	10.00 am – 12.00 noon	Herbarium and its importance in botanical research Q&A	Dr. Veronicah Ngumbau
	Day 8	4 th May 2026	10.00 am – 12.00 noon	Ecological roles of Fungi and applied uses in food production Q&A	Ms. Susan Kabacia

		Date	Time	Course Offered	Facilitator
Hands on activities at NMK	Day 1	3 rd June 2026	9.00 am – 4.00 pm	• Introduction to herbarium technique and their importance in botanical research • Principles of Plant Collection • Hands on practice on plant collection techniques	Drs. Kirika & Ngumbau
	Day 2	4 th June 2026	9.00 am – 4.00 pm	• Identification and Nomenclature • Specimen's processing, mounting and laying in. Herbarium Curation and Management	Drs. Mwachala Ngumbau & Mary
				• Introduction to key ecological drivers (biotic, abiotic and their interaction) influencing plant/fungi diversity and distribution in ecosystem in Kenya	

		Date	Time	Course Offered	Facilitator
	Day 3	5 th June 2026	9.00 am – 4.00 pm	• Use of bio-indicators (plant/fungi) and biological indexes in assessing health status of an ecosystem for plant/fungi diversity • Introduce to key drivers of ecosystem degradation, and propose possible mitigation measures	Dr. Mary
				• Viable strategies of sustaining an ecological healthy ecosystem for rich plant/fungi diversity.	
	Day 4	6 th June 2026	9.00 am – 4.00 pm	• Ecology Practical sessions Discussions • Introduction to Fungi/ Importance/ Soil health • Mushroom Biology and Diversity/ Cultivation	Dr. Mary & Ms. Kabacia

Facilitator Profiles

 Dr. Geoffrey Mwachala	Chief Research Scientist, National Museums of Kenya and Editor in Chief, Flora of Kenya. Formerly Director, National Repository and Research and Head of Botany Department. Seasoned scientist in plant systematics, ecology and conservation.
 Dr. Paul Kirika	Head of Botany Department and Senior Research Scientist. Expert in plant and fungal taxonomy, Ecology, Phylogenetics, Lichenology and Conservation.
 Dr. Mary Nyawira Muchane	Senior Research Scientist, In-situ conservation and Ecology Laboratory section, Botany Department. Specialist in taxonomy, conservation and management of plant, fungi and soil resources.
 Dr. Veronicah Ngumbau	Senior Research Scientist, Head Training Section, Botany department. Specialist in plant taxonomy, biodiversity assessment, species assessment, and conservation.

 Ms. Susan Kabacia	Expert in macrofungi, taxonomy of wild mushrooms and conservation. She is a trainer in mushroom cultivation, value addition, spawn production, and mushroom product development, promoting sustainable livelihood options and community-based conservation initiatives.
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Trainees List

No.	Name	Gender	Level of Education	Nationality	Institution
1	Naomi Makokha	Female	MSc ongoing	Kenyan	Egerton University
2	Tabitha Njeri	Female	PhD ongoing	Kenyan	Kenyatta University
3	Vincent Okelo Wanga	Male	PhD	Kenyan	Chinese Academy of Science
4	Achieng Vallery	Female	MSc ongoing	Kenyan	Pwani University
5	Christine Chai	Female	MSc ongoing	Kenyan	Pwani University
6	Nancy Maoga	Female	BSc	Kenyan	Technical University of Kenya
7	Tobin Mutiso	Male	BSc	Kenyan	Jomo Kenyatta University of Agriculture and Technology

No.	Name	Gender	Level of Education	Nationality	Institution
8	Julius Njuguna	Male	Diploma	Kenyan	WRTI
9	Judith Nyamai	Female	MSc ongoing	Kenyan	National Museums of Kenya
10	Janet Kerubo	Female	BSc ongoing	Kenyan	Kenyatta University
11	Levy Emokol	Male	Diploma	Kenyan	Endebes Training Institute
12	Maurice Omanywa	Male	Diploma	Kenyan	WRTI

Trainees Post Training Evaluation Report

1. Brief overview of skills acquired as outlines by the trainees:

- The trainees acquired both theoretical and practical skills in plant ecology, taxonomy, herbarium techniques, and mycology.
- Field sampling, study plot establishment and vegetation assessment.
- Collection, preservation, pressing, drying, mounting, and labeling of plant specimens following herbarium standards.
- Herbarium curation and management, including specimen documentation, cataloguing, and database management using Botanical Research and Herbarium Management System (BRAHMS).
- Practical experience in mushroom cultivation and identification.
- Developed skills in assessing mycorrhizal colonization in plant roots and understanding plant-fungal interactions, and their use as bioindicators.

- Soil sampling techniques and laboratory analysis, including measuring soil pH and determining the concentration of various soil ions.
- The trainees also gained skills in ecological approaches and their application in conservation. This was through the use of citizen science tools in plant taxonomy, including iNaturalist and PlantNet;

2.Training objectives and their achievement

The main objective of the training:

- The training aimed to enhance participants' knowledge and practical skills in plant ecology, mycology, herbarium techniques, exposing trainees to biodiversity conservation, and scientific research methods.

Specific objectives included:

- Develop competence in plant and fungal identification and understanding ecological survey methods
- Enhance specimen collection and preservation techniques
- Gain experience in herbarium curation and management
- Strengthen skills in biodiversity documentation and conservation research
- Promote scientific collaboration, knowledge sharing, and interdisciplinary learning among participants from diverse backgrounds.

Objective achievement:

- These objectives were successfully met through a combination of lectures, practical laboratory sessions, fieldwork, and group discussions.
- The training improved the trainee's technical competencies in ecological research and specimen management while also broadening their understanding of collaborative approaches to biodiversity science.
- The course enhanced the trainee's practical skills and professional development, providing valuable knowledge applicable to research, conservation, and academic work.

3. Most interesting task/exercise/procedure during the training

- The most interesting aspect of the training was the practical sessions on plant collection, specimen processing, and herbarium preparation.
- The sessions on mushroom biology and cultivation, fungal diversity and identification techniques.
- Learning the different stages of mushroom cultivation from substrate preparation and sterilization to inoculation, incubation, and harvesting provided practical insights into applied mycology and sustainable agricultural practices.
- Dissecting succulent plant specimens before pressing.
- Collection of good DNA samples for further analysis.
- Collect soil samples for pH analysis and mycorrhizal identification.
- Learning about CITES and the illegal harvesting of certain species, such as sandalwood and the gum Arabic product.

4. Tasks or processes that required more elaboration

- Training on GIS, fungal identification, mycorrhizal root assessment and identification, and practical demonstrations on mushroom cultivation.
- Plant taxonomy, systematics, Herbarium techniques and management, specimen digitization, quality control procedures, biodiversity research, and conservation.
- Data analysis, processing, and interpretation, and application of results in ecological research for an enhanced learning experience.
- Bioinformatics and Databases: metadata entry into global networks like BRAHMS software to further strengthen the capacity of participants working in plant sciences and biodiversity documentation.

5. Application of the acquired skills in work/studies

- The ecological sampling and soil analysis techniques will strengthen trainee's ability to conduct field research and environmental assessments.
- Mushroom cultivation knowledge will be applied in research, community outreach and income-generating projects.

- Herbarium techniques will assist in proper plant identification, specimen preservation and biodiversity documentation during research activities.
- The knowledge acquired will be used in training and mentorship: integrating the practical skills and experiences in teaching, technical, undergraduate and postgraduate students.
- Strengthening students' practical competencies, promote appreciation of herbarium-based research, and encourage the application of modern ecological and biodiversity assessment techniques in their studies and future careers.
- Support reliable data collection for assessing habitat conditions and informing conservation management decisions.
- Skills gained will be used in improving community livelihoods such as culturing beneficial local mycorrhizae to allow for inoculation of indigenous tree seedlings, which drastically improves their survival and drought resistance when transplanted into degraded soils.
- Tracking wild fungal populations for provision of a reliable bioindicator to assess soil health and organic matter decomposition rates in the field.
- Using the iNaturalist for scientific data collection contributing to conservation of key biodiversity areas.

6. Trainees' feedback on training content

The training content was comprehensive, relevant, and well-structured, and met and exceeded the expectations of most of the trainees. It covered a wide range of relevant topics and provided an excellent balance between theoretical concepts and practical applications.

The hands-on sessions greatly enhanced understanding and skill acquisition and exceeded the trainee's expectations. The trainees particularly appreciated the opportunity to learn from experienced professionals and interact with participants from different backgrounds.

7. Content delivery, practical demonstrations, and replicability

- The training was delivered through a combination of: Online lectures with interactive Q&A session; Onsite practical demonstrations and fieldwork at the National Museums of Kenya.
- Trainers provided clear explanations followed by practical demonstrations, allowing participants to apply the techniques themselves. This approach was highly effective because it encouraged active participation and improved understanding.
- The trainees recommend the replication of this training model in their various institutions because it promotes experiential learning and builds practical competence while enhancing active learning and improving knowledge retention.
- The model of integrating lectures with demonstrations, fieldwork, and practical exercises provides students with a deeper understanding of scientific concepts, and develops essential research skills.
- The experiential learning approach is particularly valuable in plant sciences, ecology, and biodiversity studies, where hands-on experience is critical for building competence and confidence.

8. Feedback on time allocation and areas recommended for improvement

- Majority of the trainees felt that the time allocated was generally sufficient, especially for theoretical sessions.
- However, more time is recommended for: hands-on experience in herbarium techniques, mushroom cultivation, mycorrhizal root assessment, fungal identification, seed inoculation in the laboratory, soil sampling and data analysis in ecological field assessments.

9. Networks created during the training for future professional collaboration

The training provided an excellent opportunity to build professional networks with participants and experts from diverse fields serving as an important platform for creating both new and reinforcing existing networks.

Some highlights included:

- Interaction with professionals working in various areas of biodiversity research and conservation, and students undertaking ongoing research projects. This allowed exchange of ideas, experiences, and knowledge that may support future collaborations.
- Valuable connections were established with experts from other local and regional institutions including trainers and staff from the National Museums of Kenya (NMK). These networks will facilitate future collaboration in biodiversity research, ecological monitoring, specimen exchange, conservation projects, training opportunities, and information sharing.

10. Reasons for recommend this training / technology to your colleagues and friends

- It offers opportunities to interact with experts, learn new research techniques, and build professional networks that can be valuable in future academic and career pursuits.
- It provides a unique combination of theoretical knowledge and practical experience in biodiversity research, conservation, and natural resource management.
- The training exposes participants to real-world field techniques, laboratory procedures, and modern scientific equipment used in research and specimen management.
- The course also offers hands-on experience in areas such as botanical specimen collection and curation, ecological field surveys, soil sampling and analysis, and mycological techniques, making it highly relevant for professionals and students working in environmental and conservation fields.
- The training creates valuable networking opportunities with experts, researchers, and fellow participants, which can

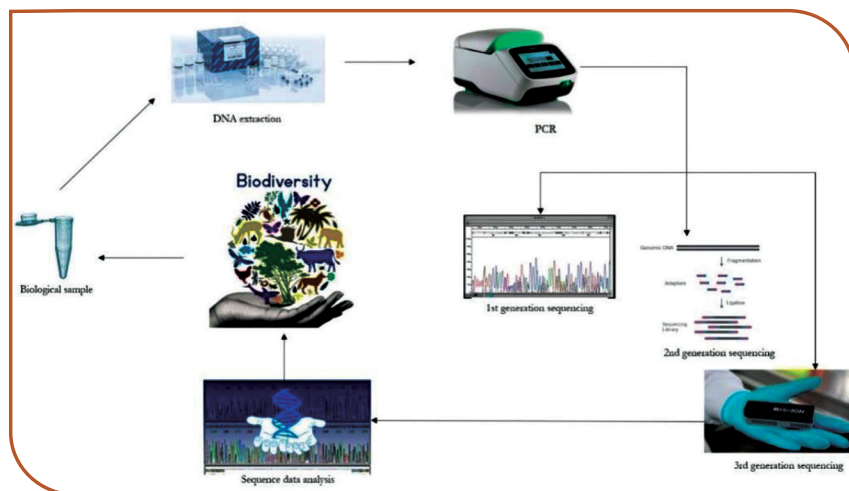
lead to future collaborations, mentorship, and academic opportunities. It introduces participants to potential income-generating activities such as mushroom farming.

Photo Gallery



Trainees during laboratory sessions and herbarium visit

7.2.3. Biomonitoring of Species Using DNA Technology



24th Feb – 6th June 2026

Course contacts: mwauran@gmail.com & [mwangiwigui25@gmail.com](mailto:mwangiwangui25@gmail.com), 2kipscham@gmail.com

Brief course introduction:

Identification of specimen to species level is key in biodiversity studies, biomonitoring and conservation. Morphological identification has its limitations including when only parts of an organism are available. The use of DNA techniques has become crucial in species identification. Upcoming sequencing techniques offer rapid and cost-effective sequencing solutions where hundreds of specimens can be sequenced at a go with minimal destruction to voucher specimen. These voucher specimens can then proceed to natural history collections to be used as reference collections for taxonomic work.

Aim of the course:

Participants will be trained on non-destructive way of DNA extraction and downstream analysis using upcoming sequencing techniques.

The technique is:

- Economical – multiple specimens sequenced at once.
- Efficient – Extraction of DNA process so simplified
- Data generated can form reference database for identification.
- The technique also reduces significantly the time spent in the field and can be replicated.
- The data can be utilized in biomonitoring especially where only parts of organisms are available.
- The DNA technology can be used to monitor biodiversity in different disciplines. E.g., pest control in agriculture, forest health etc.

Background reading & Reference: <https://dx.doi.org/10.17504/protocols.io.rm7vzy974lx1/v1>

Course Outline:

	Month (Year:2026)	Training Days	Activity	Trainer
Virtual	February	24 th	Pre- sampling Requirements/ preparation needed to be assembled before sampling, application, safety procedures	Kosgei, Ann & Esther
	Sampling			
		25 th	Field sample collection: Fish sampling, micro- invertebrate sampling, eDNA sampling	Kosgei & Ann
	March	24 th	Sample sorting, sub- sampling, Labelling	Kosgei & Esther
	Curation			
	April	1 st	Lab preparation for molecular work, quality control	Kosgei & Esther
	Molecular work			
		14 th	A preview of the main processes: extraction, PCR, Electrophoresis	Ann & Esther

	Month (Year:2026)	Training Days	Activity	Trainer
		28 th	Pooling and probe preparation, loading flow cells	Ann & Esther
	May	12 th	Softwares and Processes: Assembly, editing, blasting etc.	Esther & Ann
	Data analysis			
		13 th	Data publishing	Esther & Ann
Hands on Practical Session	June	3 rd to 6 th	Practical trainings	Ann, Esther, Kosgei
		3 rd	Sample collection	Kosgei, Ann, Esther
			Sample sorting & Imaging	
			DNA Quick extraction & dilution	
			COI amplification	
		4 th	PCR electrophoresis	Esther, Ann, Kosgei
			Gel electrophoresis	
			Pooling and cleaning	
			End prep- ligation	
		5 th	DNA library loading	Ann, Esther, Kosgei
			Specimen imaging	
			Metadata preparation	
			Exploring generated sequences – hands on	

	Month (Year:2026)	Training Days	Activity	Trainer
			Matching sequence data to plate wells,	
			BLAST	
		6 th	Exploring and handling fasta files	Esther, Ann, Kosgei
			Matching sequence data to plate wells, handling fasta files	
			Quality check	
			Editing and analysis of fasta sequences	
			Sequence data publishing: Available platforms, meta data requirements	

Facilitator profiles

 Dr. Ann Mwaura	Ann is Senior Scientist and the Head of the Molecular Genetics Section, CBD department at NMK. She holds a PhD degree in Genetics. Her research interests are in Biodiversity and population genetics, DNA barcoding for identification and verification, forensic science and application of sequencing technology to study populations and contribute to agriculture and conservation. She is keen in building the capacity of young upcoming scientists and trains in Molecular Biology, DNA barcoding/metabarcoding and Nanopore sequencing. She has extensive knowledge in molecular biology and genetics.
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Esther Mwangi

Esther is a Research Scientist at the Zoology Department under the Directorate of National Repository and Research, NMK. She holds an MSc. In Bioinformatics and is currently pursuing a PhD in Biotechnology. Her main research interest is in using genetics to study the relationships of different species in the wild. She is currently studying the effect of hybridization in two sister species of birds and how this interaction affects the genetic diversity of the less abundant species.



Gilbert Kosgei

Gilbert is a Research Scientist at the Ichthyology Section, Zoology Department, National Museums of Kenya. He holds MSc degree in Biology of Conservation. His main focus is in freshwater fish taxonomy and systematics. Phylogenetics come in handy to aid in solving taxonomical challenges often experienced while using traditional morphometric characters.

List of Trainees

No	Name	Gender	Level of Education	Nationality	Institution (If student)
1	Joseph Mkama	Male	BSc	Tanzanian	National Museum of Tanzania
2	Immaculate Muthoni	Female	PhD ongoing	Kenyan	University of Nairobi
3	Brian Kipkorir	Male	MSc ongoing	Kenyan	Jomo Kenyatta University of

No	Name	Gender	Level of Education	Nationality	Institution (If student)
					Agriculture and Technology
4	Amphrey Adika	Male	BSc ongoing	Kenyan	Meru university of science and technology
5	Reuben Kipkorir	Male	MSc ongoing	Kenyan	Chuka University
6	Rebecca Mwema	Female	BSc	Kenyan	Jomo Kenyatta University of Agriculture and Technology
7	Nathan Kiboi	Male	PhD ongoing	Kenyan	Masinde Muliro University of Science and Technology
8	Faith Njoroge	Female	BSc	Kenyan	Kenyatta University
9	Natalie Lukas	Female	MSc ongoing	Kenyan	University of Nairobi
10	Esther Mwende	Female	MSc ongoing	Kenyan	Chuka university
11	Faith Jepkemei	Female	MSc ongoing	Kenyan	Nelson Mandela African Institution of Science and Technology
12	Tevin Onyango	Male	BSc	Kenyan	Mpala Research center

No	Name	Gender	Level of Education	Nationality	Institution (If student)
13	Chepkemoi Naomi Ngeny	Female	MSc ongoing	Kenyan	Chuka University
14	Michelle Adhiambo	Female	MSc ongoing	Kenyan	Kenyatta University
15	Joseph Gaitho	Male	BSc	Kenyan	Rongo University
16	Geoffrey Ochieng	Male	MSc	Kenyan	University of Antwerp
17	Loise Ngari	Female	PhD ongoing	Kenyan	Kenyatta University
18	Christine Akware	Female	MSc ongoing	Kenyan	Chuka University
19	Davine Otieno	Female	MSc ongoing	Kenyan	Chuka University

Trainees Post Training Evaluation Report

1. Brief overview of skills acquired as outlines by the trainees

Trainees unanimously acknowledged that the training significantly enhanced their knowledge and technical competencies in molecular biology and biodiversity monitoring. The combination of online lectures and intensive practical sessions enabled participants to understand the complete workflow involved in DNA-based biomonitoring.

The practical skills acquired included:

- Environmental DNA (eDNA) sampling and specimen collection.
- Sample sorting and specimen metadata management.
- DNA extraction, purification.
- Polymerase Chain Reaction (PCR) amplification.
- Gel electrophoresis for DNA quality assessment.
- Nanopore sequencing technology.
- Introduction to Sanger sequencing.
- Bioinformatics analysis using ONT Barcoder, MEGA, BioEdit, BLAST, and GenBank.

- Sequence editing, trimming, alignment, and phylogenetic analysis.
- DNA barcoding for species identification.
- DNA library preparation.
- Morphological identification of organisms.
- Sequence submission and publication to GenBank.

Beyond laboratory techniques, participants also gained valuable knowledge in biodiversity conservation, GIS applications, scientific writing, statistical analysis, grant proposal development, laboratory quality assurance, and teamwork.

Many participants appreciated learning how molecular tools complement traditional morphological identification methods, making biodiversity assessments more accurate and efficient.

2. Training objectives and their achievement

- Participants overwhelmingly agreed that the training objectives were fully achieved.
- The program successfully built participants' capacity to use DNA technologies in biodiversity monitoring by integrating theoretical instruction with field and laboratory practical. The objectives of equipping trainees with competencies in DNA extraction, PCR amplification, sequencing, molecular species identification, and bioinformatics were consistently reported as having been met.
- Several participants also noted that the multidisciplinary nature of the course exposed them to applications of molecular biology beyond biodiversity conservation, including wildlife management, environmental monitoring, disease diagnostics, genomics, and ecological research.
- The hybrid format allowed participants to first understand the scientific principles through online sessions before reinforcing their learning through practical laboratory experience.

3. Most interesting task/exercise/procedure during the training

- The laboratory practical sessions emerged as the most exciting and memorable aspect of the training.

- Participants particularly enjoyed:
 - DNA extraction and purification.
 - PCR amplification.
 - DNA pooling and library preparation.
 - Nanopore sequencing.
 - Environmental DNA (eDNA) analysis.
 - DNA barcoding.
 - Field sampling of aquatic organisms.
 - Bioinformatics analysis.
 - Real-time sequence analysis and species identification.
- Many respondents expressed excitement at witnessing how DNA sequences could be used to accurately identify species, describing the process as an eye-opening experience that demonstrated the power of modern molecular technologies.
- Field excursions involving specimen collection from aquatic ecosystems and the subsequent laboratory analysis also provided participants with a complete appreciation of the biomonitoring workflow.

4. Tasks or processes that required more elaboration

- Although participants were highly satisfied with the training, one consistent recommendation emerged across almost all evaluations the need for more time dedicated to bioinformatics and sequence analysis.
- Participants indicated that additional practical sessions should be allocated to:
 - Sequence editing and trimming
 - Data cleaning
 - Bioinformatics software applications.
 - ONT Barcoder
 - BLAST searches
 - MEGA software
 - Sanger sequencing
 - Phylogenetic analysis
 - Interpretation of sequencing results
 - Troubleshooting sequencing workflows
 - DNA sequence submission to GenBank

- Many participants noted that while the introduction to these tools was adequate, additional practice would improve confidence and enable independent data analysis.

5. Application of the acquired skills in work/studies

- Participants demonstrated a clear understanding of how they intend to apply the acquired knowledge within their respective institutions and research programs.
- Applications identified included:
 - Application of molecular tools/technology in Biodiversity monitoring, infectious disease surveillance and research.
 - Wildlife management
 - Environmental DNA (eDNA) surveys
 - Water quality assessment using macroinvertebrates
 - Taxonomy and species identification
 - Molecular breeding programs
 - Academic teaching and student supervision
 - DNA barcoding projects
 - GCI Mapping
- Several MSc and PhD students highlighted that the techniques learned would directly support their ongoing thesis research, while research scientists indicated that the skills would strengthen institutional molecular biology capacity.

6. Trainees feedback on training content

- Participants expressed very high levels of satisfaction with both the content and organization of the training.
- Most respondents indicated that the course met or exceeded their expectations because it successfully combined theory with practical application. The curriculum was considered comprehensive, relevant, and aligned with current global developments in molecular biology, biodiversity conservation, and environmental monitoring.
- Participants particularly appreciated the progression of the course from field sampling to laboratory processing, sequencing, bioinformatics, and data interpretation.

7. Content delivery, practical demonstrations, and replicability

- Participants described the training as:
 - Well organized
 - Interactive
 - Highly practical
 - Easy to follow
 - Professionally delivered.
 - Trainee-centered
- The use of lectures, demonstrations, supervised laboratory practicals, group discussions, and field exercises created an engaging learning environment. Working in small laboratory groups allowed every participant to perform the molecular techniques independently under expert supervision.
- Several participants indicated that they intend to replicate the same teaching approach within their own universities and research institutions.

8. Feedback on time allocation and areas recommended for improvement

- While participants appreciated the overall duration of the four-month program, many felt that the onsite practical sessions were too short considering the complexity of the laboratory techniques.
- Most respondents recommended allocating additional time to:
 - DNA sequencing
 - Bioinformatics
 - Sequence editing
 - Data interpretation
 - Sanger sequencing
 - Nanopore troubleshooting
- Suggestions ranged from extending the laboratory component by several additional days to conducting advanced follow-up workshops dedicated solely to bioinformatics.

9. Networks created during the training for future professional collaboration

- The training also served as an important networking platform.
- Participants established professional connections with:
 - National Museums of Kenya
 - National Museums of Tanzania
 - Mpala Research Centre
 - SAJOREC
 - Association of Kenya Entomologists (AKE)
 - Universities in Kenya, Tanzania, Belgium, and other institutions
 - Conservation organisations
 - Molecular biology laboratories
 - Fellow postgraduate students and early-career researchers
- These interactions created opportunities for future collaborative research, scientific publications, mentorship, student supervision, capacity building, and knowledge exchange.

10. Reasons for recommend this training / technology to your colleagues and friends

- Participants unanimously recommended the training to colleagues because it:
 - Provides extensive hands-on practical experience
 - A well-planned training that gives one value from their time
 - Bridges theory and laboratory application
 - Introduces modern DNA technologies relevant to biodiversity conservation
 - Builds highly marketable molecular biology and bioinformatics skills
 - Enhances research quality and scientific confidence
 - Supports evidence-based conservation and environmental management
 - Offers opportunities for professional networking

- Is facilitated by experienced trainers who provide close mentorship Is directly applicable to academic research, laboratory work, and conservation practice. Several participants described the training as transformative, career-enhancing, and highly relevant to current scientific and technological developments.

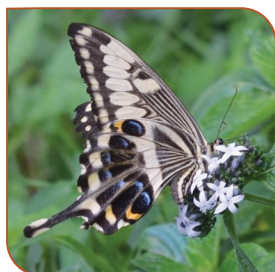
Photo gallery





Trainees during field sampling, laboratory and data analysis sessions

7.2.4. Fundamentals of sampling and monitoring insect pollinators



Course facilitators contact: ekioko@museums.or.ke;
jaynemmacharia@gmail.com and alecksters@gmail.com

Brief Course Introduction

Pollination is an essential ecosystem service contributing to food security and environmental health. Worldwide, there is increasing concern about the decline of pollinators. Data on insect pollinators, however, are scarce, limiting clear understanding of and monitoring their changes over time. The pollinator crisis calls for efforts to bridge the information gap. Closing the information gap requires efforts to understand the fundamentals of sampling and monitoring insect pollinators, their identification processes, and the management of data in the development of accessible information resources to support conservation strategies.

Aim of the Course

- i. Participants were trained on diverse sampling methods applicable to insect pollinators, specimen sorting, identification, the ecology and value of insect pollinators, management of a pollinator collection, data retrieval and management
- ii. Application of modern technology in monitoring insect pollinators
- iii. Management of insect pollinator data for wider accessibility.

Resource materials for reference:

- iv. www.nhm.ac.uk › research › projects › manual-afrotropical-diptera
- v. <https://abctaxa.naturalsciences.be/?s=ABC+TAXA+BEES>
- vi. A-field-guide-to-Taita-Hills-butterflies-NMK-JRS-2021.pdf
- vii. <https://genent.cals.ncsu.edu/insect-identification/order-lepidoptera>
- viii. <https://insect.kindwise.com/demo/>
- ix. <https://www.inaturalist.org/>
- x. Global Biodiversity Information Facility; <https://www.gbif.org/>
- xi. Emerging technologies for pollinator monitoring: <https://doi.org/10.1016/j.cois.2025.101367>
- xii. www.pindip.org

Course Outline:

Mode	Day	Timeline	Time	Activity	Responsibility
Virtual	1	March 9 th , 2026	10 – 12 am	Introduction to Insect pollinators	Mr. Alex Musyoki, Ms. Jane Macharia, Mr. Josiah Achieng, Mr. Morris Mutua, Prof. Esther Kioko
	2	March 25 th , 2026	10 – 12 am	Insect pollinators sampling methods	Mr. Alex Musyoki, Ms. Jane Macharia, Mr. Josiah Achieng, Mr. Morris Mutua, Prof. Esther Kioko
	3	April 1 st 2026	10 – 12 am	Harvesting, killing and preservation	Mr. Alex Musyoki, Ms. Jane Macharia,
				of insect pollinators collection	Mr. Josiah Achieng, Mr. Morris Mutua, Prof. Esther Kioko

Mode	Day	Timeline	Time	Activity	Responsibility
Hands on Session	1	June 3 rd , 2026	9.00–10.00	Opening Ceremony	Prof. Kioko and SEC Team
			11.00–12.30	Introduction to Pollinator Course	Pollinator Team
			12.30–1.00	Tour to the Invertebrate Collection	Alex and Josiah
			1.00–2.00	Lunch	
			2.00–4.00	Pollinator adaptations	Pollinator Team
			4.00–4.30	Closing day Remarks	Prof. Kioko
	2	June 4 th , 2026	8.00–8.30	Registration & Recap	Josiah & Prof. Kioko
			8.30–10.00	Sampling insect pollinators	Pollinator Team
			10.00–11.00	Tea Break	
			11.00–1.00	Sampling insect pollinators	Pollinator Team
			1.00–2.00	Lunch	
			2.00–4.30	Sampling insect pollinators	Pollinator Team
			4.00–4.30	Closing day Remarks	Jane + Trainee

Mode	Day	Timeline	Time	Activity	Responsibility
	3	June 5th 2026	8.00– 8.30	Registration and recap	Jane + Morris
			8.30– 10.00	Harvesting traps/ sampling	Pollinator Team
				Tea Break	
			11.00– 1.00	Sorting and processing of specimens	Pollinator Team
				Lunch	
			2.00– 4.00	Identification of processed specimens	Pollinator Team
			4.00– 4.30	Closing day Remarks	Jane + Trainee
	Day 4	June 6th 2026	8.00– 9.00	Registration and recap	Jane + Alex
			9.00– 10.00	Identification of processed specimens	Pollinator Team
			10.00– 11.00	Tea Break	
			11.00– 12.00	Data management and Digitization	Pollinator Team
			12.00– 12.30	Closing day Remarks	Jane + Trainee
				Lunch	

Training Facilitators Profiles



Prof. Esther N. Kioko
ekioko@museums.or.ke

Esther Kioko is an Entomologist/ working as a Principal Research Scientist in the Invertebrate Zoology Section, at NMK and adjunct associate Professor, Biology Department, University of Nairobi. She holds a PhD and MSc in Agricultural Entomology and a second MSc in Environmental Management with research experience in insect ecology focusing on butterflies and moths, pollination, biodiversity assessments, and insect-based enterprises. With a long-standing interest in museum collections, she has led a regional project on the assessment of Lepidoptera pollinator species diversity data in museum collections in East Africa. Passionate about the role of museums in sustainability, she has served as a jury member for the International Council of Museums award for sustainable development practices in museums.



Ms. Jane Macharia
mmuthoni@museums.or.ke

Jane Macharia is a Research Scientist at the National Museums of Kenya and PhD student at the University of Cambridge, United Kingdom. Ms Macharia is a member of the International Union for the Study of Social Insects (IUSSI) and holds an MSc in Agriculture Entomology. Her expertise lies in African bee taxonomy, bee ecology, pollination and beekeeping including stingless bees. Passionate about bees and environmental conservation, her current research explores the role of World Heritage Sites as refugia for insect pollinators.



Alex Musyoka
alecksters@gmail.com

Research Scientist, Zoology Department. An entomologist with passion in pollination ecology, specialized in invertebrate assessment, taxonomy and conservation awareness creation.



Josiah Collins Achieng
josiaachieng@gmail.com

Josiah Collins Achieng, is based at the Zoology Department. A keen Dipterologist and has worked on Seven (7) families of pollinating flies which are published on Global Biodiversity Information Facility (GBIF).



Morris Mutua
mmutua17@yahoo.com

Morris Mutua serves as a Research Technologist in the Zoology Department at the National Museums of Kenya. With over twenty years of expertise in beetle taxonomy and ecology, his extensive experience has enabled him to partition beetle communities into various functional groups, such as pollinators.

List of Trainees

No.	Name	Gender	Education Level	Nationality	Institution (If student)
1	Cynthia Mogiti	Female	BSc Ongoing	Kenyan	Kenyatta University
2	Emmanuel Yongo	Male	Diploma	Kenyan	Kitale Polytechnic
3	Erick Kaila	Male	BSc	Kenyan	Laikipia University
4	Esther Wasike	Female	Early Career	Kenyan	Farmers educator
5	John Wambua	Male	BSc Ongoing	Kenyan	Kenyatta University
6	Liberatus Alfred	Male	BSc	Tanzanian	Sokoine University
7	Felistas Mwanja	Female	MSc	Kenyan	Pwani University
8	Ochieng' Jeff	Male	MSc Ongoing	Kenyan	Mbarara University
9	Wilson Mwakulomba	Male	Early Career	Kenyan	Nature volunteer
10	Collins Wangila	Male	BSc	Kenyan	Masinde Muliro University of Science and Technology
11	Boniface Kariemu	Male	BSc	Kenyan	Solidaridad Organisation
12	Lawrence Mulei	Male	MSc Ongoing	Kenyan	African Nazarene University
13	Anthony Karani	Male	PhD Ongoing	Kenyan	University of Embu
14	Jamlick Lep-aa Mpakany	Male	BSc Ongoing	Kenyan	Masaai Mara University

No.	Name	Gender	Education Level	Nationality	Institution (If student)
15	Scholasica Irungu	Female	MSc Ongoing	Kenyan	Chuka University
16	Faith Cher-onoh	Female	MSc	Kenyan	Pwani University
17	Doreen Amukoya	Female	BSc	Kenyan	Moi University
18	Amran Ali Issack	Female	BSc	Kenyan	National Museums of Kenya
19	Varliewin Makena	Female	MSc	Kenyan	National Museums of Kenya

Trainees Post-Training Evaluation Report

1. Brief overview of skills acquired as outlines by the trainees

- Study design, sampling using passive and active sampling methods (sweep-nets, pan traps, pooter, searches); specimen sorting, identification (keys), and pinning (normal and double); handling, preservation, and labeling of specimens, digitization of collections; data management and analysis using R.
- Basic statistics and map-making in QGIS, fundraising and grant-writing, proposal writing, and publication of research work.
- Practical knowledge on the importance of insect pollinators E.G crop production and the ecosystem, identification of common pollinator groups, data collection techniques and field survey protocols. The training improved my ability to conduct pollinator monitoring and contribute to biodiversity conservation research.
- Assessment of pollinator abundance, diversity and distribution
- Adherence to ethical and safety practices during field sampling
- Basic analysis and interpretation of pollinator survey data for research and conservation purposes, citizen science.

- Use of field equipment like sampling tools, Microscopes Camera and GPS/GIS device.
- Grant application, utilization of citizen science platforms, effective communication and presentation skills.

2. **Training objectives and their achievement**

- To better understand different pollinator groups and to learn how to sample and process specimens particularly Lepidoptera before storage into repository.
- The training aimed to build the importance of insect pollinators, introduce standard pollinator sampling methods, develop skills in field data collection and pollinator identification and enhance capacity for pollinator monitoring and conservation research. discussions.
- To equip participants with the knowledge to record and analyze insect pollinators.
- Role of pollinators in crop protection.
- Understand how different environments affect pollinator communities.
- Estimates the abundance and distribution of pollinators.
- To understand the ecological role and impact of pollinators in natural ecosystems.
- To study plant-pollinator interactions.
- These objectives were fully met through a combination of lectures, practical demonstrations, and interactive field exercises.

3. **Most interesting task/exercise/procedure during the training**

- Setting traps for sampling insect pollinators (pan traps) Sorting, identifying, preserving, and pinning various pollinator groups.
- The field sampling exercises were the most valuable because they provided hands-on experience in collecting, observing, and recording pollinator data using standard sampling techniques. This helped bridge the gap between theory and practice.
- Sweep-net sampling is an efficient, low-cost technique for collecting insect pollinators, enabling researchers to assess

species diversity, abundance, and distribution in various habitats collected at the same time.

- Practical field exercises gave firsthand appreciation of the diversity of pollinators and the techniques used to study them.
- Significance of repository in research.

4. Tasks or processes that required more elaboration

- Data analysis and interpretation of results.
- Detailed coverage of insect pollinator classification and identification, particularly distinguishing closely related species using identification keys.
- Reconnaissance survey and sampling procedures.
- Night/ light trapping of insect pollinators.
- Automatic monitoring using AMI machine and scientific publication.
- Field sampling exercises to extend beyond the botanical garden to a natural ecosystem, such as a forest, for a more comprehensive learning experience. For those involved in teaching and research, the experience would have been particularly valuable in preparing us to guide students undertaking field-based studies and to design robust pollinator research projects across diverse ecosystems.

5. Application of the acquired skills in work/studies

- To enhance research skills in the future, apply reconnaissance, study design, sampling, sample processing, and data management techniques learned.
- Use grant-writing skills to secure research funding related to pollinator studies.
- Use the skills learned to publish a thesis and a paper in a reviewed scientific journal.
- Use the skills to conduct pollinator surveys, support biodiversity conservation initiatives, contribute to ecological research, and improve monitoring of pollinator populations in agricultural and natural ecosystems.
- Apply the skills acquired by identifying, sampling, classifying, and monitoring insect pollinators in agricultural and natural ecosystems.

- Collect accurate data, support pollinator conservation initiatives, advise farmers on pollinator-friendly practices and contribute to research and policy decisions aimed at improving crop production and biodiversity conservation.
- Active participation in the institutional project involving collections of insects and conservation practices involving community. Empower local community in their Agri-tourism aspect: beekeepers, and also share the knowledge with other professional scholars.
- Useful in supporting farmers to improve crop production and sustainability.
- Advise farmers to keep beehives inside their farms to assist with pollination.
- Promote conservation of biodiversity by maximizing pollination services through championing apiculture; engaging on citizen science platforms; creating awareness for the protection of pollinators; minimizing hazardous chemicals in food systems by championing IPM and natural predation.
- Forms a critical basis for students' academic advancement and core for research.
- Developing some monitoring protocols.
- Mentor and supervise studies involving insect pollinators by assisting in the development of research questions, designing sampling protocols, selecting suitable sampling approaches, and ensuring the collection of high-quality, reliable data.
- Designing and implementing studies on pollinator diversity, abundance, and plant-pollinator interactions across different ecosystems, particularly in forest ecosystems such as Arabuko Sokoke.
- Selection of appropriate sampling techniques, maintaining standardized protocols, curating reference collections, and generating robust data that can contribute to a better understanding of pollinator communities and the factors influencing them.
- Inform pollinator conservation strategies, ecosystem management, and sustainable agricultural practices.
- Develop a professional butterfly display to boost eco-tourism.

6. Trainees' feedback on training content

- All participants voted yes. They stated that the course exceeded their expectations.

7. Content delivery, practical demonstrations, and replicability

- Content delivery was both online and physical sessions. trainers used simple language. PowerPoint slides used during training were visible and well designed. Students also asked questions and got clarifications.
- Trainers explained and showed trainees various equipment and methods in the laboratory before embarking on field activities.
- Demonstrations were carried out to show correct methods of sampling, equipment, specimen handling, identification techniques and data recording procedures, and the adaptation of some pollinators (pollen baskets and resource partitioning in bees).
- Trainees participated in setting up pan traps and sample collection.
- Facilitators used lectures, discussions, and visual cards to explain key concepts of insect pollinator sampling and practicing standard monitoring methods under the guidance of the trainers.
- Content delivery was good, breaking down hard concepts and tasks into simple understandable means.
- The content was well delivered, covering the instructions, procedures of data collection, samplings to analysing and drawing conclusions from the case studies conducted.
- Delivery used a participatory approach that motivated active engagement of trainees, open sharing of information, incorporated hands-on practical learning, clear channels and effective communication, deployed scientific protocols and referenced well-researched scientific information.

8. Feedback on time allocation and areas recommended for improvement

Trainees were satisfied with the time allocation for online classes,

apart from a few technical sessions. However, they agreed that more time was needed for the practicals as proposed below;

- **Online classes:**

Technical sessions such as GIS, statistics, and R programming.

Practical session

- More sampling days to collect enough data that is publishable.
- Pollinator advanced sampling techniques, data collection, and identification.
- We needed more time for our hypotheses; automatic monitoring methods (e.g., AMI operation and data interpretation) and scientific publication.
- Classification of insect pollinators is to be handled separately, i.e., Hymenoptera, Lepidoptera, Coleoptera, and Diptera.

9. **Networks created during the training for future professional collaboration**

- Network and future collaboration with trainers working on similar species of interest.
- Research collaboration with a butterfly farmer to investigate and learn about moth larvae and food plants, farming, and research.
- Joint proposal grant writing among trainees.
- Foreign museum curator to learn more about their museum collection, techniques, and skills
- Wildlife ranger conducting research on pollinators (moths).
- Professional societies such as AKE members, joining the team and working towards caring for pollinators and taking part in the group's activities.
- Connection with researchers, students, and conservation practitioners working in pollinator ecology and biodiversity monitoring.
- Valuable professional networks with participants from different universities across East Africa as well as researchers and professionals from various research institutions.
- Strengthen professional growth and promote regional cooperation in addressing common agricultural and environmental challenges.

- Created networks which will enhance active engagement in conservation of biodiversity, participation in citizen science platforms, bidding for conservation grants, general awareness, and collaboration in research work.
- These networks may support future collaboration in research, data sharing, and capacity building, by accessing professional support and participating in initiatives that promote pollinator conservation and sustainable agriculture practices.

10. Reasons for recommending this training / technology to your colleagues and friends

- It forms a good prerequisite course for data sampling, data management, and publication.
- Physical training enables access to trainers and facilities such as, laboratories and equipment.
- It is an opportunity to network, collaborate, exchange knowledge with peers, and interact with role models and experts in their fields.
- It benefits job seekers and boosts careers.
- The training provided practical skills, hands-on experience, and up-to-date knowledge on pollinator sampling and monitoring.
- It was well organized, interactive, and directly applicable to research and conservation work.
- It provides valuable knowledge, hands-on experience, and professional connections that enhance one's ability to contribute to pollinator conservation, agricultural productivity, and Environmental sustainability.
- Educational and informative for people to understand their biodiversity and building curiosity for nature.
- The training is timely; addresses current threats to biodiversity, creating opportunities for positive impact and economic transformation.
- Networks forged are critical in generating data for evidence-based decision-making, advance collective action and accelerating the achievement of sustainable development.
- Provides both theoretical knowledge and practical skills that are essential for research, conservation, and agricultural

development. The training enhances participants' understanding of the important role of insect pollinators in maintaining biodiversity and improving crop productivity. It strengthens data collection, management, analysis, and reporting skills that are useful in scientific research. Participants learn current methods and technologies used in pollinator monitoring and biodiversity assessment.

Photo Gallery

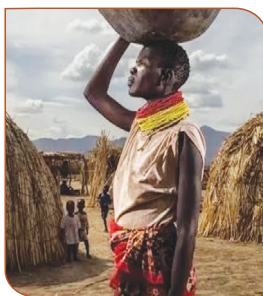
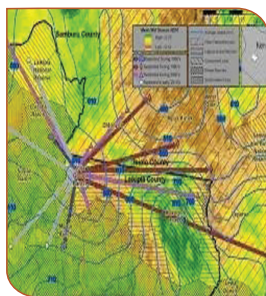


(Above) Participants at the NMK Botanic Garden for insect pollinators sampling session and Identification session in the invertebrates laboratory



(Above:) Group photo for the course trainers and trainees

7.2.5. Modelling landscape to reframe our understanding of past socioecological changes in Kenya



Course facilitator Contact: endiema@museums.or.ke or endiema@gmail.com

Course facilitators: Dr Rahab Kinyanjui (NMK), Dr Johnathan Reeves (Portugal)

Ms. Sylvia Wemanya (Rice University)

Brief Course Introduction:

Over the past twenty years, the landscape approach has deeply influenced disciplines such as archaeology, anthropology, and ecology by enabling the emergence of research frameworks focused on socio-ecological dynamics, especially in East Africa. These approaches are based on strong interdisciplinarity and on a collective work deployed within the theoretical framework of STS (Science-Techniques- Society). They result in the establishment of “critical zones” or “workshop zones” calling on diverse disciplinary skills. They are based on new tools ranging from GIS to modelling and 3D virtual models. Based on interdisciplinary research carried out on the “water places” of Northern Kenya, the panel proposes presenting the STS framework and showing how the specific contribution of GIS and data modelling within a disciplinary anchorage can renew our understanding of socio-ecological dynamics. Advances in digital technology have transformed how we collect, interpret, and visualize data in archaeology, anthropology, and environmental sciences. The rise of open-source tools for data modeling, 3D reconstruction, and spatial visualization now allows researchers to create integrated models that link natural and cultural landscapes in new ways.

This training introduces participants to interdisciplinary data modeling and visualization approaches using open-source software. Participants will learn how to construct, analyze, and visualize datasets using 3D and GIS-based technologies. The course builds upon the Science–Technology–Society (STS) framework to explore how digital modeling can reshape our understanding of past and present socio-ecological systems in Kenya and East Africa.

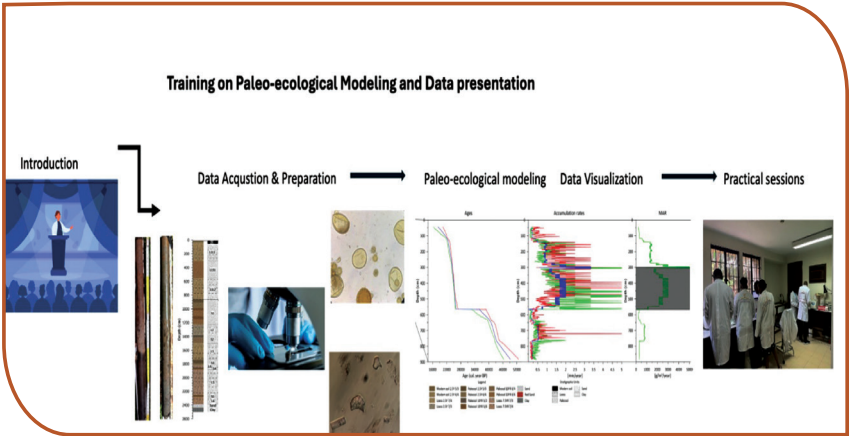
This course introduced participants to R software for data manipulation, analysis, and visualization. The course is designed for beginners with little to no prior experience in R, aiming to provide a solid foundation for future learning and application. Participants were given a brief overview of R, including how it differs from statistical software, and its advantages. This overview was followed by a practical component that acquainted attendees with R syntax and basic operations, focusing on vectors and data frames. Participants learned to import data from Excel spreadsheets and to subset and summarize data. Participants were introduced to basic statistical tests, plotting, and visualizing data using ggplot2. The overall aim was to ensure participants leave the course with a fully reproducible script that is transferable to a range of analytical problems across multiple disciplines.

Participants were required to install and run the required open-source software (e.g., QGIS, Blender, MeshLab, R, or Python-based visualization tools prior to the training.

Aims of the Course

- To equip students and early-career scientists with interdisciplinary skills and tools in landscape approaches, focusing on socio-ecological dynamics within the theoretical framework of Science–Techniques–Society (STS).
- Equip early-career scientists with interdisciplinary skills in data modeling, digital mapping, and visualization.
- Promote the use of open-source technologies for research, documentation, and communication of socio-ecological change.
- Strengthen participants' ability to produce reproducible, data-driven analyses and visual narratives for publication and presentation.

Target Audience: Early-career scientists and researchers in archaeology, anthropology, ecology, and related fields.



Course Program

		Date	Topic	Lead Facilitator (s)
Virtual	Day 1	3/26/2026	Introduction to Modelling	Dr Ndiema/ Ms. Wemanya
	Day 2	3/27/2026	Geospatial data	Dr. Ndiema/ Dr. Reeves
	Day 3	4/29/2026	Modelling Vegetation cover	Dr. Kinyanjui
	Day 4	5/18/2026	Geospatial data cont'd	Dr Ndiema
	Day 5	5/19/2026	Introduction to R studio	Dr. Reeves/ Ms Wemanya
	Day 6	5/28/2026	Data analyses and visualization	All
	Day 7	5/29/2026	Mapping Vegetation cover	Dr. Kinyanjui

		Date	Topic	Lead Facilitator (s)
Hands on practical sessions	Day 1	06/02/2026	Geospatial analyses	Dr. Ndiema and all
	Day 2	06/03/2026	Data Analyses and visualization	Dr. Reeves and all
	Day 3	06/04/2026	Paleoenvironmental reconstruction	Dr. Kinyanjui and all
	Day 4	06/05/2026	Fieldwork and Data collection at Orlegasaillie	Ms. Wemanya and all
	Day 5	06/06/2026	Data Analyses and visualization	Dr Reeves and all

Facilitators Profiles



Dr. Emmanuel Kimuma Ndiema. Head, Department of Earth Sciences | National Museums of Kenya

Dr. Emmanuel Ndiema is a leading Kenyan archaeologist and heritage scientist serving as the Head of the Department of Earth Sciences at the National Museums of Kenya (NMK). His work integrates archaeology, paleontology, and environmental science to explore how human societies have adapted to changing landscapes across East Africa. Over the past two decades, Dr. Ndiema has spearheaded interdisciplinary research and training programs that apply Science–Technology–Society (STS) frameworks and digital tools—including GIS, 3D modeling, and data visualization—to reframe understanding of socio-ecological dynamics in Kenya’s past. He has designed and led numerous field and capacity-building programs, such as the Data Modeling and Visualization for Heritage and Environmental Research

	course, aimed at equipping early-career scientists with skills in open-source digital technologies for heritage research. Dr. Ndiema's broader research interests span human-environment interactions, landscape archaeology, and cultural resilience. His work emphasizes the value of integrating scientific and community perspectives in conserving Kenya's rich natural and cultural heritage. Email: endiema@museums.or.ke / Alternate: endiema@gmail.com
 Dr. Rahab Kinyanjui Senior research scientist	Dr. Kinyanjui is a senior research scientist at Palynology and palaeobotany section, Earth sciences department at NMK. Her research focuses on reconstructing past vegetation, ecosystems and paleoenvironments to understand their responses to climate change and human activities. She is particularly interested in the role of Human-environment interactions in shaping the ecosystems over time. The palaeoecological proxies she studies fossil pollen, spores, phytoliths, diatoms, charcoal and other plants-macro-remains. Understanding past ecosystems dynamics provides valuable insights for predicting the future environmental changes and developing mitigation strategies, especially when predicted scenarios threaten natural and cultural heritage. Email address: rkinyanjui@museums.or.ke; rkinyanji@gmail.com



**Dr. Jonathan Scott
Reeves
Research Fellow |
Portugal**

Dr. Jonathan Scott Reeves is a researcher and data scientist specializing in digital heritage, environmental modeling, and open-source data visualization. Based in Portugal, he collaborates closely with the National Museums of Kenya (NMK) on interdisciplinary research and training programs integrating data science with archaeology, anthropology, and ecology. Dr. Reeves's work focuses on using computational and open-source tools—such as R, Python, and GIS platforms—to analyze and visualize complex environmental and cultural datasets. He is particularly interested in developing reproducible, data-driven workflows that connect natural and cultural landscapes through 3D and spatial modeling. As a course facilitator for the Data Modeling and Visualization for Heritage and Environmental Research program, Dr. Reeves trains early-career scientists in applying digital and analytical methods to heritage and ecological research. His current research emphasizes the transformative role of digital technologies in advancing interdisciplinary understanding of socio-ecological systems in Africa and beyond.



Ms. Sylvia Wemanya
Researcher | Rice
University

Ms. Sylvia Wemanya is a researcher and environmental scientist affiliated with Rice University. Her work bridges ecology, anthropology, and data science, focusing on the intersections between environmental change, cultural adaptation, and sustainable resource management. She has contributed to interdisciplinary projects that integrate modeling, GIS, and visualization tools to better understand socio-ecological systems, particularly in East Africa. As a facilitator for the Data Modeling and Visualization for Heritage and Environmental Research and Pre-Conference Training on Modelling Landscapes, Ms. Wemanya brings expertise in statistical analysis, data visualization, and the use of open-source tools such as R and Python to support research communication and evidence-based environmental policy. Her ongoing work emphasizes participatory and data-driven approaches to landscape research and the empowerment of early-career scientists in Africa through digital and analytical capacity-building.

List of Trainees

No.	Name	Gender	Level of Education	Nationality	Institution
1	Erneste Uwimana	Male	BSc	Rwandan	Dian Fossey Gorilla Fund
2	Hezekiah Obwang'i	Male	MSc ongoing	Kenyan	University of Nairobi

No.	Name	Gender	Level of Education	Nationality	Institution
3	Lovisa Tutyeni Kandenge	Female	BSc	Namibian	Namibia University of Science and Technology
4	Salma Thoya	Female	MSc ongoing	Kenyan	University of Nairobi
5	Margaret Wangare	Female	BSc	Kenyan	Pwani University
6	Beatrice Mwangi	Female	BSc	Kenyan	Kenya Methodist University
8	Topister Odeke	Female	Msc ongoing	Kenyan	Kibabii University
9	Kevin Kipngetich	Male	BSc	Kenyan	Jomo Kenyatta University of Agriculture and Technology
10	Zedekiah Okwany	Male	MSc	Kenyan	National Museums of Kenya
11	Irene Chepng'etich	Female	Bsc	Kenyan	Technical University of Kenya

Trainees Post-Training Evaluation Report

1. Brief overview of skills acquired as outlined by the trainees

- Participants reported acquiring a broad range of knowledge and practical skills that are directly applicable to environmental research, biodiversity conservation, and landscape analysis.
- The training strengthened participants' technical, analytical,

and scientific communication competencies through an integrated approach combining classroom instruction, fieldwork, and hands-on practical exercises.

- The course provided hands-on training in data analysis, GIS, R and R Studio for data management, analysis, and visualization through packages such as tidyverse and ggplot2.
- Introduction to Tilia software for managing, analyzing, and interpreting palaeoecological data.
- Both theoretical knowledge and practical skills related to landscape analysis, socioecological systems, and geospatial technologies.
- Remote sensing concepts and drone imagery can be processed and interpreted to understand landscape features, environmental change, and ecosystem dynamics.
- Publishing processes, principles of good data collection and management, financial accountability in research, and the importance of citizen science and community engagement in conservation.

2. Training objectives and their achievement

The trainees affirmed that the objectives were successfully met through interactive lectures, practical demonstrations, and field hands-on exercises, and interactive discussions on various technologies. The objectives as presented by trainees included;

- Introduction to the use of Tilia software for palaeoecological data analysis, modelling and presentation, and landscape reconstruction
- Introducing participants to the Science–Technology–Society (STS) and landscape framework, enhancing skills in data modelling and visualization using open-source software such as R and RStudio, Python, and GIS tools.
- Scientific writing skills for Both Academic and Public Audiences.
- The training aimed to introduce participants to the use of digital tools and spatial technologies for understanding landscape change and socioecological processes such as drones and remote sensing.

3. Most interesting task/exercise/procedure during the training

Participants identified the practical and field-based components of the training as the most engaging and memorable aspects of the programme, as highlighted below,

- Writing and executing scripts, and applying them to data analysis. using R.
- Field exercise at the Olorgesailie Prehistoric Site to understand historical environmental changes and their effects on ecosystems and species, and to connect with theoretical concepts to real-world evidence.
- Collect spatial data in the field using GPS, drones, and process the data in QGIS.
- Drone demonstrations, and the subsequent analysis of collected coordinates in QGIS was allowing comprehensive spatial data collection, processing, and visualization.
- Analysis of 3D landscape models and visualizing how landscapes have changed over time.

4. Tasks or process that required more elaboration

Participants recommended extending the practical sessions to allow more in-depth exploration of these advanced topics. They emphasized that additional time devoted to hands-on exercises using real datasets and field-collected imagery would strengthen technical proficiency, improve confidence, and enhance the application of these tools in research, biodiversity conservation, and environmental management.

- More time for advanced practical exercises in R and applications in QGIS, and paleoecological modelling using Tilia software, particularly statistical analysis and data interpretation. reinforce these concepts and improve confidence in applying them to real research datasets.
- More time for scientific writing and publication skills.
- Drone image processing, remote sensing classification, and landscape modelling workflows, including the use of 3Dmodels using our own captured pictures from the drone.

5. Application of the acquired skills in work/studies

Participants indicated that the knowledge and practical skills gained during the training will be applied extensively in both academic research

and professional conservation work. The most frequently mentioned applications include:

- Applying R programming for data cleaning, statistical analysis, visualization, and management of ecological and biodiversity datasets thereby improving the quality and efficiency of research.
- Using GIS, QGIS, and spatial analysis techniques to develop maps of study areas, map species distributions, georeference biodiversity records, analyze spatial patterns, and assess environmental changes relevant to conservation and sustainability.
- Utilizing drone mapping and remote sensing technologies to monitor vegetation dynamics, evaluate habitat condition, detect landscape changes, and assess the impacts of climate change on biodiversity.
- Applying landscape modelling, 3D spatial analysis, and palaeoecological tools (including Tilia) to reconstruct past environments, understand long-term ecological change, evaluate habitat connectivity, and support evidence-based conservation planning.
- Strengthening scientific writing and communication skills to prepare high-quality research reports, journal publications, conference presentations, posters, and other scientific outputs.
- Supporting biodiversity conservation initiatives, including Red List assessments of threatened species, Key Biodiversity Area (KBA) identification and monitoring, biodiversity digitization, ecological monitoring, and conservation decision-making.
- Integrating citizen science and stakeholder engagement approaches into biodiversity monitoring and natural resource management, recognizing the importance of community participation in conservation.

6. Trainees' feedback on training content

Overall, participants reported that the training met and, in many cases, exceeded their expectations. They appreciated the comprehensive and multidisciplinary approach, which effectively combined theoretical

instruction with practical, hands-on learning experiences.

Key highlights from the feedback include:

- The training provided in-depth practical skills in R programming, QGIS, Tilia, drone technology, and remote sensing, exceeding participants' expectations despite the short duration of the course.
- The combination of classroom lectures, fieldwork, and computer-based practical sessions created an engaging and effective learning environment that enhanced participants' understanding and application of the concepts.
- Participants found the content highly relevant to current research, biodiversity conservation, and environmental management, with practical tools that can be readily applied across various scientific disciplines.
- The multidisciplinary nature of the course demonstrated how different technologies and analytical approaches can be integrated to study socio-ecological systems, landscape dynamics, and environmental change.
- The field-based activities were particularly valued for reinforcing theoretical concepts through practical application, making the training both relevant and impactful.

7. Content delivery, practical demonstrations, and replicability

Participants highly appreciated the training delivery approach, describing it as interactive, well-structured, and learner-centered. Participants unanimously indicated that they would replicate this training model within their own institutions.

Key aspects of the delivery that participants valued included:

- A combination of lectures, demonstrations, computer-based practical sessions, online learning, and field exercises, which catered to different learning styles and enhanced participant engagement.
- Step-by-step guidance from trainers during practical sessions in R, QGIS, GIS applications, and other analytical tools, allowing participants to follow demonstrations and independently apply the techniques.
- The use of real-world examples, case studies, and practical datasets that made the learning relevant to current research and conservation challenges.

- Hands-on field experiences, including GPS data collection, drone demonstrations, and the field excursion to the Olorgesailie Prehistoric Site, which enabled participants to collect real data and subsequently analyze it using GIS and other software. This effectively bridged the gap between theory and practice.
- A supportive learning environment where trainers demonstrated professionalism, patience, and responsiveness, encouraging active participation and ensuring that participants' questions were thoroughly addressed.

8. Feedback on time allocation and areas recommended for improvement.

Participants generally agreed that the training duration was adequate for introducing the concepts and tools covered. However, most felt that additional time was needed to allow for deeper engagement with the practical components, particularly those involving software applications and data analysis.

The key recommendations for additional time allocation included:

- R programming and statistical analysis, with more time dedicated to coding practice, data cleaning, analysis using real datasets, interpretation of outputs, and data visualization.
- GIS and QGIS applications, particularly advanced spatial analysis, mapping techniques, and practical exercises using real-world environmental and biodiversity data.
- Tilia software and palaeoecological data analysis to enable participants to develop greater proficiency in environmental reconstruction and long-term ecological analysis.
- Drone image processing and remote sensing, including practical demonstrations and hands-on analysis of remotely sensed data.
- Scientific writing and data presentation, with additional opportunities to strengthen skills in preparing research reports, publications, and scientific presentations.
- Project-based learning and independent practical exercises, allowing participants to apply the knowledge gained to real research scenarios and build confidence in using the tools independently.

9. Networks created during the training for future professional collaboration

Participants reported that the training provided valuable opportunities to establish professional networks with fellow students, researchers, trainers, and conservation practitioners from diverse institutions, disciplines, and countries. These interactions fostered meaningful relationships that are expected to support future academic and professional collaborations.

Key networking outcomes included:

- Establishing connections with researchers, students, and professionals working in biodiversity conservation, ecology, environmental sciences, palaeoecology, GIS, and spatial analysis.
- Creating interdisciplinary networks that will facilitate collaborative research projects, knowledge sharing, academic publications, conference participation, and capacity-building initiatives.
- Learning about professional development opportunities, including scholarships, research funding programmes, and professional associations such as the Association of Kenyan Entomologists (AKE), SAJOREC, and the WYSS Academy.
- Maintaining ongoing communication with fellow participants and mentors, enabling the continued exchange of ideas, technical expertise, career guidance, and information on academic and professional opportunities.

10. Reasons for recommending this training/ technology to your colleagues and friends

Participants expressed strong support for recommending the training to colleagues and peers, citing its practical relevance, high-quality instruction, and applicability across research and conservation disciplines. They highlighted the training as an excellent opportunity for developing both technical and professional competencies.

The main reasons for recommending the training include:

- The training provides hands-on, practical experience using internationally recognized tools and technologies, including R/RStudio, GIS/QGIS, GPS, drone mapping, remote sensing, palaeoecological modelling, and 3D landscape analysis,

which are increasingly important in environmental research and conservation.

- It effectively combines theoretical instruction with fieldwork, laboratory exercises, and computer-based practical sessions, enabling participants to apply concepts to real-world research and conservation challenges.
- The interactive teaching approach, supportive trainers, and step-by-step demonstrations create an engaging learning environment that builds participants' confidence in using new technologies and analytical methods.
- The training develops essential skills in data analysis, spatial analysis, scientific communication, critical thinking, and problem-solving, which are transferable across a wide range of academic and professional fields.
- Participants valued the opportunity to understand and interpret environmental and socio-ecological changes using modern scientific techniques, thereby strengthening evidence-based conservation planning, archaeology, landscape management, and sustainable development initiatives.
- The training offers valuable opportunities for professional networking, collaboration, mentorship, and knowledge exchange with experts and participants from diverse institutions and disciplines.
- Several participants noted that the practical and supportive learning environment increased their confidence in using analytical software, particularly R and GIS, making complex tools more accessible and applicable to their own research.

Photo Gallery





Above: Trainees during a training session



Below: Trainees Visit to the Olorgesailie Prehistoric Site, Magadi, Kenya

8.0 Opening Remarks and Speeches During the Opening Ceremony

Moderator: Ms. Linda Mboya, National Museums of Kenya

Rapporteur: Sam Guchu, National Museums of Kenya



Guest during the opening ceremony: Left to Right: Dr. Namikoye Samita, Prof. Qing-Feng Wang, Mr. Edwin Abonyo, Prof. Mary Gikungu and Prof. Esther Kioko

8.1 Opening Ceremony Remarks, Dr. Namikoye Samita, Kenyatta University, Chair, AKE



Dr. Namikoye Samita, Chairman AKE, officially welcomed participants to the Second Joint International Conference. She acknowledged key dignitaries, including Guest of Honour Prof. Wang, NMK Board Chairperson Mr. Edwin Abonyo, NMK Director General Prof. Mary Gikungu, and Conference Chair Prof. Esther Kioko, alongside partners, sponsors, and scientists.

Expressing her delight at the gathering of researchers, students, and development partners, Dr. Samita drew inspiration from nature. She used the example of ants collectively building anthills to illustrate how teamwork, collaboration, and unity allow scientists to achieve far greater societal and scientific impact than working in isolation. She introduced AKE as a non-profit professional organization registered in 2024, succeeding the Entomological Society of Kenya established in 1993. The Association has grown to over 215 members from universities, research institutions, government agencies, and the private sector across Africa and beyond. AKE remains committed to excellence in insect science, professional collaboration, and mentorship.

The AKE Chair, specifically praised the heavy attendance of students and young scientists as a vital investment in the discipline's future. She also highlighted AKE's strong partnerships, particularly its deep ties with the National Museums of Kenya (NMK) and regional bodies like the Association of African Insect Scientists. She extended sincere thanks to NMK, SAJOREC, sponsors, and the organizing committees for making the conference possible.

Addressing the theme, *"Harnessing Biodiversity and Cultural Heritage for Economic Transformation,"* Dr. Samita noted that biodiversity discussions often overlook insects in favor of larger animals. She

emphasized that insects are actually indispensable to environmental health, food security, and economic development. Entomologists are crucial in tackling global challenges like migratory pests, invasive species, and vector-borne diseases. She noted that; In Kenya, entomologists have been pivotal in responding to agricultural threats such as the Fall Armyworm, False Codling Moth, Persea mites, mealybugs, and fruit flies that directly endanger rural livelihoods. Dr. Samita stressed that scientific research must extend beyond laboratories and academic journals to deliver tangible benefits to society. She framed the conference as a vital platform for knowledge sharing, networking, and translating research into practical solutions.

In closing her closing remarks, Dr. Samita challenged participants to emulate the resilience of the dung beetle and the unity of the honeybee. Expressing confidence that scientific cooperation would drive lasting economic and environmental transformation, she wished everyone a successful conference and productive deliberations.

8.2 Opening Remarks from Prof. Esther Kioko, OGW, Chair, Conference Secretariat



Prof. Kioko began by warmly welcoming delegates, scientists, researchers, students, partners, and guests.

She emphasized the honor of hosting the conference and expressed gratitude on behalf of the Secretariat.

She highlighted the importance of the theme, noting that culture, nature, and heritage are often

undervalued economically, but global perspectives are shifting.

Acknowledgements & Recognitions

- Secretariat Team: Appreciated for coordinating abstracts, peer reviews, communications, and logistics to ensure smooth operations.
- National Museums of Kenya (NMK): Special thanks to the Chair of the NMK Board, Mr. Edwin Abonyo, and Director General Prof. Mary Gikungu for their support.
- Association of Kenyan Entomologists: Recognized for organizational contributions, led by Dr. Samita Namikoye.
- Sino-Africa Joint Research Center (SAJOREC): Acknowledged for co-hosting, represented by Prof. Wang and his team from Wuhan Botanical Garden.
- Financial and Institutional Partners: JRS Biodiversity Foundation (USA), ICEA Lion Group, Kenya Museum Society, Fauna and Flora, Liaison Group, Mpala Research Centre, British Institute in Eastern Africa, African Academy of Sciences and Prof. Jack Harris.

International & Regional Representation

She highlighted the diversity of participants from African countries including Kenya, Uganda, Tanzania, Rwanda, Namibia, Ghana, Zambia,

Nigeria, Ethiopia, Malawi, Cameroon, Congo, South Africa; and global representation from China, India (represented by among others, Prof. Suresh Raina, a former researcher in Kenya based at icipe) Russia, USA, UK, Switzerland, South Korea and Australia; underscoring the conference's international scope.

Reference to the Conference Theme

Prof. Kioko tied the acknowledgements back to the theme “Harnessing Biodiversity and Cultural Heritage for Economic Transformation” noting the diversity of abstracts and participants reflected a shared commitment to addressing the global challenges through science and collaboration. She stressed that biodiversity loss, habitat degradation, invasive species, climate variability, and emerging diseases demand interdisciplinary and international cooperation.

In her closing remarks, she recognized the behind-the-scenes efforts of committees, reviewers, technical teams, and volunteers and concluded by wishing participants a fruitful conference and an enjoyable stay in Kenya.

8.3 Opening Remarks, Prof. Mary Gikungu, Director General, NMK



Prof. Gikungu began by greeting the guest of honor, Prof. Qing-Feng Wang, Wuhan Botanical Garden, CAS, NMK Board Chair, Mr. Edwin Abonyo, Dr. Samita (Chair of AKE), Prof. Esther Kioko (Chair of the Conference Secretariat), and all participants.

She expressed delight at hosting the conference at the National Museums of Kenya (NMK), noting that it was a privilege to convene the second joint international conference after the successful inaugural in June 2024.

Acknowledgements & Recognitions

- She emphasized on NMK's core mission: collecting, documenting, preserving, studying, and presenting Kenya's natural and cultural heritage.
- Prof. Gikungu also appreciated the Association of Kenyan Entomologists (AKE), led by Dr. Samita, the Sino-Africa Joint Research Center (SAJOREC) for co-hosting and thanked sponsors and partners, including the JRS Biodiversity Foundation and other local and international organizations.
- In addition, she extended gratitude to the NMK board, senior management, secretariat, and technical teams for their dedication for their contributions.

Reference to the Conference Theme

- Prof. Gikungu tied her remarks to the theme "Harnessing Biodiversity and Cultural Heritage for Economic Transformation," describing it as a "crown call."
- She emphasized that Kenya's rich natural and cultural diversity is under threat from climate change, habitat destruction, and

biodiversity loss, and that the conference theme reflects urgent action.

- Highlighted NMK's strategy of integrating scientific research, indigenous knowledge, and technological innovations to develop holistic approaches that support the government's economic transformation agenda.

Conference Structure & Opportunities

- She emphasized on the opportunities provided by the conference to foster interactive exchange through:
 - o Keynote papers from renowned scientists worldwide.
 - o Capacity-building programs such as PEBCA, nurturing the next generation of scientists.
 - o Specialized symposiums offering in-depth engagement with thematic issues.
- She encouraged young participants to seize these opportunities, noting her admiration for their training and its potential impact.
- Finally, she expressed personal aspiration to present at the next conference, inspired by mentors such as Prof. Raina from India.

Closing

Prof. Gikungu called for inclusivity and shared stewardship to safeguard natural and cultural wealth for a prosperous future. She thanked all partners, sponsors, and the Secretariat for their contributions and wished participants fruitful deliberations and blessed the gathering.

8.4 Opening Remarks, Mr. Edwin Abonyo, Board Chairman, NMK



Mr. Abonyo began with a light-hearted cultural note, explaining greetings in Kiswahili and acknowledging the diverse audience, while expressing humility and honour at addressing the gathering.

He welcomed the guest of honor, Prof. Qing-Feng Wang Director General Wuhan Botanical Garden, CAS, Prof. Mary Gikungu Director General

NMK, Prof. Esther Kioko Chair Secretariat, Dr. Samita Namikoye Chair AKE, and other distinguished participants.

He also recognized Prof. Raina from Nagpur University, India as a mentor to Prof. Kioko, while he was at *icipe* and applauded his contribution to the current and the previous conference.

Acknowledgements & Recognitions

- Mr. Abonyo celebrated NMK's own achievers including Prof. Manthi (recognized by the American Academy of Sciences), Dr. Terer, and other team members
- He affirmed the support of the Cabinet and the Principal Secretaries for the conference
- He appreciated Prof. Wang for training over 50 Kenyan students under the SAJOREC program and support for pre-conference training thus strengthening scientific capacity in Kenya and Africa
- Finally, he acknowledged the presence of over 300 delegates from 20 countries, calling it a significant achievement.

Reference to the Conference Theme

- He linked his remarks to the conference theme aligning it with Kenya's national economic transformation agenda

- He further emphasized the role of museum as a catalyst for the future, converting scientific assets into tangible economic activities.
- The NMK board chair further highlighted programs under the Natural National Products Industry (NPI), focusing on harnessing cultural heritage medicines, foods, and dances for economic transformation
- He made reference to sustainable approaches such as:
 - o Nature-based enterprises empowering rural communities.
 - o Climate-smart agriculture for food security.
 - o Carbon and biodiversity markets to attract global investment into local conservation.

Mentorship & Networking

The board chair stressed NMK's commitment to mentorship and guidance for early-career researchers through attachments, internships, and affiliations, encouraging young scientists to network and utilize the conference as a platform for growth.

Closing

He noted challenges of heritage loss due to climate change but emphasized collective resolve and interdisciplinary partnerships as solutions reiterating the support from the NMK Board.

8.5 Opening Remarks, Chief Guest, Prof. Qing-Feng Wang, Director General, Wuhan Botanical Garden, CAS, China



Prof. Wang greeted the dignitaries including NMK Director General Prof. Mary Gikungu; Prof. Esther Kioko; Dr. Samita Namikoye, Mr. Edwin Abonyo, and all participants.

He expressed pleasure, on behalf of the Sino-Africa Joint Research Center (SAJOREC) and the Wuhan Botanical Garden, Chinese Academy of Sciences, in welcoming

delegates to the conference.

He extended sincere gratitude to the National Museums of Kenya for their thoughtful preparations and hard work in making the conference possible.

Acknowledgements & Recognitions

- Prof. Wang recognized the collaboration between Chinese and African institutions, noting the partnership with NMK since 2014.
- He appreciated the contributions of scholars, researchers, and policymakers from around the world who joined the conference

Reference to the Conference Theme

- Prof. Wang tied his remarks to the theme “Harnessing Biodiversity and Cultural Heritage for Economic Transformation,” emphasizing Africa’s extraordinary richness in biodiversity and natural heritage.
- He noted urgent challenges from climate change and economic pressures, stressing the need for innovation and global scientific responsibility.

- He further described the conference as a platform for dialogue, collaboration, and action, enabling biodiversity research and cultural heritage protection to contribute meaningfully to sustainable economic growth in Africa.

Key Initiatives & Projects

Prof. Wang highlighted key initiatives and projects as below:

- The 2015 documentation Flora of Kenya project with NMK, aiming to produce 31 volumes covering 7,000 species in Kenya (two volumes already published).
- Field surveys and biodiversity monitoring technologies.
- Conservation projects, including on-site and ex-situ conservation of plant species.
- Training courses and exchange programs for young scientists between China and African institutions.
- Translating scientific achievements into practical benefits for ecosystems, communities, and sustainable development.

Closing

Prof. Wang described the conference as a “new starting point” for joint efforts in protecting biodiversity and preserving cultural heritage. He urged participants to work together toward building a sustainable future and concluded by wishing the conference every success and thanking all partners and participants.

9.0 Closing Ceremony Remarks

9.1 Dr. Philista Malaki, Chair, Editorial Committee



The Chair of the Editorial Committee reported that the Joint International Conference had successfully concluded after four days of intensive scientific engagement, collaboration, and knowledge exchange. The Chair noted that while the conference activities had taken place over a relatively short period, the scientific contributions presented reflected years and,

in many cases, decades of research, innovation, and commitment by researchers and institutions worldwide.

The Chair reported that the conference had brought together an exceptional and diverse community of scholars, researchers, students, policymakers, conservation practitioners, and development partners from diverse nationalities. More than 300 abstracts had been presented, demonstrating the breadth and depth of scientific inquiry across multiple disciplines and highlighting the importance of international collaboration in addressing global challenges.

It was further reported that the conference had benefited greatly from the participation of universities, research institutions, government agencies, museums, conservation organizations, private sector partners, and international organizations. These interactions had strengthened existing partnerships and created new opportunities for future collaboration.

The Chair highlighted innovation as one of the central themes emerging throughout the conference. Particular mention was made of the exciting presentations on silk and silk-based technologies, which demonstrated the potential of scientific innovation to contribute to industry, livelihoods, conservation, and sustainable development.

The Editorial Committee also acknowledged the outstanding contributions of students and early-career researchers. Their presentations demonstrated exceptional creativity, scientific rigor, and commitment, providing confidence in the future of science and innovation. The mentorship opportunities provided during the conference were recognized as an important platform for strengthening scientific capacity and fostering future collaborations.

The Chair reported that the oral presentations, poster sessions, plenary discussions, and breakout sessions had showcased scientific excellence and encouraged interdisciplinary thinking and collaboration. It was emphasized that the impact of the conference would extend beyond the four days of the event through continued research collaborations, partnerships, policy influence, innovation, and knowledge sharing. On behalf of the Editorial Committee, the Chair expressed sincere appreciation to all keynote speakers, presenters, moderators, rapporteurs, judges, volunteers, sponsors, exhibitors, and the organizing committees whose dedication and commitment contributed significantly to the success of the conference.

The Chair further encouraged all participants to continue serving as ambassadors of science, innovation, conservation, and knowledge sharing, and particularly as ambassadors of museums, recognizing their important role as centers of scientific discovery, education, research, innovation, and cultural heritage preservation.

In concluding the report, the Chair observed that the success of the conference had demonstrated the value of collaboration and collective action. It was noted that the relationships established, the knowledge shared, and the partnerships initiated during the conference would continue to bear fruit in the years ahead.

The Chair then announced that the conference would proceed to one of its most anticipated sessions: the recognition of excellence among student presenters. It was reported that the quality of both oral and poster presentations had been exceptionally high, reflecting the bright future of scientific research and innovation. Before the announcement of the award recipients, the Chair invited the distinguished judging panels for oral and poster presentations to provide brief reports on their evaluation processes and observations.

9.2 Dr. Taita Terer, Director National Repository and Research.



Dr. Terer, reflected on the achievements of the four-day conference and expressed appreciation to all those who contributed to its success.

He noted that the 2nd Joint International Scientific Conference had provided a vibrant platform for knowledge exchange, collaboration, and innovation under the theme, **“Harnessing Biodiversity and**

Cultural Heritage for Economic Transformation”. He observed that the scientific discussions, presentations, and networking sessions had demonstrated the critical role of biodiversity and cultural heritage in promoting sustainable development, economic resilience, and evidence-based decision-making.

He highlighted that the conference had brought together researchers, policymakers, conservation practitioners, students, and development partners from diverse disciplines, creating opportunities for interdisciplinary collaboration and the sharing of innovative research findings.

Dr. Terer conveyed his sincere appreciation to the Director-General, Prof. Mary Gikungu, for her visionary leadership and unwavering support throughout the planning and implementation of the conference. He also acknowledged the valuable contributions of the keynote speakers, session chairs, presenters, researchers, students, and participants, whose expertise and active engagement enriched the conference discussions. Special recognition was extended to the Conference Secretariat, the Organizing Committee, technical teams, volunteers, and logistics personnel for their dedication and professionalism in ensuring the smooth execution of the conference programme.

He further expressed gratitude to the conference sponsors SAJOREC, JRS, ICEA Lion, Kenya Museum Society, Fauna & Flora Liaison Group, Mpala Research Centre, the British Institute in Eastern Africa, the African Academy of Sciences, and Prof. Jack Harris for their generous support. Appreciation was also extended to the exhibitors, including ICEA Lion, Liaison Group, Rhino Ark, Mpala Research Centre, Kenyatta University, Inqaba Biotec East Africa, Nature Kenya, Fauna & Flora, and SAJOREC, for showcasing innovative research outputs, conservation initiatives, and biodiversity-based products.

In his concluding remarks, Dr. Terer encouraged the participants to build upon the collaborations established during the conference and to translate the knowledge shared into practical actions that inform policy, strengthen conservation efforts, and contribute to sustainable economic transformation. He emphasized that the lasting impact of the conference would be measured by the partnerships formed, the research undertaken, and the implementation of innovative solutions beyond the conference.

He concluded by wishing all delegates safe journeys to their respective destinations and officially declared the 2nd Joint International Scientific Conference closed.

10.0 Conference Exhibitions Highlights

The conference featured a vibrant exhibition that brought together universities, research institutions, conservation organizations, development partners, and the private sector. The exhibition complemented the scientific programme by providing delegates with opportunities to interact with exhibitors, exchange knowledge, and explore innovative research, technologies, and conservation solutions.

Kenyatta University, through the National Phytotherapeutics Research Centre, showcased a range of natural and phytotherapeutic products developed from indigenous medicinal plants, highlighting research that supports healthcare, biodiversity conservation, and sustainable livelihoods.

The Wyss Academy for Nature exhibited innovative nature-based products developed in collaboration with local communities, especially the Chui Mama women's group and the local youth group. Highlights include products derived from the elephant mushroom, demonstrating how community-driven enterprises can promote biodiversity conservation and human-wildlife coexistence while generating sustainable incomes.

Inqaba Biotec showcased advanced laboratory technologies, molecular biology solutions, and laboratory support services that facilitate scientific research, diagnostics, and capacity building.

Mpala Research Centre highlighted its ecological research programmes, long-term wildlife monitoring, and conservation initiatives, demonstrating the role of science in sustainable rangeland management. In addition, it also showcased products that support local community empowerment.

Rhino Ark Kenya Charitable Trust presented its work on ecosystem restoration, the protection of Kenya's water towers, focusing on the Eburu Forest, and community-based conservation initiatives, with an emphasis on bee farming and honey production.

The Sino-Africa Joint Research Center (SAJOREC) showcased collaborative scientific research between African and Chinese institutions, with a focus on biodiversity conservation, environmental research, biotechnology, and scientific capacity building. They also showcased one of the publications, *Flora of Kenya* which was published in collaboration with scientists from the East African Herbarium, NMK.

Fauna & Flora showcased its community-based conservation programmes, emphasizing practical nature-based solutions implemented in partnership with organizations such as the Northern Rangelands Trust (NRT) and the Olpejeta Conservancy (OPC). Its exhibition highlighted the importance of collaborative approaches and the nexus between science, policy, and community adoption in achieving long-term conservation and sustainable livelihoods.

Nature Kenya, our longstanding partner and supporter of previous conferences and exhibitions, exhibited their work on nature conservation, species protection, IBA/KBA monitoring, community conservation, and citizen science initiatives, highlighting its role in promoting sustainable resource management and public participation and advocacy in conservation.

Liaison Group, the sponsor of the conference's student awards, exhibited its insurance and risk management solutions while reaffirming its commitment to supporting upcoming scientists as a commitment to ensuring sustainability in conservation.

As the host institution, the National Museums of Kenya showcased its extensive work in biodiversity research, taxonomy, natural history collections, cultural heritage conservation, and environmental education, reinforcing its leadership in research and conservation. Overall, the exhibition served as an important platform for knowledge sharing, networking, partnership building, and showcasing practical innovations that link scientific research, conservation, community development, and sustainable enterprise.



Exhibition Booths during the 2nd Joint International Scientific conference

10.1 Exhibitors' Feedback Summary

Based on the exhibitors' responses from the conducted survey, the overall feedback indicates that the planned exhibition was successful, but there are several areas recommended for future improvement, as summarised below;

1. Logistical Support

Overall Rating: Good, with notable areas for improvement

- Booth allocation and setup were generally well organized.
- Exhibition layout promoted smooth movement and accessibility.
- Booth positioning encouraged a natural flow of delegates and visitors.
- Move-in and move-out processes were well coordinated.
- Control dust by watering the exhibition grounds where necessary.
- Provide clearer, more consistent communication and guidance to exhibitors well before the conference.
- Increase diversity of visitors by inviting schools, industry players, and the general public in addition to scientists.
- Organize visitor and school bus routes to pass through the exhibition area, increasing exhibitor exposure.

2. Visibility and Public Awareness

Exhibitors reported that the exhibition:

- Increased organizational visibility and public awareness.
- Created valuable networking opportunities.
- Generated promising business partnerships and commercial opportunities.
- Enhanced awareness of conservation, ecosystem restoration, and community-based initiatives.
- Demonstrated the value of collaborative partnerships among organizations.

Although visibility improved, overall visitor traffic to the exhibition could be increased.

3. Recommendations for Future Conferences

The exhibitors suggested several improvements that would significantly enhance the exhibition experience:

- Introduce dedicated exhibitor pitch sessions during the opening ceremony and other high-profile conference sessions.
- Schedule a daily exhibition hour without competing scientific sessions.
- Improve power supply and internet services.
- Enhance communication with exhibitors through earlier and more consistent dissemination of conference information.
- Increase participation from schools, industry stakeholders, policymakers, and the general public to diversify visitors.
- Improve traffic flow through the exhibition area and implement dust control measures.
- Improve technical support by adequately briefing and preparing support personnel.

Conclusion

All exhibitors indicated that they would recommend future conferences to organizations within their respective sectors.

The main reasons include:

- o High-quality delegates and networking opportunities.
- o Strong research and conservation collaborations.
- o Potential for business development and partnerships.
- o Increased organizational visibility.

Appendices

Appendix 1: PEBCA Case Study Scholars Profiles

Name	Project Title, Mentor(s) and Supervisors
 Burudi Shirengo, Masinde Muliro University of Science and Technology	Development and Testing of Low-Cost Sticky Traps for Managing Stable Flies <i>Stomoxys spp</i>) in Smallholder Livestock Systems of Western Kenya Mentor: Dr. Namikoye Samita Kenyatta University Supervisors: Dr. E. Mungube, Dr. P. Mudavadi Dr. J. Cheruiyot
 Diana Thakya Kasomo, University of Nairobi, Kenya	Eco-Anxiety and Community Responses to Climate Change: Implications for future Sustainable Climate Adaptation Projects in Makueni County, Kenya. Mentor: Dr. G. Buluma Bakesia, Masinde Muliro University of Science and Technology Supervisor: Dr. Salome Richu, University of Nairobi
 Jane G. Njagi, Kenyatta University, Nairobi	Adoption and Perceived Impacts of Selected Nature-Based Practices on Soil Health and On-farm Biodiversity in Kiambu County, Kenya. Kenyatta University. Mentor: Dr. Esther Muindi, Pwani University Supervisors: Prof. Monicah W. Mucheru-Muna, Prof. Jayne N. Mugwe, Kenyatta University

Name	Project Title, Mentor(s) and Supervisors
 Sharon Jerop Kemboi, Kabarak University	Evaluating the Influence of Community Participation on Wildlife Conservation in Lake Nakuru National Park, Kenya Mentor: Dr. Jane Macharia, National Museums of Kenya Supervisors: Dr. Rose Sagwe; Dr. Eliud Michura, Kabarak University
 Dennis Mbandi, Kenyatta University	Climate Change, Coastal Biodiversity, and Heritage Resilience in Lamu Old Town, Kenya Mentor: Dr. Purity Kiura, National Museums of Kenya Supervisors: Prof. Lazarus Ngari, Dr. Lucas Bwire – Kenyatta University
 Ruth Nawakwi, University of Zambia	Youth-Led Climate Adaptation and Biodiversity Conservation through Inclusive Agroforestry in Lusaka Province, Zambia, University of Zambia Mentor: Dr. Mwangi Githiru, Wildlife Works Supervisor: Dr. G. Masaiti, University of Zambia

Name	Project Title, Mentor(s) and Supervisors
 Marystella Injete Sirengo, University of Eldoret	Characterization of antimicrobial-resistant bacteria and genes in surface waters of Tana, Athi, and Malewa River Basins Mentor: Dr. Sabella Kiprono Masinde Muliro; Public Health and Biomedical Sciences Supervisors: Dr. Becky Aloo, Prof. Maurice Okoth; Dr. Brenda Rasowo, University of Eldoret
 Peter Mwangangi Njeru University of Nairobi	Assessing the impact of Land Use and Land Cover Change policies in the conservation of Steppe Eagle <i>Aquila nipalensis</i> in Kenya, Mentors: Dr. Phillista Malaki NMK, Dr Bernard Cheruiyot Soi, Chuka University Supervisors: Prof. Stephen Anyango, and Prof. Nicholas Oguge, University of Nairobi
 Nuwagaba Leonidas, University of Eldoret	Evaluation of Community Climate-Based Strategies among agro-Pastoral Households within Kipkomo Subcounty, Kenya Mentor: Dr. King'asia Mamati, University of Bonn, German Supervisors: Prof. Ole Kiyiapi J. and Dr. Ototo Gilbert, University of Eldoret

Name	Project Title, Mentor(s) and Supervisors
 Betsy Alice, University of Nairobi	Comparative Study of the Phytochemical Diversity and Antioxidant Activity of Selected Edible Plants. Mentor: Dr. Daniel Mutyambai, ICIPE Supervisors: Prof. Catherine Lukhoba, Dr. Judith Agot Odhiambo, and Dr. Jolly Rajat, University of Nairobi
 Christine Maroma, Jomo Kenyatta University of Agriculture Science and Technology	Seasonal and Spatial Variations of Heavy Metals Levels in Water and Sediments from the Ondiri Wetland and Its Outflows, National Museums of Kenya Mentor: Dr. George Nderitu, Karatina University Supervisors: Dr. Paul Njogu, JKUAT, Dr. Jane Mburu, Murang'a University of Technology
 Elijah Kikuvi, Kenyatta University	Boosting Coffee Resilience Through Management of The Coffee Berry Borer <i>Hypothenemus hampei</i> Using Shade Tree Strategies in Kenya Mentor: Ms. Anne Wangui Kimani, National Potato Council of Kenya Supervisors: Dr. Namikoye E. Samita (KU), Prof. Gathu R. (KU)

Name	Project Title, Mentor(s) and Supervisors
 Kariuki Muthoni, Kenyatta University	Tides of Collaboration: Sustaining Heritage Tourism at Manda Bay through the Public-Private-Community Partnerships (PPCP) Model Mentor: Dr. Peggy Ngila, Strathmore University Supervisors: Dr. David Maina, and Dr. Washington Ndiiri, Kenyatta University
 Maxwell Abugri Awenpanga, University of Ghana	Insecticidal Potential of the Aqueous Extracts of Citrus sinensis Peels and <i>Chromolaena odorata</i> leaves against insect pest complex of garden eggs under open-Field Conditions. University of Ghana Mentor: Witness Dlamini, Durban University of Technology, South Africa Supervisors: Dr. Thomas Buxton, Prof Ebenezer Owusu, University of Ghana
 David Mwanzia South Eastern Kenya University	Determinants of the Adoption of Climate-Smart Agriculture Practices Among Smallholder Farmers in Mwingi West Sub-County, Kitui County, Kenya Mentor: Prof Esther Kioko, NMK, Kenya Supervisors: Prof. Thomas Akuja, Dr. Simon Mbala, SEKU

Oral presentations

Award Summary Statement for the Best Oral and Poster Student Presentation



Best Male Oral Presentation:
Nathan Kiboi, Masinde Muliro
University of Science and
Technology, Kenya

**Title: Morphological and
molecular characterization of
haloalkaliphilic fungi from Spring
Shores of Lake Magadi**

First and foremost, I begin by
humbly acknowledging, as well as
expressing unwavering enthusiasm

and delight, in emerging among the top oral presentation award winners at the 2nd Joint International Scientific Conference. The pre-conference training experience, coupled with the opportunity to disseminate my research findings through an oral presentation under the sub-theme: “Biosystematics, Ecology, Evolution and Biogeography”, creates a platform for nurturing upcoming young scientists as we navigate through the evolving yet wide-ranging scientific landscape. Likewise, the invaluable opportunity has facilitated constructive exchanges and networking with lead, seasoned researchers and industry players aligned within biodiversity conservation in our natural protected sites, including East African Rift-valley Soda lakes that harbour a repertoire of extremophilic fungal microbial species bearing an assortment of bioactivities with previously uncharacterised medicinal capacities. As such, my research findings overall purpose to provide crucial, evidence-based material and knowledge for critical research founded decision making practices.



Best Female Oral Presenter:
Beatrice Mukami, Kenya Methodist University

Title: Digitizing and publishing *Dytiscidae* specimens from the National Museums of Kenya to GBIF

Receiving the Best Female Student Oral Presentation Award at the 2nd Joint International Scientific

Conference is a tremendous honour and a moment of great joy for me. I am deeply grateful for the opportunity to present my research and share my work with researchers, students and professionals from diverse scientific backgrounds. This recognition is both encouraging and motivating, as it affirms the value of my efforts and inspires me to continue pursuing excellence in research. My study focused on digitizing, standardizing, georeferencing, validating, and publishing Dytiscidae (predaceous diving beetle) specimen records to the Global Biodiversity Information Facility (GBIF). By mobilizing over 1,200 historical occurrence records, the project contributes to biodiversity research, conservation planning, and informed environmental decision-making. Therefore, I sincerely thank the National Museums of Kenya and the conference organizers for their support and for making this achievement possible.



1st Runner Oral Presentation:
Charity Barasa, University of Eldoret
(Right)

**Title: Riverine Ecosystem Health
and Potential for Sustainable
Restoration: A Case of River
Kiminini, Trans-Nzoia County,
Kenya**

Receiving the 1st Runner-Up Oral
Presenter Award was a truly

unexpected and humbling honor. Being called forward as one of the awardees at the 2nd Joint International Scientific Conference filled me with a deep sense of disbelief, joy, gratitude, and pride. In that brief but memorable moment, I was reminded that dedication, perseverance, and commitment to scientific excellence never go unnoticed. This recognition underscores the critical role of freshwater monitoring in addressing the growing global challenge of freshwater ecosystem degradation. My research focused on assessing freshwater ecosystem health using aquatic macroinvertebrate bioindicators, whose responses to environmental change provide vital insights into water quality and ecological integrity. By generating evidence-based knowledge, this work contributes to the conservation and sustainable management of freshwater resources, increasingly threatened by human activities. I am inspired to continue conducting impactful research and collaborating with the scientific community to safeguard aquatic ecosystems for present and future generations.



2nd Runner Oral Presentation:
Christine Chai, Pwani University
(Left)

Title: The Effect of Management Practice on the Conservation of beneficial symbiotic microbes in Agro-Ecosystems in Coastal Kenya

Receiving this award at my first international conference is truly an honour and a memorable milestone in my academic journey. I did not expect to leave the conference with such recognition and I am deeply grateful for this achievement. As a young researcher from Pwani University, this award validates the hard work, dedication and passion that have gone into my research over the years. Beyond the recognition itself, this award has strengthened my confidence and motivated me to continue pursuing research that contributes to sustainable agriculture and biodiversity conservation. It has also reminded me of the importance of providing opportunities for early-career researchers to share their work and learn from the wider scientific community. I am sincerely grateful to the conference organizers, sponsors, my supervisors and colleagues for their support. This achievement inspires me to continue growing as a scientist and to make meaningful contributions through my future research.

Poster Presentations

Best Male Poster Presentation: John Wambua, Kenyatta University



Title: Efficacy of Selected Natural and Synthetic Adjuvants in Improving the Pathogenicity of *Metarhizium anisopliae* against *Spodoptera frugiperda*

Winning this award at the 2nd Joint International Scientific Conference is a truly humbling and motivating experience for me as an undergraduate student. It has strengthened my belief in

myself and shown me that dedication, hard work, and perseverance can lead to meaningful achievements. This recognition has inspired me to continue pursuing research and to advance my academic journey to the next level. My research focused on sustainable management of fall armyworm in maize production, contributing to efforts aimed at improving food security while promoting environmentally friendly pest control strategies. Beyond the award itself, this achievement encourages me to remain passionate about scientific inquiry and innovation. I also hope it inspires fellow students and young researchers to embrace research, as it is a powerful tool for generating knowledge, solving real-world challenges, and creating positive impact in society.

Best Female Poster Presentation: Esther Mwende, Chuka University (Left)



Title: Molecular Breeding of Common Bean *Phaseolus vulgaris* L. for High Yield, Anthracnose Tolerance, and Low Flatulence to Enhance Food Security

I am deeply honored to be selected as an award winner at the 2nd Joint International Scientific Conference. This recognition validates my research focused on the molecular breeding of

common bean (*Phaseolus vulgaris* L.) to enhance food security in Kenya. My project aims to develop high-yielding, anthracnose-resistant, and low-flatulence F₂ hybrids by leveraging indigenous genetic diversity. Receiving this award is a significant milestone that highlights the importance of integrating molecular markers with phenotypic characterization to drive agricultural innovation and economic transformation. I am grateful for the mentorship of Prof. Moses Muraya, Dr. Ann Mwaura and the support of various stakeholders such as NMK who have guided my journey in becoming a better researcher. This achievement inspires me to continue my work in bridging the gap between heritage conservation and agricultural productivity, ultimately striving to improve local livelihoods and ensure sustainable food systems for the future.

1st Runner Poster Presentation: Ngenerwanayo Gedeon, University of Rwanda (Presenting)



Title: Impact of Infrastructure Development and Land Use Change on Bat Roosting and Population Trends in Northern Rwanda

I am honored to be among the 8 award winners at the 2nd Joint International Scientific Conference. This recognition is especially meaningful because my study was a first step into

bat research in northern Rwanda, using only a phone, a flashlight, and a willingness to explore caves near Musanze. My work on the Impact of Infrastructure Development and Land-Use Change on Bat Roosting Sites and Population Trends in Northern Rwanda examined how expanding roads, buildings, and farms are affecting bats. I documented over 2,000 bats at Susa Cave, identified four *Rhinolophus* species, and found that 73% of locals see bats as decreasing, while 93% still value them for pest control, pollination, and seed dispersal. The findings show that infrastructure and bats can coexist, but only if we plan carefully. Protecting roosting sites, creating buffer zones, and educating communities can reduce conflict and ensure that bats continue to support agriculture and healthy landscapes. This award is not a celebration of finished work, but an encouragement to continue. Thank you for believing in a student from Rwanda with a dream.

Brief summary of the impact of my research This research draws attention to the urgent need for studying bat populations in relation to infrastructure development in northern Rwanda. Through a preliminary survey of four roosting sites, it documented over 2,000 bats at Susa Cave, identified four *Rhinolophus* species, and revealed community perceptions 73% see bats decreasing, and 93% value them for pest control, pollination, and seed dispersal. Susa Cave has some protective awareness initiatives, though it is not formally managed. In contrast,

Nyabihu Cave demonstrates how infrastructure directly affects bats; a nearby church, prayers inside the cave, and waste disposal have contributed to near abandonment, with only one bat recorded. The findings highlight the need for formal protection of roosts like Susa, buffer zones around caves, and community education to reduce human-bat conflict. This research calls for further studies and conservation action to ensure bats continue to support agriculture, reduce pesticide costs, and preserve Rwanda's natural heritage.

2nd Runner Poster Presentation: Jeff Ochieng, Mbarara University of Science and Technology Uganda (Presenting);



Title: Diversity, Habitat Threats and Indigenous Knowledge of Local Community on Hawkmoths (Lepidoptera, Sphigidae) in and around Ruma National Park, Kenya

I would like to thank the Organizing Committee and the Secretariat, 2nd Joint International Scientific

Conference on recognizing my work and presentation titled "Diversity, Indigenous Knowledge, and Habitat Threats Facing Hawkmoths (Lepidoptera, Sphigidae) in and around Ruma National Park, Kenya". I am delighted to have emerged as a second runners up in the poster category. The win motivates me to continue championing the conservation of usually forgotten insects (moths), which play significant ecological roles as nocturnal pollinators, a source of food for other invertebrates, and biological indicators of climate change. My novel research fills the knowledge gap by documenting seven previously undocumented hawkmoth species in Homa Bay County, provides useful environmental education information, highlights the need to control and manage invasive plant species, and calls for a review of artificial light sources in conservation areas to alleviate the impact of light pollution on nocturnal insects.

Appendix 3: SAJOREC Excursion Report

A Report on the Visit to the Sino-Africa-Joint-Research Centre, Juja, Kenya by A Delegation of PEBKA Scholars and Conference Secretariat National Museums of Kenya

Prepared by Ochieng Jeff, Mbarara University of Science and Technology, Uganda and Esther Mwende, Chuka University, Kenya

Introduction

This report documents a four-hour visit to the Sino-Africa Joint Research Centre (SAJOREC) located within Jomo Kenyatta University of Agriculture and Technology (JKUAT) in Juja Kenya that took place on 12th June 2026. SAJOREC together with the National Museums of Kenya (NMK) and the Association of Kenyan Entomologists (AKE) organized by the Second Joint International Scientific Conference that was hosted by NMK between 8th and 12th June 2026. The tour was therefore necessary for the conference secretariat and other delegates to see first-hand activities SAJOREC was involved in and also for the delegation to learn and explore opportunities for future research and collaborations. The trip kicked off in front of the Louis Leakey Auditorium, at NMK at 0900 hours.



SAJOREC premises at JKUAT

Composition of the delegation

The visit offered the Conference Secretariat, NMK staff, AKE representatives, Pathways for Emerging Biodiversity Change-makers in Africa (PEBCA) scholars, students from other universities, and other stakeholders an opportunity to learn about the SAROJEC complex and explore opportunities for future collaborations. Prof. Qing-Feng Wang, Director General, SAJOREC, welcomed the team and after pleasantries, a guided tour by one, Mr. Liu Huaibo (David), took the visitors through laboratories, a botanical garden, a greenhouse, and a demonstration farm.

Focus on SAJOREC Visit

The center occupies a significant landscape within the JKUAT campus, featuring a 37-acre botanical garden and comprehensive accommodation facilities comprising 24 rooms. SAJOREC operates six specialized laboratories designed for international collaboration and high-level scientific research.

The Sino-Africa Joint Research Center (SAJOREC) at the Jomo Kenyatta University of Agriculture and Technology (JKUAT) is a landmark collaborative project established in 2013 between JKUAT and the Chinese Academy of Sciences (CAS). As the first of its kind in Africa, it serves as a premier hub for scientific research, biodiversity conservation, and talent cultivation, fostering knowledge exchange and technological cooperation between China and African nations.

Areas Visited

a) Molecular and Remote Sensing laboratories

Both the laboratories were well equipped with modern equipment and were available to all researchers and students from all over the world at a pocket-friendly fee. The lab provides services including reagent management, bench support, DNA and extraction. Those interested in molecular laboratory analysis are required to purchase reagents on their own.



Mr. Huaibo Liu (David) (SAJOREC) explained to the delegation about the molecular laboratory

Remote Sensing Lab functions as a training venue for Geographic Information Systems (GIS) applications, including disaster management, agriculture, forest landscape mapping, and biodiversity conservation. This lab has also facilitated the publication of significant research books. Wildlife Conservation & Utilization Lab is dedicated to the study and sustainable utilization of wildlife resources.

b) Botanical Garden.

Established in 2016, the 4-acre artificial lake and its surrounding botanical garden serve as a center for research and conservation. The lake features diverse water lily varieties, including indigenous blue-flowered water lilies and imported yellow and pink-flowered species. Research is needed because the indigenous water lily is overgrown by the imported ones. Strict quarantine protocols of typically 3 months for all imported plant materials is done. The greenhouse collection includes members of the Euphorbiaceae family, such as *Kalanchoe nyikae*, *Cissus rotundifolia*, and various Aloe species like *Aloe secundiflora* among others.

The garden mimicked both terrestrial and aquatic ecosystems and offered researchers, students, and merry makers an opportunity

to interact with indigenous plants, ornamental plants and aquatic plants. An artificial lake constructed within the botanical garden has two species of water lily (Genus *Nymphaea*), one from China and the other native, catfish (Genus *Clarius*) and tilapia (Genus *Tilapia*). The botanical garden had well-maintained paths, lawns, and places for rest.



The artificial lake located in the botanical garden

c) The succulent green house

The green house several had both indigenous and exotic succulent plants from Kenya and other parts of the world like China. The plants included several aloes (*Aloe* spp), snake plant (*Dracaena* sp.), sisal (*Agave* sp.), cactus (*Euphorbia* sp.) among others. The greenhouse ensured that those species sourced from outside Kenya survived in the country.



A section of the Succulent greenhouse

d) Modern Agriculture Demonstration Area

The 10-acre agricultural demonstration site aims to introduce high-yield crop varieties and advanced technologies to improve local livelihoods. The site demonstrates sophisticated operational practices, including systematic land preparation using rotavators and harrows, and precise land demarcation.

JKUAT and SAJOREC jointly operated the farm where new technologies (planters) and efficient farming methods (crop rotation and intercropping) were applied to improve crop yields. Crops such as maize (*Zea* sp.), soybeans (*Glycine* sp.), cassava (*Manihot* sp.), groundnuts (*Arachis* sp.), five types of grapes (*Vitis* spp.), Napier grass (*Cenchrus purpureus*). The farm relied mostly on compost manure and very little fertilizer.

- o Planting Patterns: Maize is cultivated at a spacing of 50 x 30 cm, while intercropping of maize and soya follows a 50 cm spacing for maize and 30 cm for soya.
- o Equipment: Manually operated planters are used for fertilizer and seed application, designed for efficiency outside of the rainy season.
- o Crop Diversity: The area cultivates maize, soya, napier grass, groundnuts, avocado, and improved cassava varieties (including 019, 68, 86, 35, and the 'golden' sc09).
- o Grape Cultivation: A specialized grape project initiated in 2022 utilizes drip irrigation. The program employs pruning of small berries to maximize fruit quality, bagging to protect against birds, and ensures a productive lifespan of up to 20 years.



Grapes in a greenhouse (*Vitis* sp.)



Golden cassava (improved variety)



A demonstration of how a maize seed planter works

e) Tea-break and Departure

The NMK delegation and SAJOREC's staff shared a light refreshment and one of the PEBCA students gave a vote of thanks before departure at noon.



Stephen Shirengo (PEBCA scholar) giving a vote of thanks to SAJOREC, NMK and AKE

Conclusion

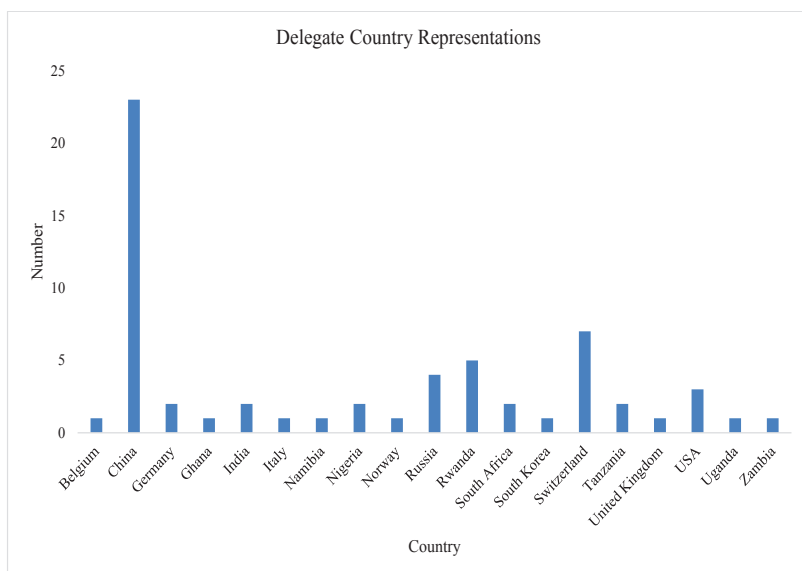
SAJOREC extends its reach beyond Kenya through regional offices in Madagascar, Rwanda, Tanzania, and Mauritania. By providing scholarship opportunities, technology transfer, and a platform for collaborative scientific endeavors, the center strengthens the partnership between China and African nations, positioning JKUAT as a central innovation hub for the continent.

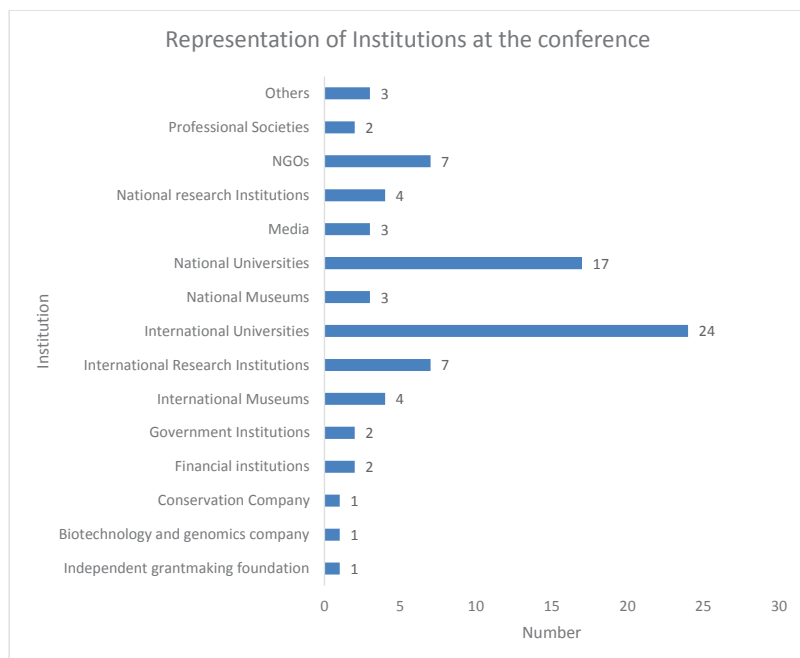
The visit to SAJOREC presented research (modern laboratories) and collaboration (benchmarking and capacity building) opportunities in molecular ecology, remote sensing, and climate-resilient crop research between SAROJEC and NMK. NMK could also to tap into technology transfer opportunities. Students and researchers could also benefit through funding opportunities advertised on SAJOREC website. There was need to ensure non-proliferation of exotic plants particularly into nearby aquatic ecosystems surrounding SAROJEC's lake dispersed by wind and aquatic birds (exotic water lily in the artificial lake).

Appendix 4: Conference Delegate Representation

The conference hosted 309 participants with 25% of the attendees being students or early-career researchers. The participants were from four different continents, including Africa, Europe, Asia and North America, representing 20 countries. Africa was represented by nine nationalities: Ghana, Kenya, Namibia, Nigeria, Rwanda, South Africa, Tanzania, Uganda and Zambia. Asia was represented by China, India and South Korea. Europe was represented by Belgium, Germany, Italy, Norway, Russia, Switzerland, and the United Kingdom. North America was represented by the USA. The representation spanned 81 institutions. These included national and international research institutions, universities, and museums.

The conference also brought together representatives from NGOs, professional societies, financial institutions, biotechnology/genomics companies, conservation and nature-based enterprise organisations among others. The broad representation of institutions reflects a strong and diverse participation of delegates in the 2nd Joint International Scientific Conference.

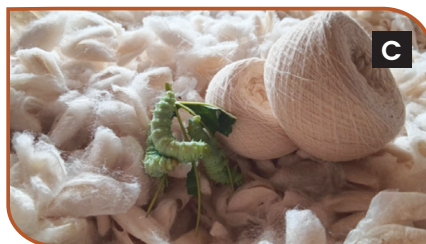




Appendix 5: Conference and Exhibitions Photo Gallery



Registration and Hospitality Team



- A. Spinning of Eri silk yarn and weaving it into silk products at Tosheka Textiles
- B. Eri silkworms reared in Tosheka Textiles rearing trays
- C. Eri silk cocoons and silk yarn at Tosheka Textiles



*Ms. Linda Mboya, Conference MC
at the Closing Ceremony*



*Conference Session
at the LLA*



*Conference Session at the
DNRR Seminar Room*



*Conference session with
Russian Delegates*



Fauna and Flora Exhibition Booth



*Mpala Research Centre Exhibition
Booth*



*Pre-conference Workshop Trainees and
Trainers*



*Session during the
Pre-Conference Workshop*



*Session during the
Pre-Conference Workshop*



*Conference session at the DNRR
Seminar Room*



*Student award oral presentation
judges*



*AKE Awardee during the
conference (Left)*



*AKE Founding members
during awards ceremony*



*AKEHF members during
awards ceremony*



*2nd Joint International Scientific
Conference Secretariat*



*Left: Liason Group Representative
Mr. Edward Kibuchi; Right: Nathan
Kiboi best male oral presenter*



awards



*Best student awardees with Judges
and Liaison Group Representatives*



*Conference Secretariat during the
SAJOREC visit*



Conference participants during the SAJOREC Visit



Conference participants during the SAJOREC Visit



Posters display during the Conference



Posters session with the Judges Dr. Ann Mwaura and Ms. Miriam Gathogo

Appendix 6: Conference Exhibitors



Prof. Esther Kioko, Conference Chair and Finance Committee



Affiliation: Principal Researcher, National Museums of Kenya; and Adjunct Associate Professor, Biology Department, University of Nairobi. An entomologist/environmentalist, she holds a PhD and an MSc in Agricultural Entomology and a second MSc in Environmental Management, with research experience in insect ecology, biodiversity/environmental assessments, and insect-based enterprises.

As the Conference Chair, she oversees all aspects of the conference, ensuring its scientific and organizational excellence. She also doubles as the Chair Financial Committee, overseeing the financial planning and management of the conference and ensuring effective allocation of resources, budgeting, and financial accounting and reporting.

Dr. Namikoye Samita, Coordinator, PEBCA Case Studies and Vice Chair, Finance Committee



Affiliation: Senior Lecturer, Kenyatta University, and Chair, Association of Kenyan Entomologists

Dr. Namikoye Samita is an accomplished entomologist and crop protection specialist with extensive experience in insect science and integrated pest management. She is passionate about mentoring and capacity building of the youth.

Together with the secretariat, she coordinated the overall planning and execution of conference activities and operations. As the AKE chair, she presided over the inaugural AKE Honours and Awards Ceremony, which recognized and celebrated the Society & founding members and conferred Fellowship awards upon distinguished professionals for their outstanding contributions to the advancement of entomology in Kenya.

Dr. Boniface Ngoka, Co-Chair, Conference Secretariat



Affiliation: Vice Chair, Association of Kenyan Entomologists

Dr. Ngoka is an entomologist in the agricultural field specializing in beneficial insects and environmental health science. He has remarkable research contributions and experience in promoting insect-based enterprises such as commercial insects to Integrated Pest Management (IPM) to enhance community livelihood, conserve biodiversity and protect degrading ecosystems. Dr. Ngoka serves as a co-chair of the conference secretariat and vice-chair of the Association of Kenyan Entomologists (AKE).

Dr. Paul Muigai Kirika, Chair, Logistics



Affiliation: Senior Research Scientist and Head of Botany, Department, East African Herbarium, NMK.

Dr. Kirika holds a Ph.D. in plant and fungal taxonomy. He is a member of the editorial board for the flora of Kenya project at EA. His special research focus is the study of lichens, including their diversity, systematics, phylogeny, biogeography, and evolution. Has contributed to over 50 scientific publications in international peer-reviewed journals and books. He has a keen interest in biodiversity conservation.

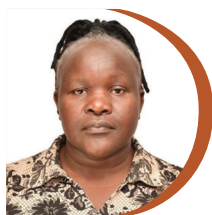
Mr. Eric Muthama, Co-Chair, Communications Committee



Affiliation: AKE, Student, Cambridge University, UK

Eric has an MSc in Crop Protection and is currently a postgraduate student at the University of Cambridge, UK. He is passionate about integrating science and sustainable agriculture to enhance crop yield and biodiversity. His interests extend to Agronomy, Entomology, IPM, Agroecology, policy and research, climate-smart agriculture and exploring sustainable agricultural practices for improved yield and climate change stewardship.

Dr. Philista Adhiambo Malaki, Chair of the Editorial Committee



Affiliation: Head of the Ornithology Section, National Museums of Kenya

Dr. Philista Malaki is a seasoned ornithologist and biodiversity scientist with more than 20 years of research and consultancy experience in avian ecology, biodiversity assessments, Environmental and Social Impact Assessments (ESIA), across East Africa. She has led and contributed to multi-disciplinary projects covering renewable energy developments, road infrastructure as well as community-based biodiversity conservation initiatives. Dr. Malaki, is responsible for ensuring quality control of abstracts, for both oral and poster presentations, overseeing the Student Awards, including the conference proceedings, the selection of keynote speakers, organizing sessions, and coordinating peer review processes to ensure high-quality presentations and discussions.

Dr. Beryl Bwong, Chair, Pre- Conference Training Committee



Affiliation: Research scientist and Head of the Herpetology Section at the National Museums of Kenya.

Her research interests are amphibians and reptiles' taxonomy, ecology, and conservation. She has published widely in peer-reviewed journals and also co- authored books on amphibians and reptiles of Kenya. Dr. Bwong was in charge of coordinating the 2026 pre-conference training.

Ms. Grace Mwende Kioko, Secretary and Co- Chair of Logistics



Affiliation: Research Scientist, National Museums of Kenya; Treasurer, Association of Kenyan Entomologists

Ms. Kioko is an arachnologist with over ten years of experience in biodiversity research, and biological

collections management. Her research focuses on the taxonomy, ecology, and conservation of arachnids and other arthropods. She has authored and co-authored more than ten peer reviewed scientific publications, including the first comprehensive checklist of spiders in Kenya, which represents a significant contribution to the documentation of the country's arachnid diversity. In the secretariat, she was co-chair logistics. With a keen eye for detail and a passion for excellent service, Ms. Kioko managed all logistics and hospitality arrangements. She ensured that all participants had a comfortable and enjoyable experience, from catering, accommodations to social events and overseeing all public related activities, including organizing for excursions.

Dr. Jane M. Macharia, Chair, Communications Committee



Affiliation: Senior Research Scientist, Head of the Wetlands and Marine Section, National Museums of Kenya.

With over two decades of experience in biodiversity conservation and environmental management, her work sits at the intersection of wetland ecology, community-based conservation, and sustainable development. In the conference preparation, she served as the communication sub-committee chair.

Front cover

Termite hill next to *Acacia tortilis* in Wajir County, Kenya (Paul Kirika)

Back Cover

1. African black tail scorpion, *Parabuthus liosoma*, Found in arid and semi-arid desert scrubs, savannahs, and grasslands. (Grace Kioko)
2. Red velvet mite, *Dinothrombium spp*, photographed in Naibunga Conservancy in Laikipia. (Namikoye Samita)
3. Forest spiny reed frog, *Afrizalus sylvaticus*; listed as Vulnerable (VU) by IUCN (Beryl Bwong)
4. Teita glider male butterfly, *Cymothoe teita*. Endemic to Taita Hills, listed as Endangered by IUCN. (Esther Kioko)
5. The dusty brown beetle or dusty maize beetle, *Gonocephalum simplex* a widespread agricultural pest across Africa. (Jane Macharia)
6. Great Blue Turaco, *Corythaeola cristata* is Africa's largest turaco restricted western tropical rainforests, photographed in Kakamega Forest National Reserve. (Philista Malaki)
7. Camel trap, *Gelrebia trothaei*. (Paul Kirika)
8. Flame lily, *Gloriosa superba*. (Paul Kirika)
9. Ochre Bush Squirrel, *Paraxerus ochraceus*. Photo taken at Mzima Springs (Simon Musila)



- ✉ scienceconference@museums.or.ke
- 🌐 <https://scientificconference.co.ke/>
- 📍 National Museums of Kenya
- ✉ P.O. Box 40658-00100 Nairobi, Kenya

ISBN: 9966-955-70-4

