



The 14th TAWIRI International Scientific Conference

06th – 08th December, 2023

AICC, ARUSHA-TANZANIA

CONFERENCE PROGRAMME

CONFERENCE THEME:

“Human-Wildlife Coexistence for
biodiversity conservation and socio-
economic development”.





**THE 14TH TAWIRI INTERNATIONAL SCIENTIFIC
CONFERENCE, 06TH – 08TH DECEMBER, 2023 AT ARUSHA
INTERNATIONAL CONFERENCE CENTRE, TANZANIA**

CONFERENCE THEME

***“Human-Wildlife Coexistence for biodiversity conservation
and socio-economic development”.***



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Organizing committee of the 14th TAWIRI International Scientific Conference 2023

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SPONSORS FOR THE 14TH TAWIRI SCIENTIFIC CONFERENCE 06TH - 08TH DECEMBER 2023

	<p>Administratively, the wildlife sector has divided its mandates into Central and Local Governments. The Central Government includes ministries, executive agencies, NCAA, TANAPA Parastatal organization and independent departments, while the Local Government includes District Councils, Wards and Village Councils. The role of Central Governments is to provide a clear national policy and regulatory framework to stimulate and promote the participation of various stakeholders in the implementation of policy, manage core wildlife protected areas and provide professional standards and technical assistance in conservation and utilization of resources.</p> <p>Contact: Director of Wildlife, P.O. Box 1351, Mtumba City, Dodoma Email: dw@maliasili.go.tz, https://www.maliasili.go.tz</p>
	<p>US government, through its international development agency, USAID, is one of the main bilateral development partners to Tanzania on various development aspects, including biodiversity.</p> <p>Contact: 686 Old Bagamoyo Road, Msasani. P. O Box 9130, Dar es Salaam, Tanzania; Email: infotanzania@usaid.gov, https://www.usaid.gov/tanzania</p>
	<p>United Asia Group (UAG) is passionate about property and has been making significant contributions to Melbourne's built environment since 1995. UAG is committed to excellence in the design and development of high-quality luxury projects. In recent years the shift into multi-unit high rise buildings has led to UAG being recognized as a developer that is synonymous with quality and luxury.</p> <p>Contacts: 881A High St, Armadale VIC 3143, Australia; Email: admin@uaggroup.com.au: http://www.uaggroup.com.au/</p>
	<p>The Six Rivers Foundation works within Iceland and Africa to promote the future protection of both invaluable places. The projects work with the local communities to develop small-scale, sustainable tourism to fund direct conservation research, and sensitive ways to protect and preserve them for the future.</p> <p>Contact: info@sixrivers.com, https://thesixriversfoundation.com</p>
	<p>Otterlo Business Corporation (OBC) is a foreign company with a mission of conducting tourist hunting, sustainable wildlife conservation, infrastructure improvement and community development in villages surrounding the hunting area. OBC supports the Tanzania Government initiative towards the protection of wildlife resources, through the provision of anti-poaching equipment for strengthening the patrolling activities.</p> <p>Contact: OBC at Kanisa Road Plot 84-Arusha: Email: otterlo@habari.co.tz</p>



World Wide Fund (WWF) for Nature Tanzania (WWF Tanzania) is a locally registered non-governmental conservation organization; an affiliate of the World-Wide Fund for Nature International (WWF). WWF has worked in Tanzania since 1962 striving to conserve wildlife and reduce human impact on the environment. From 2000, WWF TCO projects and programmes evolved to focus on integrated conservation and social development (livelihood) approach, Community-based natural resources management (CBNRM) and Landscape/ seascape planning.

Contacts: Plot No. 252 Kiko Street Mikocheni Dar es Salaam;
P. O. Box 63117, Tanzania,
tzrep@wwftz.org, <https://www.wwf.or.tz>



Tanzania People & Wildlife protects wildlife, invests in people, and restores balance to Africa's vital ecosystems through effective conservation action, applied science, and collective impact. We envision a world where Africa's people and wildlife coexist and thrive in vibrant, healthy landscapes.

Contacts: P. O. Box 11306 Arusha, Tanzania
Email: info@tanzaniapeoplewildlife.org
<https://www.tanzaniapeoplewildlife.org>



Arusha International Conference Centre is the leading conference venue in Tanzania 100% owned by the Government of Tanzania; with a total of 10 meeting rooms that cater for conferences, workshops, seminars, and committee meetings, with a seating capacity of 10 to 1000 delegates. Most of these rooms are equipped with Simultaneous Interpretation Systems (SIS) which can handle up to 12 languages.



Contacts: Barabara ya Afrika Mashariki;
P. O Box 3081; Arusha Tanzania
Email: md@aicc.co.tz, <https://www.aicc.co.tz>







Tanzania Tourist Board (TTB) is a government organization legally established by Tanzania Tourist Board act, CAP 364 of 1962 and amended by act No. 18 of 1992. The Board is mandated with promotion and development of all the aspects of tourism industry in Tanzania. It achieves its mandate through its Vision of "becoming the number one contributing sector to the GDP by the year 2025".

TTB, Mission is to promote sustainable tourism domestically and Internationally through innovative and dynamic awareness creation, in order to contribute significantly to the social – economic development of Tanzania.


Contact: Utalii House - Laibon street/Ali Hassan Mwinyi Road - Near French Embassy, P.O.Box 2485, Dar es Salaam, Tanzania.
Email: site.info@tanzaniatourism.go.tz,
<http://www.tanzaniatouristboard.com>

	<p>The Tanzania National Parks (TANAPA) is a parastatal corporation responsible for the management of Tanzania's national parks. It is governed by a number of instruments including the National Parks Act, Chapter 282 of the 2002 and the Wildlife Conservation Act No. 5 of 2009. TANAPA manages the 21 National Parks which covers approximately 15% of the land area and has the mandate to conserve and manage the wildlife in Tanzania, and to enforce the related laws and regulations in this industry. The first and foremost goal of TANAPA is to protect the wildlife and natural resources living within the parks.</p> <p>Contact: P.O Box 3134 Arusha - Tanzania Email: info@tanzaniaparks.go.tz, https://www.tanzaniaparks.go.tz</p>
	<p>The Nature Conservancy (TNC) is a global environmental nonprofit making organization working to create a world where people and nature can thrive. Founded in the U.S. through grassroots action in 1951, The Nature Conservancy has grown to become one of the most effective and wide-reaching environmental organizations in the world. TNC aims at conserving the lands and waters on which all life depends. To achieve this, they boldly address the biodiversity and climate crises over the next decade, by maximizing the ability to affect change between now and 2030, which can shape a brighter future for people and the planet.</p> <p>Contact: Plot # 16002 Mawalla Street, Arusha; P.O. Box 13265 Arusha, Tanzania Email: africa@tnc.org, https://www.nature.org</p>
	<p>The Grumeti Fund is a non-profit organization carrying out wildlife conservation and community development work in the western corridor of the Serengeti ecosystem in Tanzania. The mission of the Grumeti Fund is to collaboratively contribute to the conservation of the Serengeti ecosystem and the upliftment of local communities. Through active conservation Management, collaboration with local communities, technological innovations and the deployment of well-trained boots-on-the-ground, Grumet Fund is affecting tangible change and sustainable results.</p> <p>Contact: Western corridor of the Serengeti, Mara Region, Tanzania; Email: info@grumetifund.org, https://grumetifund.org</p>
	<p>Is a multiple land-use area and has global importance for biodiversity conservation due to the presence of globally threatened species, and the annual migration of wildebeest. Extensive archaeological research has yielded a long sequence of evidence of human evolution and human-environment dynamics, including early hominid footprints dating back 3.6 million years. The NCA is listed as an international Biosphere Reserve, inscribed as a UNESCO World Heritage Site boasting a remarkable blend of wildlife, archaeology, geography and people.</p> <p>Contact: P. O. Box 1, Ngorongoro, Email: cc@ncaa.go.tz; https://www.ncaa.go.tz</p>

	<p>Tanzania Wildlife Management Authority (TAWA), under the Ministry of Natural Resources and Tourism, is an autonomous public institution, responsible for undertaking administration and sustainable Management of Wildlife and other biodiversity resources outside National Parks and Ngorongoro Conservation Area. All Game Reserves, Game Controlled Areas and Open Areas, comprising of a total area of 169,553 km²</p> <p>Contact: TAFORI Building, P.O.Box 2658: Morogoro; Email: cc@tawa.go.tz, https://www.tawa.go.tz</p>
	<p>Jane Goodall Institute (JGI) is a not-for-profit organization registered in Tanzania. JGI operates three main projects in the country:- implements a long-standing chimpanzee and baboon research known as Gombe Stream Research Centre (GSRC) since 1960 (for chimpanzee research in Gombe National Park) Secondary to wildlife research is the Landscape Conservation in Western Tanzania (LCWT/TACARE), and a youth environmental education project known as Roots and Shoots (R&S) that provides youth forums for learning and acting on conservation by addressing people, animals and forests. R&S targets school youths by establishing environmental clubs and provides the opportunity for hands-on training.</p> <p>Contacts: P. O. Box 70728, Dar es Salaam - Tanzania Email: jgi-tanzania@janegoodall.or.tz, https://www.janegoodall.org</p>
	<p>Tanzania Forest Services Agency (TFS) is a semi-autonomous government Executive Agency. The Agency is mandated to sustainably undertake conservation, development and utilization of national forest and bee resources so that they contribute to the social, economic, ecological and cultural needs of present and future generations. The specific role and responsibilities of TFS are designed towards achieving efficient and effective management of forest and bee resources, promoting the potential for the continuous improvement of the quality and value for money on the delivery of public services.</p> <p>Contact: Box 40832 , Nyerere Road-Mpingo house, Dar.es Salaam-Tanzania: Email: mpingo@tfs.go.tz: https://www.tfs.go.tz</p>
	<p>Istituto Oikos and Oikos East Africa are two partner organizations that promote the protection of biodiversity and the sustainable use of natural resources as tools to fight against poverty. By conserving nature we guarantee health and wellness to current and future generations, boost the economic independence of vulnerable communities and tackle climate change.</p> <p>Contact: Haile Selassie Road, plot 165, House N 12; P. O. Box 1908 Arusha, Tanzania; contact@oikosea.org; http://oikosea.co.tz</p>

	<p>Tanzania Commission for Science and Technology (COSTECH) was established by the Act of Parliament No. 7 of 1986 as the successor to the Tanzania National Scientific Research Council (UTAFITI) as a parastatal organization with the responsibility of coordinating and promoting research and technology development activities in the country. It is the chief advisor to the Government on all matters pertaining to science, technology and innovation and their application to the socio-economic development of the country. COSTECH serves under the ministry responsible for science and technology. COSTECH is committed to coordinate, promote and facilitate science, technology and innovation in the country by meeting legal and customer requirements and even exceeding customer expectations.</p> <p>Contact: P.O. Box 4302, Ali Hassan Mwinyi Road, Kijitonyama (Sayansi) COSTECH Building, Dar es Salaam, Tanzania Email: info@costech.or.tz, https://www.costech.or.tz</p>
	<p>The College of African Wildlife Management (CAWM), Mwaka is the leading institution in professional and technical training in Wildlife and Tourism Management. The College is registered and recognized as a Centre of Excellence by the East African Community (EAC) and Southern African Development Community (SADC). Aims at providing the highest standards of technical training by engaging a global community and undertaking research and consultancies to meet the needs of wildlife and tourism management in Africa.</p> <p>Contact: P.o. Box 3031 Moshi - Tanzaniaia, Email: mweka@mwekawildlife.ac.tz https://www.mwekawildlife.ac.tz</p>
	<p>The Frankfurt Zoological Society (FZS) is an international conservation organization. The common goal is the conservation of wildlife and wilderness. They support partners practically, unbureaucratically, and for the long term. In Tanzania, FZS works with The Ministry of Natural Resources and Tourism to support the conservation of the Serengeti National Park, Mahale National Park and Nyerere National Park.</p> <p>Contacts: Post Office box: 14935, Arusha, Tanzania; Email: info.tz@fzs.org https://www.fzs.org/en/projects</p>
	<p>Is an oasis of tranquillity on Tanzania's gateway to major tourist destinations. The property offers uninterrupted views of Mount Meru, the second-highest mountain in Tanzania, after Mount Kilimanjaro and pristine landscaped private gardens overlooking the Golf Club. The Mount Meru Hotel is located only 45 minutes drive from Kilimanjaro International Airport (JRO), 20 minutes from Arusha Airport (ARK) and a 10-minute walk from the Arusha International Conference Centre (AICC), the historical Arusha Clock Tower, the German Boma and the Maasai Market Curios and Crafts.</p> <p>Contacts: Arusha-Taveta Road Sekei Area Arusha TZ, 2673, Tanzania, Email: info@mountmeruhotel.co.tz https://www.mountmeruhotel.co.tz</p>

	<p>An oasis within Arusha set out on 18 acres of beautiful landscaped coffee and tea plantations. Spectacular views of Mount Meru. A river runs through the property and there are several natural springs. A herb and vegetable garden is hidden between the plantations. Its ideal location makes it the perfect base for discovering the untamed natural beauty of Tanzania on safari.</p> <p>Contacts: P. O. Box Simeon Road P. O. Box 1184, Arusha Email: gran.melia.arusha@melia.com, https://www.melia.com/en/hotels/tanzania/arusha</p>
	<p>The Tanzania Association of Tour Operators (TATO) represents over 256 tour operators in the United Republic of Tanzania. It aims at providing a common and comprehensive position of the tourism industry in its relations with the Government and its institutions in matters related to the formulation of tourism policy, plans, and programs. TATO also aims at establishing and maintaining high quality and standards amongst its members. For safari and unique tourism experience in Tanzania kindly, contact TATO for recommendations.</p> <p>Contact: P. O. Box 6162, Arusha Tanzania Email: info@tatotz.org; https://sirili@tatotz.org</p>
	<p>Gadgetronix.Net is part of a renowned group of companies from Tanzania. It represents several well-recognized international companies in the pursuit of developing, testing and promoting clean energy technologies and their other services to empower individual Gadgetronix</p> <p>Contact: Old NSSF, Behind Manjis Metropole, P. O. Box 1116 Arusha, Tanzania. Email: info@blink.co.tz, https://gadgetronix.net</p>
 <p>THE AGA KHAN UNIVERSITY</p>	<p>Is a private University with a Vision of seeking to prepare individuals for constructive and exemplary leadership roles, and shaping public and private policies, through strength in research and excellence in education, all dedicated to providing meaningful contributions to society. Through its Vision, The Aga Khan University will be an autonomous, international institution of distinction, primarily serving the developing world and Muslim societies in innovative and enduring ways. To attain its Vision, The Aga Khan University's Mission is committed to the development of human capacities through the discovery and dissemination of knowledge, and application through service.</p> <p>Contact: Old NSSF, Behind Manjis Metropole, P. O. Box 1116 Arusha, Tanzania. Email: info@blink.co.tz, https://www.aku.edu</p>

	<p>Tanzania Forestry Research Institute (TAFORI) was established by Act No. 5 of 1980. Its history dates back to 1893 when the Germans established a 2.5 ha tree nursery near Dar es Salaam. The nursery tested over 270 species for tropical plantations, ornamental and other trees. There after, a Biological Agricultural Research Station was established at Amani in 1902 to undertake systematic test of indigenous (Juniper and Podo) and exotic (Cypress , Eucalypts, Teak and Black Wattle) tree species. A number of tree species tested, currently constitute major plantation tree species in Tanzania . Its Vision is “to be a centre of excellence in research for forestry and beekeeping development in in Tanzania” and to attai a mission of supporting forest and beekeeping development through conducting, coordinating, regulating research and dissemination of findings</p> <p>Contact; P.O. Box 1854, Morogoro. Email: tafori@tafori.or.tz, https://tafori.or.tz</p>
	<p>TEF is a locally managed elephant conservation NGO (not-for-profit) based in northern Tanzania. Believing in the importance of strong protected areas and the welfare of people living around their boundaries, we work with a range of partners towards long-term conservation for elephants. TEF’s work falls under three cross-pollinating categories: elephant research and monitoring, enhancing human-elephant coexistence through community-led conservation projects and education.</p> <p>Has a vision of becoming the premier organization in elephant conservation and human elephant coexistence in Africa with a mission of Promoting elephant conservation and coexistence between people and elephants</p> <p>Contact: P.O.Box 6502, Moshi, Kilimanjaro - Tanzania Email: info@tef.or.tz, https://www.tef.or.tz/</p>
	<p>Kenzan is a semi-permanent mobile camp strategically located every season in Serengeti National Park to give the guests a closer view of the migration.</p> <p>Is located witin the world’s greatest wildlife reserves and with unforgettable scenic beauty, Serengeti National Park, Tanzania a truly dream destination for everyone. Kenzan Camps and Safaris feature three intimate camps situated at exclusive sites of this park offering perfect settings for adventure seekers to enjoy one-of-a-kind experience with ample solitude and comfort.</p> <p>Contact: P.O.Box 1509, Arusha -Tanzania Email: info@kenzanwildlifesafaris.com; https://www.reservation@kenzanwildlifesafaris.com</p>



Tanzania Engineering and Manufacturing Design Organization, is a government Organization with a mission of promoting engineering design, technology development and enhancement of the competitiveness of local manufacturing enterprises through provision of quality technical support services. Its main functions are: To design and promote the designing of products and processes for Tanzania industry in accordance with national Industrial development Policy, adopt foreign design for machinery and equipment to suit local conditions of manufacture, use and maintenance and manufacture and develop prototypes and spares based on the designs produced by the organization as well as those which may be brought to the organization.

Contact: P. O. 6111, Arusha, Tanzania.

Email: dg@temdo.or.tz, <https://www.temdo.or.tz>



African Queen Adventures is a well established tours, travel and safari company with over 10 years experience in handling inbound and outbound holidays not only for domestic tourists but also international tourists from all over the world

Contact: Ingira Street, Arusha P.O. Box 13671 Arusha, Tanzania

Email: info@africanqueenadventures.com

<https://africanqueenadventures.com>



The Institute of Accountancy Arusha (IAA) is a parastatal educational institution under the Ministry of Finance and Planning originally established in 1987 to offer training for candidates aspiring to acquire National Board of Accountants and Auditors (NBAA) certification.

Contact: P. O. 6111, Arusha, Tanzania

Email: iaa@iaa.ac.tz, <https://iaa.ac.tz>



The Wildlife Conservation Society (WCS) is an international wildlife conservation organization with programs in more than 60 countries around the world, working in partnership with local and national governments, civil society and intergovernmental organizations. WCS designs and implements conservation programs that brings field-based scientific research to conservation design and policy decision-making.

Contact: P. O. 5196 Dar es Salaam, Tanzania

<https://tanzania.wcs.org>



KEYNOTE SPEAKERS



Dr. Julius Keyyu

Topic: Wildlife corridors: Status, threats and implications for sustainable biodiversity conservation and community livelihood in Tanzania

Dr. Keyyu is a Chief Research Officer and the Director of Research Development and Coordination at the Tanzania Wildlife Research Institute (TAWIRI) since 2006. Has 25 years of research experience on ecosystem and population health, especially wildlife diseases ecology. His research work has mainly been on ecological interactions at the human-livestock-wildlife interface using a One Health Approach on viral, bacterial, parasite and zoonotic diseases. Other areas of research engagement include biodiversity conservation, biodiversity and socio-economic surveys, Environmental and Social-Impact Assessment (ESIA), wildlife habitats connectivity especially corridors and population genetics. Has contributed to knowledge, science, technology and innovation through 80 papers in peer reviewed journals, including 3 papers in the journal of Science and currently 3 registered patents (two on hair loss prevention/hair growth promotion and one on skin lightening/wrinkle improvement).



Prof. Wineaster Anderson

Topic: Innovation and Technology for Conservation and Sustainable Tourism development

Prof. Wineaster Anderson (PhD) is the Deputy Vice Chancellor of the University of Dodoma responsible for Planning, Finance and Administration. Is a Professor of Marketing She was formerly a Dean of University of Dar es Salaam Business School and Director of Quality Assurance for the University of Dar es Salaam. She holds PhD (2008) and Masters (2005) in Tourism and Environmental Economics as well as MBA (2001) and Bachelor of Commerce (1999) in Marketing. Prof. Anderson has researched and published widely in the areas of international business, sustainable tourism, economics and marketing of tourism, poverty alleviation and gender.



Prof. Veldhuis, M. Paul

Topic: Human-wildlife coexistence: biodiversity as the basis for a sustainable future

Prof. Veldhuis, M. Paul is an Assistant Professor on fundamental principles in the organization of ecosystems at the Institute of Environmental Sciences, Leiden University, NL. Has a long working experience in savannah ecosystems in southern and eastern Africa for over 10 years enabling him to obtain the basis for understanding the complex interactions that shape savannah ecosystems. The innovative character made him to be recognized by the Royal Dutch Academy of Sciences (KNAW), but also by Leiden Science Faculty (Discoverer of The Year award 2020) and the British Ecological Society (Harper Prize 2014 for best paper by an early career). Has managed a number of international projects and published several paper in higher impacts journals including Science Journal

THE 14TH TAWIRI INTERNATIONAL SCIENTIFIC CONFERENCE,
06TH - 08TH DECEMBER, 2023

THEME: *“Human-Wildlife Coexistence for biodiversity conservation and socio-economic development”*.

GENERAL INFORMATION

Venue and Dates

The 14th TAWIRI International Scientific Conference takes place at the Arusha International Conference Centre (AICC), Arusha-Tanzania, along the East African Road, from 6th – 8th December 2023.

Contact Address

Headquarter, Njiro Road, Plot No. 213, Block “A”,
P. O. Box 661, Arusha - Tanzania
Tel.: +255 734 094646 / +255 27 254 9571 / 8240
Fax: +255 27 254 8240
E-Mail: barua@tawiri.or.tz
Website: www.tawiri.or.tz

Hospitality

Tanzanians are warm hearted, genuine, full of kindness, generosity and willing to help people visitors. They take pride in their hospitality and are known for their warmth and friendly welcome, often expressed through a traditional greeting of “Karibu” or “Welcome.” This greeting is not just a formality but is extended with genuine enthusiasm and reflects the country’s culture of hospitality.

Mobile Phone Policy

Delegates are advised to put their mobile phones either on silent mode or switched off during all Conference sessions.

The official language of the Conference is English.

Conference registration hours

Tuesday: 05th Dec. 2023: 10:00 – 17:00hrs
Wednesday: 06th Dec. 2023: 07:30 – 17:00 hrs
Thursday: 07th Dec. 2023: 07:30 – 17:00 hrs
Friday: 08th Dec. 2023: 07:30 – 13:00 hrs

Entry requirement for participants from outside Tanzania

A valid passport, three-month single-entry tourist visas are available at Tanzanian Embassies in your country. For more information, please visit www.tanzaniatourism.go.tz for country specific information.

Lost and Found

For lost and found personal belongings, please contact the Information Desk at the registration area. However, participants are encouraged to keep their belongings safe.

Name badge

Your name badge is your entrance ticket to all sessions. Please, always remember to wear your badge throughout the conference. Participants without name badges will be denied access to conference rooms/sessions. If you lose your badge, a new one will be provided against proof of your original registration.

WiFi/Internet connections

Wi-Fi will be available to all delegates. Participants will be informed of Wi-Fi access points during the conference.

Lunch and Coffee Breaks

Lunch and coffee/tea is included in the registration fee and will be served daily in the conference area.

Registration and conference payment

All participants are required to register and receive their conference materials at the reception. Registration will start on **Tuesday 5th December 2023 from 11:00 to 17:00hrs**. To avoid unnecessary delays on Wednesday 6th December 2023, all participants are requested to register a day before.

Dressing code

All participants are advised to wear uniforms provided during registration on the first day (Light blue T-shirts and caps) and second day (White T-shirts). Casual wear will be used on the third day of the conference.

Important: All participants are reminded to pay participation/registration fees before conference dates to avoid inconveniences and to allow smooth preparation of their conference materials. Ask for a ‘control number’ through conference2023@tawiri.or.tz for payment of registration fees.

Weather

The weather in Arusha during this time of the year is usually sunny with temperatures around 22-28°C. An umbrella might be useful as showers may occur.

Time Zone

The timezone in Arusha is GMT +3 Hours.

Banking

Banks and bureau de changes are available at the Airport and all major towns. Banks are open from Monday-Friday 8:30 to 15:00hrs and on Saturday from 8:30 to 13:30hrs. Several ATMs with multinational financial services are available in Arusha City, some are located near the conference venue-AICC.

Electricity current

The voltage in Tanzania is 220 volts AC 50Hz. Most of the sockets require three square pin plug.

Security

Tanzania is a safe country and politically stable, people are warm-hearted and generous, always eager to help visitors for their needs and get most of their stay in Tanzania. However, like in any other country reasonable precautions should be taken. Avoid walking alone at night and lock your valuables in your hotel safe. In case of any emergency, report to the nearest police station or call the Secretariat Mobile Number: +255 754 572 257.

Kilimanjaro International Airport

Kilimanjaro International Airport is the main gateway for tourists in Tanzania, connecting the Northern Tanzania tourism circuit to the world. Is located 40 km from Arusha City, it takes about one hour to reach by car. Facilities available at the Airport include banks, curio shops, bars, and restaurants. Shuttle bus services to Arusha City and Moshi town run regularly. Taxis are also available at reasonable prices. There is also Arusha Airport for people who will connect from Julius Nyerere International Airport (JNIA) in Dar es Salaam during the day. Arusha Airport is located about 6km from Arusha City Centre.

Accommodation

Arusha city is endowed with several accommodation facilities ranging from five-star hotels, lodges, guest houses to homestay. In case you need any assistance for booking kindly contact the Conference Organizing committee at conference2023@tawiri.or.tz or call the Secretariat Mobile Number: +255 754 572 257.

Safari booking and unique tourism experience in Tanzania

The conference venue is within reach of a number of attractions. The Tanzania Association of Tour Operators (TATO) represents over 256 tour operators in Tanzania to facilitate tourism safaris. TATO aims at establishing and maintaining high quality and standards to visitors amongst its members. For safari and unique tourism experience in Tanzania kindly, contact TATO for more information. P.O. Box 6162, Arusha Tanzania Tel: +255 2504188 Email:info@tatotz.org; sirili@tatotz.org

Excursion and sight-seeing

Arusha is an active African city, a starting point for safaris in the northern tourism circuit to visit Serengeti, Arusha, Lake Manyara, and Tarangire National Parks as well as Ngorongoro Conservation Area. As a destination for several safaris, there are a lot of attractions, to the Northeast lies the highest highest mountain in Africa, Mount Kilimanjaro (the roof of Africa), to the Western side, the ever-popular [Serengeti National Park](#), a home to many wildlife species including rhinoceros, zebras, gazelles, elephants, leopards, lions, giraffes; with the most anticipated annual [Great Migration](#), featuring millions of wildebeests crossing its plains.

The city is surrounded by several attractions that can be reached on a day trip, among many others include Arusha, Tarangire, Manyara National Parks, Ngorongoro Conservation Area and lake Natron. Other unique attractions within Arusha are Lake Duluti, which is a volcanic crater lake found in Mount Meru's foothill with numerous butterflies, reptiles, and primates, making it an ideal place for bird-watching and nature walk and guided canoe with the magnificent view of Mount Kilimanjaro and Mount Meru in the background. Meserani Snake Park provides a unique experience, a guided tour and learning about the world's dangerous and polite snakes from Puff Adders, Egyptian Cobra to Green Mamba and Black Mamba, and many more species.

Another important attraction and unique place to visit is the Natural History Museum which was established in 1987 to curate, and research on Tanzanian archaeological, paleontological, and paleoanthropological collections. The collections include Tanzanian birds and animals and the Olduvai Gorge, the Museum is located opposite the conference facility.

Cultural tourism centres located within the Arusha city forms an important product to tourist, visiting Mto wa Mbu, Ilkidinga, Mulala, and Ngiresi cultural heritage centres enriches visitors with more Tanzanian cultural values and a unique experience. Outside of Arusha, on the way to Moshi, you'll find the busy village of Usa River. This is a great place to take a tour and learn about Tanzanian village life and the vibrant culture in this area.

Masai Market at the heart of the City in Arusha, is a tourist area, a souvenir shopping area, you can buy great souvenirs, such as clothing, paintings, furniture, and jewelry at an affordable price.

Gemstones

Tanzanite is a beautiful blue/violet gemstone worldwide found only in Northern Tanzania. You can learn about the history of the stone in the museum at the [Tanzanite Experience](#) and buy certified jewellery.

Among the best-known tourist destinations in Arusha is the Cultural Heritage Centre, a vast magnificent property filled with larger-than-life sculptures that sells jewelry, handicrafts and fine art.

For those who wish to visit some of these attractions kindly visit the exhibition area in the conference area or you may contact the Secretariat at conference2023@tawiri.or.tz for assistance call the Secretariat Mobile Number: +255 754 572 257.

First Aid and Health checkup

Mount Meru Referral hospital is a government facility located opposite the Arusha International Conference Centre can be reached by walking. For more assistant kindly contact the Secretariat at conference2023@tawiri.or.tz for assistance call the Secretariat Mobile Number: +255 754 572 257

Certificate for conference participants

Certificates for conference participants can be collected at reception area.



THE 14TH TAWIRI INTERNATIONAL SCIENTIFIC CONFERENCE, 06TH - 08TH DECEMBER, 2023

MESSAGE FROM THE DIRECTOR GENERAL, TANZANIA WILDLIFE RESEARCH INSTITUTE (TAWIRI)



To our esteemed conference participants, on behalf of TAWIRI Management and the entire TAWIRI family, I am honoured to welcome you to the 14th TAWIRI International Scientific Conference which will be held at Arusha International Conference Centre from 6th – 8th December 2023. TAWIRI Scientific Conferences are Biennial events that aim at bringing together prominent and upcoming wildlife scientists, conservationists, development partners, policymakers, the private sector and the public from across the world to exchange information and experience on wildlife research and conservation. Research findings presented during the conference is one of the ways by which TAWIRI avails scientific information to stakeholders who are

charged with the responsibility for conserving our wildlife resources. Themes have been changing in each conference to reflect the status quo and prerequisites for wildlife conservation. This year the overarching conference theme is ***“Human-Wildlife Coexistence for biodiversity conservation and socio-economic development”***.

As aforementioned, the theme has been drawn to reflect the current global biodiversity challenges focusing on the Sustainable Development Goals and national development priorities among others. TAWIRI believes that scientific information has been the backbone of the country’s success story in wildlife conservation. Thus, more scientific information is needed to realize the future of our biodiversity richness and its role in supporting people’s livelihoods and contributing towards the country’s economic growth. Organizing a conference like this, is expensive and needs more resources and support from all partners. In this regard, let me take this opportunity to extend my sincere gratitude to all who played a significant role in supporting, planning and making this conference happen. Special thanks to the Ministry of Natural Resources and Tourism (MNRT), Organizing Committee, Keynote speakers, all presenters, conference sponsors, international organizations, service providers, media and conference participants, your support has made the conference a successful event this year.

I believe that this conference will be a memorable event for you, and you will use it for networking, provide recommendations and advice towards sustainable biodiversity conservation and for improvement of livelihood. On behalf of TAWIRI Management, I am humbly welcoming you and wishing you successful participation in the 14th TAWIRI International Scientific Conference.

A handwritten signature in blue ink, appearing to read 'E. Mjingo', written in a cursive style.

Dr. Eblate E. Mjingo
DIRECTOR GENERAL

**THE 14TH TAWIRI INTERNATIONAL SCIENTIFIC CONFERENCE,
06TH - 08TH DECEMBER, 2023**

MESSAGE FROM THE ORGANIZING COMMITTEE

The Organizing Committee of the 14th TAWIRI International Scientific Conference welcomes you to this Scientific Conference that has brought scientists and conservationists from all over the world. The Conference brings together a wide range of wildlife scientists, policymakers, conservationists/ wildlife managers, development partners, Non Governmental Organisations (NGO) and Civil Society Organisations to present their research findings so that management of natural resources can be based on sound scientific information at the national and international levels. During the conference, there will be keynote addresses, oral and poster presentations as well as organized symposium, seminars, round table discussions and exhibition of conservation activities that aim at addressing the main conference theme and sub-themes. The conference presentations will address current wildlife conservation challenges and propose solutions and recommendations especially issues of increased human-wildlife conflicts as a result of population growth that is coupled with increased demand of land for cultivation, settlement, mining, infrastructure development and livestock grazing in protected areas as well. Moreover, recommendations generated from this conference are expected not only to enhance biodiversity conservation but also to devise ways on how better communities can rationally and sustainably benefit from natural resources for livelihood improvement. We highly appreciate your attendance and support during this conference.

“KARIBUNI SANA”.

Organizing committee members;

- | | |
|--------------------------|------------------|
| 1. Dr. Julius Keyyu | Chairperson |
| 2. CPA Harold Basinda | Vice-Chairperson |
| 3. Dr. Janemary Ntalwila | Secretary |
| 4. Mr. Mwita Machoke | Member |
| 5. Mr. Brian Maganga | Member |
| 6. Mr. Rogastian Msafiri | Member |
| 7. Ms. Neema Kilimba | Member |



THE 14TH TAWIRI INTERNATIONAL SCIENTIFIC CONFERENCE

PROGRAMME FROM 06th-08th DECEMBER 2023

TUESDAY- PARTICIPANTS REGISTRATION			
DATE	TIME	Event/Activity	VENUE
5/12/2023	10:00-17:00	Participants Registration	AICC- Reception area

DAY ONE-WEDNESDAY					
DATE	TIME	Event/Activity			
6/12/2023	07:00– 08:30	Participants Registration -			Reception area
	08:30-09:00	House keeping and logistics			Simba Hall
	09:00-10:00	Arrival of the the Guest of Honour and Exhibition Visitation			
	10:01-10:10	Introducing delegates			
	10:11-10:30	Key Note Messages from Sponsors (USAID-Tanzania, Tanzania People & Wildlife, United Asia Group, Six Rivers Africa, Otterlo Business Coparation and WWF Tanzania			
	10:31-11:10	Plenary presentation Paper 1: Dr. Julius Keyyu: Wildlife corridors: status, threats and implications for sustainable biodiversity conservation and community livelihood in Tanzania			
	11:31-12:10	OPENING CEREMONY			
	12:11: 12:30	Presentation of Awards and Launching of TAWIRI documents			
	12:31 -12:50	GROUP PHOTO			
	12:51 -13:00	LOGISTICS			Simba Hall
	13:01 –14:00	LUNCH BREAK			
	14:01– 16:30	Parallel session 1: Simba Hall	Parallel session 2: Oldonyo Lengai	Parallel session 3: K 204 Hall	Parallel session 4: K 222 Hall
	16:30-17:00	HEALTH BREAK			
	17:00 –18:00	Symposium 1: Simba Hall	Seminar 1: Oldonyo Lengai		Workshop 1: K 204 Hall
19:00-21:00	EVENING GATHERING AND NETWORKING				

DAY TWO-THURSDAY

DATE	Time	SIMBA Hall			
7/12/2023	8:30 – 9:15	Plenary presentation Paper 2 Prof. Wineaster Anderson: Technology development on enhancement of wildlife conservation and tourism.			
	9:20- 10:30	Parallel session 5 Simba Hall	Parallel session 6 Oldonyo Lengai	Parallel session 7 K 204 Hall	Parallel session 8 K 222 Hall
	10:31 –11:00	HEALTH BREAK			
	11:01 –13:00	Parallel session 5 Simba Hall	Parallel session 6 Oldonyo Lengai	Parallel session 7 K 204 Hall	Parallel session 8 K 222 Hall
	13:01 –14:00	LUNCH BREAK			
	14:01 –16:00	Parallel session 5 Simba Hall	Parallel session 6 Oldonyo Lengai	Parallel session 7 K 204 Hall	Parallel session 8 K 222 Hall
	16:30-17:00	HEALTH BREAK			
	17:01-18:00	Workshop 2 Simba Hall		Symposium 2 K 204 Hall	Seminar 3 K 204 Hall
	END OF DAY 2				



DAY THREE FRIDAY -THURSDAY

DATE	Time	SIMBA Hall			
8/12/2023	8:30 – 9:15	Plenary presentation:- Paper 3 Prof. Michiel Veldhuis: Human-wildlife coexistence: biodiversity as the basis for a sustainable future			
	9:20 - 10:30	Parallel session 9 Simba Hall	Parallel session 10 Oldonyo Lengai	Parallel session 11 K 204 Hall	Parallel session 12 K 222 Hall
	10:31 –11:00	HEALTH BREAK			
	11:01 -13:00	Parallel session 9 Simba Hall	Parallel session 10 Oldonyo Lengai	Parallel session 11 K 204 Hall	Parallel session 12 K 222 Hall
	13:01-14:00	LUNCH BREAK			
	14:01-15:00	Parallel session 9 Simba Hall	Parallel session 10 Oldonyo Lengai	Parallel session 11 K 204 Hall	Parallel session 12 K 222 Hall
	15:01 -15:40	Simba Hall: Key Message: TAWIRI Wildlife Cencus			
	15:41 -16:00	Simba Hall: RESOLUTIONS			
	16:00 -16:30	HEALTH BREAK			
		16:31-17:00	CLOSING REMARKS		
		END OF THE 14TH TAWIRI INTERNATIONAL CONFERENCE			
		ASANTE SANA, SEE YOU IN 2025			

POST CONFERENCE EVENT

DATE	TIME	Activity	Organizer	VENUE
Saturday 9/12/2023	09:00-16:00	Training workshop on Designing questionnaires For conservation	Bangor University, UK Freya St John, Harriet Ibbett & Leejiah Dorward	TAWIRI Board room



DAILY PROGRAMME

PRE-CONFERENCE EVENTS TUESDAY 5TH DECEMBER 2023

Time	Activity /Symposium	Location/Venue	Responsible
10:00-17:00	Participants arriving & Registration	AICC – Reception registration desk	Organizing Committee

DAY ONE WEDNESDAY 6TH DECEMBER 2023

EVENTS/PRESENTATIONS: SIMBA HALL				
S/N	Time	Event/Paper	Responsible	Chairperson
	08:00 –08:30	Participant Registration Visitation	Organizing Committee	Moderator
	08:30 – 9:00	Housekeeping and Logistics	Moderator	Moderator
	09:00 - 10:00	Guest of Honour arrival and Exhibition Visitation	Organizing Committee	Moderator
	10:00-10:10	Introduction of Deligates	Moderator	Moderator
	10:11-10:30	Key note Messages	Sponsors (USAID- Tanzania, Tanzania People & Wildlife, United Asia Group, Six Rivers Africa, and WWF Tanzania	Moderator
1.	10:31-11:10	Plenary presentation Paper 1 Wildlife corridors, status, threat and implication for sustainable biodiversity conservation and community livelihood in Tanzania.	Dr. Julius Keyyu	Prof. Noah Sitati
	11:11-12:10	OPENING CEREMONY	Guest o Honour	Moderator
	12:11-12:30	Awards – presentation and Launching of TAWIRI documents	Guest of Honour	Moderator
	12:31 -12:50	GROUP PHOTO	All	Moderator
	12:50 - 13:00	LOGISTICS	Organizing Committee	Moderator
	13:00 -14:00	LUNCH BREAK		

**DAY ONE 6th DEC. 2023: AFTERNOON-PARALLEL SESSION 1:
SIMBA HALL**

SUB-THEME: Human-Wildlife Interactions

S/N	Time	Paper	Presenter	Chairperson
2.	14:00-14:20	Using social and biodiversity sciences to co-design restoration for biodiversity and people in the Kilombero Valley, Tanzania	Marion Pfeifer et al	Dr. Allan H. Kijazi
3.	14:21-14:40	The role of social values and time preference on biodiversity conservation: A case of ecological corridors of Tanzania	Qambemeda. Nyanghura et al	
4.	14:41-15:00	Influence of deforestation and drought on human-elephant conflict intensity	María M.Botey et al	
5.	15:01-15:20	Characterizing Elephant Use of Human dominated Landscapes in the Greater Serengeti Ecosystem	Lollian Kosyando et al	
6.	15:21-15:40	Human-wildlife conflict and the role of emerging innovative policy and institutional frameworks: the case of zimbabwe	Never Muboko et al	
7.	15:41-16:00	Wildlife and trees distribution, vegetation change and their potential to support investment in transforming lives of surrounding communities in nyonga	Siima Bakengesa et al	
8.	16:01-16:20	Assessing the societal benefits of the mngeta wildlife corridor restoration program using the ecosystem services approach	Nangware Msofe et al	
	16:21-16:30	Key Messages	Tanzania Forest Services Agency	
	16:30–17:00	HEALTH BREAK		
	17:01-18:00	Symposium 1: Non-<i>Apis</i> Pollinators in Tanzania: Stingless and Solitary Bees Organizers: AgaKhan University		
9.	17:01-17:10	Climate Change and Community Resilience in Tanzania	Emmanuel Sulle et al.	Allen Richard
10.	17:11-17:20	Solitary Bees and Wasps in Avocado	Kathrin Krausa et al.	
11.	17:21-17:30	What new technologies or techniques to build a national collection of insects?	Alain Pauly et al.	
12.	17:31-17:40	Effectiveness of sampling designs for assessing insect diversity in Njiro Urban forest	Neema Kilimba et al.	
13.	17:41-17:50	BEEtopia	Warren Steyn et al.	
END OF DAY ONE				

NYASA HALL: EVENING SCIENTIFIC GATHERING AND NETWORKING			
19:00-19:30	Key Messages	Wildlife Division, Tanzania National Parks, Jane Goodall Institute, Ngorongoro Conservation Area Authority, Gurumet Fund, Frankfurt Zoological Society and Tanzania Wildlife Management Authority	
19:31-20:00	Award Presentations	TAWIRI	
20:01-21:30	Dinner and Networking	Moderator	

DAY ONE 6 th Dec. 2023: AFTERNOON PARALLEL SESSION 2: OLDONYOLENGAI HALL				
SUB-THEME: Vegetation Ecology, Invasive Species and habitat Conservation				
S/N	Time	Paper	Presenter	Chairperson
14.	14:00-14:20	Understanding and managing rangeland degradation in Northern Tanzania.	Rob Critchlow et al	Dr. Laly Lichtenfeld
15.	14:21-14:40	The effect of temperature and precipitation on native and non-native herbaceous flowering plants' abundance across elevation zone in the Tarangire-Manyara Ecosystem	Rosalie Ross et al	
16.	14:41-15:00	First record of thermophilization in Afromontane forests	Emanuel H. Martin et al	
17.	15:01-15:20	The role of herbarium and its database in plant diversity conservation	Immaculate Kileo Constatine et al	
18.	15:21-15:40	The effects of extreme climate on the invasive plant <i>Gutenbergia cordifolia</i> : implications for its future management in savannah ecosystems	Herieth-Nyarobi et al	
19.	15:41-16:00	Land titling as tool to support realizations of land use plans in Vikonge village in western Tanzania	Fadhili Mlacha et al	
20.	16:01-16:20	<i>Calotropis procera</i> (Apocynaceae) invasion on wildlife foraging rangelands in Ruaha National Park	John Bukombe et al	
	16:21-16:30	Key Message	College of African Wildlife Management	
	16:30-17:00	HEALTH BREAK		
		Seminar 1: Climate change analysis		
		Organizers: The Nature Conservancy		
	Time	Title	Organizer	Chairperson
21.	17:01-18:00	A climate change analysis of selected wildlife management areas and municipal districts in Northern Tanzania	The Nature Conservancy	Exper Pius
END OF DAY ONE				

NYASA HALL: EVENING SCIENTIFIC GATHERING AND NETWORKING			
19:00-19:30	Key Messages	Wildlife Division, Tanzania National Parks, Jane Goodall Institute, Ngorongoro Conservation Area Authority, Gurumet Fund, Frankfurt Zoological Society and Tanzania Wildlife Management Authority	
19:31-20:00	Award Presentations	TAWIRI	
20:01-21:30	Dinner and Networking	Moderator	

DAY ONE 6 th Dec. 2023: AFTERNOON PARALLEL SESSION 3: K 204 Hall				
SUB-THEME: Wildlife Ecology and Ecological Interactions				
S/N	Time	Paper	Presenter	Chairperson
22.	14:00-14:20	Carnivore population trends in MBOMIPA WMA: Highlighting an important wildlife area in the Ruaha-Rungwa landscape	Joseph F. Kaduma et al.	Prof. Florah Magige
23.	14:21-14:40	Re-assessment of chytridiomycosis disease in the Kihansi gorge spray wetlands in Tanzania	Devolent Mtui et al.	
24.	14:41-15:00	Dynamics of herbivore distribution and habitat selection in the Greater Serengeti Ecosystem, Tanzania	Hamza K Kija et al.	
25.	15:01-15:20	Habitat selection and use patterns by African lion (<i>Panthera leo</i>) across a multiuse landscape connecting subpopulations in the Ngorongoro Conservation Area, Tanzania	Ingela Jansson et al	
26.	15:21-15:40	Female transfer in olive baboons at Gombe.	Marini Bwenda et al	
27.	15:41-16:00	Dry season water use by mammals in viramba baboons range, Mikumi national park	Samuel Mtoka et al	
28.	16:01-16:20	Home range and survival probability of two dominant rodent species on the slopes of mount Kilimanjaro, Tanzania	Suzana M. Thomas at al	
	16:20-16:30	Key Messages in Simba, Oldonyo Lengai and K 222 Halls		
	16:30–17:00	HEALTH BREAK		
29.	17: 01-8:00	Seminar 2: Influence of Deforestation on increased HEC		
		Organizers: GIZ		
		Title	Organizer	Chirperson
		Influence of deforestation and drought on human elephant conflict intensity	GIZ	Dr.Emmilian Kihwele
END OF DAY ONE				

NYASA HALL: EVENING SCIENTIFIC GATHERING AND NETWORKING			
19:00-19:30	Key Messages	Wildlife Division, Tanzania National Parks, Jane Goodall Institute, Ngorongoro Conservation Area Authority, Gurumet Fund, Frankfurt Zoological Society and Tanzania Wildlife Management Authority	
19:31-20:00	Award Presentations	TAWIRI	
20:01-21:30	Dinner and Networking	Moderator	

**DAY ONE 6th Dec. 2023: AFTERNOON PARALLEL SESSION 4:
K 222 Hall**

SUB-THEME: Water resources and wetland conservation, climate change and Vegetation Ecology, Invasive Species and habitat Conservation

S/N	Time	Paper	Presenter	Chairperson
30.	14:00-14:20	Human Migration into Rufiji Delta Wetlands as Climate Change Adaptation Strategy: Effects and Mitigation Measures	Emmanuel Mwainunu et al	Dr. Victor Kakengi
31.	14:21-4:40	Woody vegetation structure, floristic composition and species richness along the elevation gradient of Mt. Meru, Tanzania	Julius V. Lasway et al	
32.	14:41-5:00	Strategies of Rural Women in Coping with Effects of Climate Change in North Tanzania	Charles Raphael et al	
33.	15:01-5:20	The impacts of anthropogenic activities on the Physicochemical water quality of Pinyinyi River around Lake Natron Ramsar Site, Arusha-Tanzania	Omary Rajabu R et al	
34.	15:21-5:40	Assessment of the mangrove degradation and community involvement in its restoration at Mtwara-Mikindani Municipal Council, Mtwara Region	Emmanuel Patroba Mhache et al	
35.	15:41-6:00	Tracking establishment and spreading of an Invasive Tree Prosopis juliflora in Tanzania	John R. Mbwambo et al	
36.	16:01-6:20	A land systems data product for biodiversity and socio-economic analysis	Lazaro Johana Mangewa et al	
Workshop 1: Organizer: Frankfurt Zoological Society				
37.	17:00-18:00	Promoting coexistence between wildlife and the communities in the Western Serengeti: addressing the symptoms and causes of human wildlife conflicts	FZS	Dr. Stephen Nindi

	16:21-16:30	Key Message	Tanzania Forest Research Institute
	16:30–7:00	HEALTH BREAK	
		Symposium Simba Hall; Seminars in Oldonyolengai and K 204	
END OF DAY ONE			
NYASA HALL: EVENING SCIENTIFIC GATHERING AND NETWORKING			
	19:00-19:30	Key Messages	Wildlife Division, Tanzania National Parks, Jane Goodall Institute, Ngorongoro Conservation Area Authority, Gurumet Fund, Frankfurt Zoological Society and Tanzania Wildlife Management Authority
	19:31-20:00	Award Presentations	TAWIRI
	20:01-21:30	Dinner and Networking	Moderator

DAY TWO: THURSDAY 07TH DECEMBER 2023

KEY MESSAGES: SIMBA HALL				
S/N	Time	Paper	Presenter	Chairperson
	08:20-08:30	Key Message	Otterlo Business Coparation, Tanzania Association of Tour Operators and The Nature Conservancy	Moderator
MORNING SESSION: PRENARY PRESENTATION PAPER 2				
38.	08:30-09:15	Innovation and Technology for Conservation and Sustainable Tourism development	Prof. Wineaster Anderson	Prof. Han Oloff
MORNING PARALLEL SESSION 5: SIMBA HALL				
SUB-THEME: Wildlife Ecology and Ecological Interactions				
S/N	Time	Paper	Presenter	Chairperson
39.	09:20-09:40	Are wildebeest movement patterns triggered by rainy clouds?	Boyers, M. et al	Dr. Emmanuel Sulle
40.	09:41-10:00	Population density of lion and leopard in the Selous-Nyerere landscape	Leonard Haule et al.	
41.	10:01-10:20	Ecological conditions, wildlife distribution and anthropogenic disturbances in the Selous-Niassa Wildlife Corridor, Tanzania	Hamza Kija et al	
42.	10:21-10:40	The need for establishing Rangeland Management Areas (RMAs) in Tanzania	Han Oloff at el.	
10:40–11:00 HEALTH BREAK AND POSTER PRESENTATION				
43.	11:01-11:20	Genetic evidence of population subdivision among Masai giraffes separated by the Gregory Rift Valley in Tanzania	George G. Lohay et al.	Dr Marion Pfeifer

44.	11:21-11:40	Drivers of Rodent Community Structure in an Urban National Park, Kenya	Immaculate M. et al Mungai	
45.	11:41-12:00	Elephant Conservation at the Cross Road	Edward Kohi et al	
46.	11:45-12:00	Spatio-temporal distribution of Tsetse and Human Infective Trypanosomes in Serengeti National Park, Tanzania.	Idrissa S. Chuma et al	
47.	12:01-12:20	Genetic status of the African lion (Panthera leo) in the Ngorongoro Conservation Area including the high-density population in the Ngorongoro Crater, Tanzania	Ingela Jansson et al	
48.	12:21-12:40	Moon phase and season alter road use by lions	Stanslaus B. Mwampeta et al	
49.	12:41-13:00	Application of stable isotope ratio analysis to study movement and dietary preferences of migratory ungulates	Zabibu Kabalika et al.	
13:00 - 14:00 LUNCH BREAK				
50.	14:00-14:20	Behavioural responses to human-mediated risk in African savanna elephants	Josephine B. Smit et al.	Noel Mbisse
51.	14:21-14:40	Artificial Intelligence for Smart Wildlife Conservation in Africa: A Transformative Approach	Maliaki, L et al,	
52.	14:41-15:00	Promoting Coexistence and Addressing Conflict between Humans and Carnivores in the Eastern Serengeti	Franco Mbise et al,	
53.	15:01-15:20	Migratory routes, home range sizes and site fidelity of GPS satellite collared Western White Bearded Wildebeest in the Serengeti-Mara Ecosystem	Benjamin Chow-Battersby et al	
54.	15:21-15:40	An update on African wild dog status in Selous-Nyerere	Singira N. Parsais et al.	
55.	15:41-16:00	Is the new generation of Tanzanian captively bred spray toads able to locate local prey in the wild?	Devolent Mtui et al.	
56.	16:01-16:20	Vehicle-wildlife collision monitoring through a citizen science approach	Julie Courret et al.	
	16:21-16:30	Key Mssage	Tanzania Tourist Board & Aga Khan University	
16:31– 17:00 HEALTH BREAK AND POSTER PRESENTATION				
17 :00-8 :00 Poster Presentations at display area				
57.	17 :00-18 :00	Seminar 2: Trends in HEC in Ngorongoro Conservation Area		
		Organizers: Tanzania People and Wildlife		
		Title	Presenter	Chairperson
		Trends in Human-Elephant Conflict in the NCA and Surrounding Communities	Yamat Lengai et al.	Dr. Josephine Smit
END OF DAY TWO				

DAY TWO 7th Dec. 2023: MORNING PARALLEL SESSION 6 OLDONYO LENGAI HALL				
SUB-THEME: Ecosystem health and wildlife diseases				
S/N	Time	Paper	Presenter	Chairperson
58.	09:20-09:40	Treatment response of Giraffe Skin Disease (GSD) to Ivermectin, Antibiotic and their combination in Ruaha National Park	Julius Keyyu et al.	Dr. Robert Fyumagwa
59.	09:41-10:00	Efficacy of bio-acaricide for management of ticks in domestic and wild animals in Ngorongoro conservation area	Never Zekeya et al.	
60.	10:01-10:20	Zoonotic Disease Risk Analysis Along the Game Meat Trade Value Chain in Northern Tanzania	Mdetele et al.	
61.	10:21-10:40	Crimean-congo haemorrhagic fever virus in Tanzania: A one health investigation into a tick-borne zoonosis	R.F. Bodenham et al.	
10:40-11:00		HEALTH BREAK AND POSTER PRESENTATION		
62.	11:01-11:20	Biodiversity and distribution of flea (Siphonaptera), rodent (Rodentia), and Crocidura (Insectivore) species associated with plague epidemiology in eastern	Stanley S. Nyirenda et al.	Dr. Katharine Thompson
63.	11:21-11:40	Malignant catarrhal fever vaccination and large-scale perturbations impact pastoralist livestock habitat use and risk-resource trade-offs	Sam Bainbridge et al.	
64.	11:41-12:00	Effect of ivermectin® on intestinal helminths in multimammate mouse (<i>Mastomys natalensis</i>)	C Thomas et al.	
65.	11:45-12:00	Prevalence of <i>Campylobacter</i> and <i>Brucella</i> species isolated from a diversity of rodent in Kasulu district, Tanzania.	Baby Asenga et al.	
66.	12:01-12:20	Traumatic Ventriculitis in an Adult Ostrich: A case report from Dodoma, Tanzania	Mikidadi Mtalika et al.	
67.	12:21-12:40	Assessing the Role of Domestic Dogs and Wildlife in Rabies Transmission: A study in Southeast Tanzania and its Impact in Control Measures	Kennedy Lushasi et al.	
68.	12:41-13:00	Parasite Resource Bank: Understanding of Parasite Research Resources	Barakaeli Ndossi et al.	
13:00 - 14:00		LUNCH- BREAK		

AFTERNOON PARALLEL SESSION 6: OLDONYO LENGAI HALL

SUB-THEME: Tourism Development and diversifications for social-economic development

S/N	Time	Paper	Presenter	Chairperson
69.	14:00-14:20	Leveraging Tourism Potentials of “the Past” in Tanzania	Noel B.Lwoga et al.	Timoth Mdinka
70.	14:21-14:40	SWOT analysis for apitourism potential in southern Tanzania	Jerome Kimaro et al.	
71.	14:41-15:00	Leeway of developing wine tourism in Tanzania: The prospective opportunities and challenges	Neema Sabulaki et al.	
72.	15:01-15:20	Effect of tourism industry on conservation of Saa Nane island national park in Mwanza	Prisca N. Kahangwa et al.	
73.	15:21-15:40	Local Inclusion in Tanzanian Tourism: A comparison of Coastal and Southern Circuit	Nelly Maliva et al.	
74.	15:41-16:00	Experiences, Enjoyment and Novelty in National Parks	Kezia H. Mkwizu	
75.	16:01-16:20	Corporate Social Responsibility Practices by Tanzania Tour Operators: A local Community Perspective.	Musa Bajuni et al.	
76.	16:21-16:40	Diet composition and niche overlap of four sympatric rodents; <i>Beamys hindei</i> , <i>Grammomys cometes</i> , <i>Lophuromys machangui</i> and <i>Praomys delectorum</i> inhabiting mount rungwe forest nature reserve”	Upendo Richard et al.	
	16:41– 17:00	HEALTH BREAK AND POSTER PRESENTATION		
	17 :00-18 :00	Seminar and Poster presentations		
		Workshops and Symposiums in Simba, K204 and K 222 Halls		
E N D O F DAY TWO				



**DAY TWO 7th Dec. 2023: MORNING PARALLEL SESSION 7
K 204 Hall**

SUB-THEME: Wildlife ecology and ecological interactions

S/N	Time	Paper	Presenter	Chairperson
77.	09:20-09:40	Persistence of lions <i>Panthera leo</i> groups in unprotected landscapes adjacent to Selous Game Reserve and Nyerere National Park, southeastern Tanzania.	Ikanda, D	Dr. Alex Kisingo
78.	09:41-10:00	Unveiling the Enigmatic Rungwecebus Kipunji: The Untold story behind its conservation setbacks.	Philipo Jacob	
79.	10:01-10:20	Habitat Inversion due to Habitat Invasion: More Wildlife within Settlements than in the Wild and on Farms	Emmanuel F. Nzunda	
80.	10:21-10:40	Using mixed methods to measure topic sensitivity in conservation	Harriet Ibbett	
	10:40 - 11:00	HEALTH BREAK AND POSTER PRESENTATION		
81.	11:01-11:20	Habitat suitability modeling for sustainable conservation of the endangered red colobus in lower Tana River Delta, Kenya	Johnstone Kimanzi	Dr. Maurus Msuha
82.	11:21-11:40	Restoring grazing value for livestock and wildlife through fire. The case of Loliondo plains in the eastern part of Serengeti-Mara Ecosystem.	Fred V.Ledidi	
83.	11:41-12:00	Annual home range sizes and movement behaviour of African elephant in Ngorongoro Conservation Area	Donatus Gadiye	
84.	11:45-12:00	Potential threats at the Amani- Nilo Corridor in East Usambara, Tanga, Tanzania.	Elifuraha E Njoghomi	
85.	12:01-12:20	Decoding the Major Factors Behind Active Wildfire Occurrences in Woodland Ecosystems Using Remote Sensed Data and GIS Analysis Techniques.	Baraka Naftal	
86.	12:21-12:40	Perceptions of the community on Indian house crow (<i>Corvus splendens</i>), its potential impacts and the way forward	Theresia Ndanu	
87.	12:41-13:00	Breeding population, success, and nesting preferences of the critically endangered White-backed vulture (<i>Gyps africanus</i>) in Western Serengeti, Northern Tanzania	Vainess Laizer	
	13:00-4:00	LUNCH- BREAK		

AFTERNOON PARALLEL SESSION 7 K 204 Hall

SUB-THEME: Human wildlife Interactions

S/N	Time	Paper	Presenter	Chairperson
88.	14:00-14:20	Extending Serengeti National Park to Lake Victoria: ecological opportunities and challenges	Yustina A. Kiwango	Dr. Ezekiel Dembe
89.	14:21-14:40	Dry season hourly motorcycles activity patterns during the day in villages adjacent to northwestern Serengeti ecosystem, Tanzania	Julius William Nyahongo	
90.	14:41-15:00	Environmental Resources and Economic Growth: Accounting for Environmental Resources in Tanzania: A Theoretical Review	Odass Bilame and Janemary Ntalwila	
91.	15:01-15:20	Challenges, Opportunities and Involvement of Local Communities in conservation of the Mount Rungwe Nature Forest Reserve	Naza E. Mmbaga	
92.	15:21-15:40	The role of procedural fairness in encouraging compliance with protected area rules	Freya St John	
93.	15:41-16:00	The Magnitude and Patterns of Human-Wildlife Conflicts in Villages surrounding Mkomazi National Park, Northern Tanzania	Kwaslema Malle Hariohay	
94.	16:01-16:20	Peoples' Awareness, Consumption and Socio-Cultural Barriers Towards Entomophagy as Climate-Smart Protein Source in Morogoro Region, Tanzania.	Nalaila J	
95.	16:20-16:40	Conservation benefit-sharing mechanisms and their effectiveness in the Greater Serengeti Ecosystem: Local communities' perspectives	Juma J. Kegamba	
	16:41 –17:00	HEALTH BREAK AND POSTER PRESENTATION		
	17 :01-18 :00	Symposium: REGROW Project Oragnizer: Tanzania Wildlife Research Institute		
		Title	Presenter	Chairperson
96.	17 :01-17 :10	Enhancing Tourism through Wildlife Research in southern Tanzania	Bukombe, J.	Dr. Noel Lwoga
97.	17 :11-17 :20	COCOBA: a microfinance model supporting both conservation and socioeconomic development	Hobokela Mwamjengwa et al.	
98.	17 :21-17 :30	Potential of api-tourism in Southern Tanzania	Emmanuel Mmassy et al	
99.	17 :31-17 :40	Artificial intelligence: a tool for improving the use of camera traps on enhancing tourism in Southern Tanzania	Wilfred Marealle et al	

100.	17 :41-17 :50	Improving Human-Wildlife co-existence through the application of Non-lethal mitigation measures in Southern Tanzania	Victor Kakengi et al	
101.	17 :51-18 :00	Improving wildlife information sharing through the National Wildlife Research Information System (NWRIS)	Machoke Mwita et al	
102.	18 :01-18 :10	Research on flora biodiversity for Protected areas will enhance management plans for conservation and tourist attraction in wildlife-based tourism systems	Bukombe John et al	
END OF DAY TWO				

**DAY TWO 7th Dec 2023: MORNING PARALLEL SESSION 8
K 222 Hall**

SUB-THEME: Bee ecology, Beekeeping and Api-tourism development

S/N	Time	Paper	Presenter	Chairperson
103.	09:20-09:40	Non-Apis Pollinators in Tanzania: Stingless and Solitary Bees	Kathrin Krausa	Dr. Siima Bakengesa
104.	09:41-10:00	Traditional Beekeeping Practices and their Effects on Community-Managed Forests in Central Tanzania	Matana Levi Ng'weli	
105.	10:01-10:20	Influence of temperature and precipitation on pollinator diversity and plant-pollinator Interactions in the Tarangire-Manyara Ecosystem.	Rachel Kent	
106.	10:21-10:40	Exploratory Study of Honey Bee Pest and Predators at Kibaoni Ward, in Mlele District, Katavi, Tanzania	Shayo, I. W	
	10:40–11:00	HEALTH BREAK		
107.	11:01-11:20	Comparison of honey production between modern and traditional beehives in Ngorongoro Conservation Area	Ndooto William	Alphonse Mallya
108.	11:21-11:40	Promoting high bee diversity in Afro tropical drylands: The impact of agriculture intensification with seasonal fallow lands	Julius V. Lasway	
109.	11:41-12:00	Beekeeping value chain and community readiness to adopt the Village Savings and Lending Associations in Mwikoro and Kigori Villages, Butiama district in Mara	Allen Richard	
110.	11:45-12:00	Exploring drivers for low-hive occupancy in beekeeping high potential areas for beekeeping: A case study of Geita and Tabora Regions	Alphoncina Mponzi	

111.	12:01-12:20	local knowledge and understanding on pollination service in small scale agriculture	Elisia P Kimambo	
112.	12:21-12:40	Honeybees (<i>Apis mellifera</i>) navigation efficiency in food collection for colony survival in a savanna ecosystem	Jeremiah Chakuya	
113.	12:41-13:00	Social and ecological drivers of illegal bird hunting in the Indawgyi wetland in Myanmar	Thazin Hitay	
13:00-14:00		LUNCH- BREAK	All	Chairperson

AFTERNOON PARALLEL SESSION 8: K 222 Hall				
SUB-THEME: Human-Wildlife Interactions				
S/N	Time	Paper	Presenter	Chairperson
114.	14:00-14:20	Ecology and control of human-bat conflict in Dar es Salaam City Council, Tanzania	Julius D. Keyyu	Prof. Michiel Veldhuis
115.	14:21-14:40	The contribution of small holders home-garden trees to climate change adaptation, mitigation and resilience	Eleanor Moore	
116.	14:41-15:00	Impacts of wildlife migratory corridors' blockage on livelihoods of communities living adjacent to Arusha national park, Tanzania	Mary Clement Mtenga	
117.	15:01-15:20	Linking spatial-temporal change in rangeland resources to agricultural intensification and human-wildlife conflicts in and outside Enduimet Wildlife	Charles J. Kilawe Virtual Presentation	
118.	15:21-15:40	Understanding unauthorised subsistence hunting in western Tanzania	Paulo Wilfred	
119.	15:41-16:00	Socioeconomic drivers for human wildlife conflict in communities living adjacent to protected areas in Ruaha-Mikumi landscape, Tanzania	Victor Alexander Kakengi	
120.	16:01-16:20	Perceptions and willingness of local communities to conserve pangolins in the Burigi-Ibanda-Rumanyika ecosystem	Nyemo A. Chilagane	

121.	16:21-16:40	Special Talk –East African Community	EAC	Dr. Julius Keyyu	
	16:41-17:00	HEALTH BREAK AND POSTER PRESENTATIONS			
	17 :00-18 :00	Seminar and Poster Presentations			
	Time	Workshop 3: Wildlife Census for monitoring of biodiversity resources			
S/N	Time	Paper	Presenter	Chairperson	
122.	17:00-18:00	“Development of a National Wildlife Censuses and Surveys strategic plan for the next 5 years”	Alex Lobora	Dr. Simon Mduma	
END OF DAY TWO					Organized by TAWIRI



DAY TWO: POSTER PRESENTATIONS: 07TH DECEMBER 2023

Chairperson(s): Emmanuel Masenga and John Sanare

S/N	Title	Author(s)	Sub-theme
122.	Population assessment of maasai giraffe (<i>giraffa camelopardalis</i>) in Mkomazi national park, Tanzania	Albert L. Mangowi	Wildlife ecology and Ecological interactions
123.	Creating a national tsetse and trypanosomosis atlas: advancing socio-economic progress in Tanzania	Deusdedit Malulu	Ecosysteme Health and wildlife diseases
124.	Enhancing East African bee assemblages: The impact of grazing intensity and potential forage resources	Julius V. Lasway	Bee ecology, Beekeeping and Api-tourism development
125.	Factors hindering beekeepers on the adoption of modern beekeeping technologies in Rombo district, Kilimanjaro region	Salustia Christopher	Bee ecology, Beekeeping and Api-tourism development
126.	Community adaptation to climate variability and its impact on Mnyamasi riverine ecosystem in Vikonge and bugwe villages western Tanzania	Fadhili Mlacha	Climate Change and - ecological resilience
127.	Adoption of Climate-Smart Agriculture in Small-Scale farming in Africa: Are the pillars for CSA accounted for?	Jonathan Stephen Mbwambo	Climate Change and - ecological resilience
128.	<i>Shigella flexneri</i> infection in wild chimpanzees (<i>Pan troglodytes schweinfurthii</i>) in the Gombe-Masito-Ugalla Ecosystem, Tanzania	Priscilla S. Shao	Ecosystem health and wildlife diseases
129.	Lungworm infection: host behavior and lungworm burden in wild ungulates	Senso, B. C	Ecosystem health and wildlife diseases
130.	Health assessment of giraffes in Arusha National Park.	Tezia Marwa Waitara	Ecosystem health and wildlife diseases
131.	Coccidia infection: host behaviour and coccidia burden in wild ungulates	Trentinus, A	Ecosystem health and wildlife diseases
132.	Porcine Cysticercosis Sero-prevalence and Factors Associated with its Occurrence in the Southern Highlands, Tanzania	Flora Kajuna	Ecosystem Health and Wildlife Diseases
133.	Environmental controls on parasite infection dynamics in a multihost community at the wildlife-livestock interface	Houssein Samwel Kimaro	Ecosystem Health and Wildlife Diseases
134.	Parasite Resource Bank: Understanding of Parasite Research Resources	Barakaeli Abdieli Ndossi	Ecosystem health and wildlife diseases
135.	Control and monitoring of sustainable hunting of free-ranging lion: lessons learnt from a 12-year long programme in Tanzania or else?	Elisante O. Leguma1	Human - Wildlife Interaction

S/N	Title	Author(s)	Sub-theme
136.	What forms of militarised conservation are morally acceptable? Perspectives from Sub-Saharan Africa, the US and the UK	Darragh Hare	Human - Wildlife Interactions
137.	Human – wildlife interaction around Selous Reserve in Tanzania.	Twaha Twaibu	Human - Wildlife Interactions
138.	Human-Lion Conflicts and role of wildlife veterinarians in mitigation in Tanzania	E. Usangila ¹	Human - Wildlife Interactions
139.	Public perceptions of trophy hunting are pragmatic, not dogmatic	Darragh Hare	Human - Wildlife Interactions
140.	Copying strategies: Community engagement towards Human-wildlife coexistence	Janemary Ntalwila	Human - Wildlife Interactions
141.	Smallholder farming practices shape patterns of wildlife crop raiding; lessons from southern Tanzania	Jerome Kimaro	Human - Wildlife Interactions
142.	Navigating the dilemma of human wildlife conflict in the Mbarang'andu Wildlife Management in the era of climate change	Philipo Jacob	Human - Wildlife Interactions
143.	Incentives for Biodiversity Conservation under Asymmetric Land Ownership	Qambemeda. M. Nyanghural,	Human - Wildlife Interactions
144.	Occupancy, illegal trade flows, and uses of pangolins in the Burigi-Ibanda-Rumanyika ecosystem	Elisante Kimambo	Human - Wildlife Interactions
145.	Assessing the Basic Knowledge on Animal Behaviour, Habitats and Their Interaction with Human Beings Among the Young Generation from the Community Living Around Arusha National Park.	Subira Kahise	Human - Wildlife Interactions
146.	Human-Elephant Interactions; Exploring Conflicts and Drivers in Enduimet Wildlife Management Area, Tanzania	John Erasto Sanare	Human - Wildlife Interactions
147.	Contributions of Wildlife-Based Tourism to Conservation and Livelihoods: A Case of Wildlife Management Areas in Northern Tanzania	Salum R. Kulunge ¹	Tourism Development and diversifications for social-economic development
148.	Reducing Vulnerability to Multiple Shocks Through Tourism Destinations Development in Gateway Communities of Northern Tanzania	Alpha J. Mwongoso	Tourism Development and diversifications for social-economic development
149.	Agro-tourism:an alternative way of diversifying socio-economic development in Kilimanjaro region	Ebenezer Goroi	Tourism Development and diversifications for social-economic development
150.	Plant species abundance and diversity in lake Manyara-Natron ecosystem, northern Tanzania	Grayson G. Mwakalebe ¹	Vegetation Ecology, Invasive Species and habitat Conservation

S/N	Title	Author(s)	Sub-theme
151.	The status of biomass briquettes production and use in Tanzania: Baseline survey	Jerome Kimaro	Vegetation Ecology, Invasive Species and habitat Conservation
152.	The Flora resources of Mikumi National Park: an insight for strategic management of protected areas in Tanzania.	John, Bukombe	Vegetation Ecology, Invasive Species and habitat Conservation
153.	The Contribution of Plant Nurseries to City Biodiversity: A Case Study from Dar Es Salaam City	Mwanang'ombe.	Vegetation Ecology, Invasive Species and habitat Conservation
154.	Liana proliferation threatens Chimpanzee (<i>Pan troglodytes schweinfurthii</i>) food trees abundance in Gombe National Park, Tanzania	Sila K. Mbise	Vegetation Ecology, Invasive Species and habitat Conservation
155.	Identifying key drivers of sugarcane yield using a global dataset	William Ovenden	Vegetation Ecology, Invasive Species and habitat Conservation
156.	Livestock movements and rangeland conditions in the pastoral communities of the Amboseli-Kilimanjaro ecosystem	Jane Ploechl	Vegetation ecology, invasive species and habitat conservation
157.	Water quality assessment of Lukosi River Catchment using selected physico-chemical parameters as indicator. The case study of Kilolo District in Iringa, Tanzania.	Ahmad A. Nyagongo	Water Resources and Wetland Conservation
158.	Water resources and wetland conservation in Tanga, Tanzania	H.N. Kahangwa	Water Resources and Wetland Conservation
159.	Grey Crowned-crane (<i>Balearica regulorum</i>) monitoring in Kagera wetlands, Tanzania	Momburi, Leonidas	Water Resources and Wetland Conservation
160.	Diversity and distribution of mammals and occurrence of illegal incursion of humans in protected areas: A case study of Burigi-Ibanda-Rumanyika national parks	Alphonse Msigwa	Wildlife Ecology and Ecological Interactions
161.	Assessment of the abundance and distribution of ticks of the genus (amblyomma) in tortoise. "a case study of vilima vitatu village and Meserani snake park Arusha-Babati, Tanzania"	Asha S. Sele	Wildlife Ecology and Ecological Interactions
162.	Influence of land use types on composition of birds in northern Serengeti ecosystem, Tanzania	Damian S. Nguma, Ally K. Nkwabi	Wildlife Ecology and Ecological Interactions
163.	Spatio–Temporal Water Quality Determines Algal Bloom Occurrence and Possibly Lesser Flamingo (<i>Phoeniconaias minor</i>) Presence in Momella Lakes, Tanzania	Deogratias Lihepanyama ¹	wildlife Ecology and Ecological Interactions
164.	Preliminary results on abundance, detectability and chicks mortality of the Endangered secretarybird (<i>Sagittarius serpentarius</i>) in the Serengeti National Park	Elena Ramella Levisa	wildlife Ecology and Ecological Interactions

S/N	Title	Author(s)	Sub-theme
165.	Diversity of lizards in inhabited areas at Dodoma region Tanzania	Ernest Sichalwe	Wildlife Ecology and Ecological Interactions
166.	Composition of dung beetle species in relation to habitat types and wild animal excreta in Msolwa sector area of Nyerere National Park, Tanzania	Evaristo A Bruda ¹	wildlife Ecology and Ecological Interactions
167.	Assessment of density and spatial distribution of subterranean rodents in Kilimanjaro, Tanzania	Glory Shayo	wildlife Ecology and Ecological Interactions
168.	Predation of Indian house crow (<i>Corvus splendens</i>) to chickens in Dodoma the cause of Human-Wildlife conflict	Elizabeth Ngowi	wildlife Ecology and Ecological Interactions
169.	Diversity of large mammals as potential tourism attraction in the Nyerere National Park, Southern Tanzania	Goodluck Massawe	Wildlife Ecology and Ecological Interactions
170.	Land cover change in Ngorongoro Crater in relation to Black Rhino (<i>Diceros bicornis</i>) habitat	Gwamaka Jwan Mwangwala	wildlife Ecology and Ecological Interactions
171.	Correlates of breeding activity of <i>Lophuromys stanleyi</i> in Mabira Central Forest Reserve, Uganda	James Ssuuna	wildlife Ecology and Ecological Interactions
172.	Distribution and Diversity of Wildlife and Livestock in the Mara Landscape in relation to settlements	Jully S. Senteu ¹ ,	wildlife Ecology and Ecological Interactions
173.	Using hair hormonal analysis to gain insights into lion stress and reproductive physiology in the Ngorongoro Conservation Area	Katherine J. Fowler ¹	Wildlife Ecology and Ecological Interactions
174.	Therole of crickets in Kihansi spray toads	Lameki Magesa	wildlife Ecology and Ecological Interactions
175.	Post fire effects on ground beetles composition on the slopes of mount Kilimanjaro.	Lazaro Ibrahim Mbilinyi	wildlife Ecology and Ecological Interactions
176.	Avian Taxonomic and Functional Diversity in Contrasting Habitats: A Comparative Study of Urban and Remote Forests in Arusha, Tanzania	Leonard John Haule	wildlife Ecology and Ecological Interactions
177.	Assessment of the proposed important bird and biodiversity area – Makao wildlife management area, Meatu district in Simiyu region, Tanzania	Mfilinge A.E.	wildlife Ecology and Ecological Interactions
178.	Distribution and abundance of migratory bird species and the status of illegal killing of birds in central Tanzania	Mgimwa E	wildlife Ecology and Ecological Interactions
179.	Assessment of abundance of Indian House Crows and other birds in Dodoma City	Muhuri Yusuph Mathayo	wildlife Ecology and Ecological Interactions
180.	Insect diversity in the wild flowering strips along arable fields.	Neema Kilimba	Wildlife Ecology and Ecological Interactions

S/N	Title	Author(s)	Sub-theme
181.	Use of macroinvertebrates to assess the impacts of anthropogenic activities on Pinyinyi river around lake Natron Ramsar site, Arusha Tanzania	Omary Rajabu	wildlife Ecology and Ecological Interactions
182.	Re-assessing Chimpanzee Populations and Threats in the Masito Ugalla Ecosystem, Tanzania.	Paul Mjema	wildlife Ecology and Ecological Interactions
183.	Avian species composition, distribution and abundance in selected habitat types in Lake Manyara National Park, Northern Tanzania	Rajabu A. Mikole	Wildlife Ecology and Ecological Interactions
184.	Impact of fires on foraging behaviors of chimpanzees in the Issa Valley, Tanzania: range and vegetation use	Susan Chege Reuben	Wildlife Ecology and Ecological Interactions
185.	The Impact of Composting Behavior Change Campaign for Saving Chimpanzees in Western Tanzania through the TACARE Model	Robert Mkosamali	wildlife Ecology and Ecological Interactions
186.	Assesment on the fire fighting skills of porters guides and rangers to wildfire suppression in Kilimajaro national park	Simon G Kinabo	wildlife Ecology and Ecological Interactions
187.	New evidence of well digging in savanna chimpanzees (<i>Pan troglodytes schweinfurthii</i>): Kahensa, Tanzania	Sood A. Ndimuligo	wildlife Ecology and Ecological Interactions
188.	Economic Loss to chickens' famers caused by Indian house crow (<i>Corvus splendens</i>) Predation in Dodoma	Zulfa Lottu	Wildlife Ecology and Ecological Interactions
189.	Land Use and Land Cover Change Trends and their Impacts on Structure and Function of Igando - Igawa Wildlife Corridor, in Southern Highlands Tanzania	Joas J. Makwati1	Wildlife Ecology and Ecological Interactions
190.	The spatio-temporal movement pattern of the African lion in Serengeti National Park, Tanzania	Matana L Ngw'eli	Wildlife Ecology and Ecological Interactions
191.	Factors affecting sustainability of wildlife corridors joining the Ngorongoro Conservation Area and adjacent landscapes in Northern Tanzania	Cathbet Nahonyo	Wildlife Ecology and Ecological Interactions
192.	Variation in Small mammals Fleas species (Siphonoptera) infestation load as the impact of habitats modification: A potential increase in zoonotic transmission in wildlife-human interfaces in Tanzania".	Venance Theophil Msoffe	Wildlife Ecology and Ecological Interactions
	Bee Pollinator composition in the three highest mountains in Tanzania	Neema Kilimba	Bee ecology, Beekeeping and Api-tourism development

DAY THREE: FRIDAY 8th DECEMBER 2023

MORNING PLENARY SESSION: KEYNOTE PAPER PRESENTATION No. 3				
SIMBA CONFERENCE HALL				
S/N	Time	Paper	Presenter	Chairperson
193.	08:30-9:15	Human-wildlife coexistence: biodiversity as the basis for a sustainable future	Prof. Michiel Veldhuis	Dr. James Wakibara
MORNING PARALLEL SESSION 9: SIMBA HALL				
SUB-THEME: Human-Wildlife Interactions				
S/N	Time	Event/Paper	Presenter	Chairperson
194.	09:20-09:40	Comparative Species Compositions and Human Interactions Across a Bushmeat Supply Network in Cross River State, Nigeria	Katharine E.T. Thompson et al.	Emmanuel Mtiti
195.	09:41-10:00	Understanding the links between poverty and the perceived costs and benefits of living near protected areas	Leejiah J. Dorward et al.	
196.	10:01-10:20	Transfrontier conservation areas as a viable landscape approach to biodiversity conservation and sustainable development: A case study of Zimbabwe	Nothando R. Moyo et al.	
197.	10:21-10:40	The Impacts of Covid-19 on Local Small-Scale Tourism-Based Enterprises near Lake Manyara and Tarangire National Parks, Northern Tanzania.	Luna Li	
	10:40–11:00	HEALTH BREAK AND POSTER PRESENTATIONS		
198.	11:01-11:20	Trophy hunting and the associated perspectives from local communities: A Case study of Rungwa Game Reserve, Tanzania	Fenrick F. Msigwa	Dr. Ingela Jasson
199.	11:21-11:40	Efficacy of various elephant deterrents in the Kilombero valley, Tanzania	Grace J. Mchome	
200.	11:41-12:00	Characterizing Elephant Use of Human dominated Landscapes in the Greater Serengeti Ecosystem	Lollian Kosyando	
201.	11:45-12:00	Women Participation in Forest and Wildlife Monitoring: The case of Village Forest Monitoring in Western Tanzania.	Paul Mjema	
202.	12:01-12:20	Presence of Snakes and its Perceived Impacts in Rural Pastoral Communities in Ngorogoro, Tanzania: An observational case study	Tito J. Lanoy	

203.	12:21-12:40	Cultural dimensions for the conservation of the Southern Ground Hornbill at Mswakini Chini	Rosemary Mgumya	
204.	12:41-13:00	The efficacy of electric fencing on addressing human-wildlife conflict in western Serengeti	Michael H. Kimaro	
	13:00-14:00	LUNCH		
AFTERNOON PARALLEL SESSION 9: SIMBA HALL				
SUB THEME; Wildlife Ecology and Ecological Interactions				
205.	14:00-14:20	Heterogeneity of the mountain, heterogeneity of nature's values, and demands for Nature's Contributions to People by local communities	John Sanya	Dr. Emmanuel Martin
206.	14:21-14:40	Bat species and their interaction with humans: Risk identification for Marburgvirus disease Outbreak in Kagera region, Tanzania	Mikidadi Mtalika	
207.	14:41-15:00	Human-wildlife conflict mapping: a participatory tool to characterise the conflicts at community level	Alpha Laizer	
	15:01–15:40	Simba Hall: Key Message: TAWIRI Wildlife Research Matters	DR-TAWIRI	
	15:41-16:00	CONFERENCE RESOLUTIONS	RAPPORTEURS	
	16:01-16:30	HEALTH BREAK		
	16:31-17:00	CLOSING REMARKS- SIMBA HALL		
<p>END OF THE 14TH TAWIRI INTERNATIONAL SCIENTIFIC CONFERENCE</p> <p>THANK YOU ALL FOR MAKING THIS CONFERENCE SUCCESSFUL</p> <p>SEE YOU IN DECEMBER 2025 DURING THE 15TH TAWIRI INTERNATIONAL SCIENTIFIC CONFERENCE</p>				



**DAY THREE: 8th DECEMBER 2023: MORNING PARALLEL
SESSION 10**

OLDONYO LENGAI HALL

SUB-THEME: Wildlife Ecology and Ecological Interactions

S/N	Time	Event/Paper	Presenter	Chairperson
208.	09:20-09:40	Variation in avian species and feeding guild diversity between habitat types of land use and elevation zones in the Tarangire-Manyara Ecosystem, Tanzania.	Lizzie Reifsteck	Dr. Kezia Mkwizu
209.	09:41-10:00	Habitat use and Diet composition of the Common Eland (<i>Tragelaphus oryx</i>) in Ngorongoro Conservation Area, Tanzania	Gregory A Mtega	
210.	10:01-10:20	Best Practice Guidelines for Responsible Images of Non-Human Primates	Amani Kitegile	
211.	10:21-10:40	Importance of Urban Green Spaces in Avian Conservation: the status of understory birds at the University of Dar es Salaam thickets, Dar es Salaam, Tanzania, has not significantly changed after 30 years	Chacha Werema	
	10:40– 11:00	HEALTH BREAK AND POSTER PRESENTATION		
212.	11:01-11:20	The influence of food availability, rainfall, and temperature on yellow baboon ranging patterns in the issa valley, western Tanzania	Epifania Temu	Prof. Wineaster Anderson
213.	11:21-11:40	Evaluation of the Non-invasive Genetic Sampling for estimating lions' population size in Ngorongoro Conservation Area (NCA).	George Peter Shango and Ingela Jasson	
214.	11:41-12:00	Does variation in plant diversity and abundance influence browsing intensity in Black Rhinos?	Emanuel S. Sisya	
215.	11:45-12:00	Ecological correlates of population abundance of a pest small mammal species (<i>Mastomys natalensis</i>) inhabiting a protected area-farmland landscape in western Serengeti, Tanzania	Egidius J. Rwebugaa	
216.	12:01-12:20	Does variation in plant diversity and abundance influence browsing intensity in Black Rhinos?	Emanuel S. Sisya	
217.	12:21-12:40	Advances in aerial survey methods: oblique camera counts, AI and counting from space	Howard Frederick	
218.	12:41-13:00	Metapopulation genetics of hyrax	Stefanie Bapst	
	13:00-14:00	LUNCH		

AFTERNOON PARALLEL SESSION 10 : OLDONYOSAMBU HALL				
SUB THEME: Wildlife Ecology and Ecological Interactions				
219.	14:00-14:20	Maximizing efforts and accuracy in rapid demographic assessments of African elephants	Juma Minya	Dr. Wilfred Marealle
220.	14:21-14:40	Comparative analysis of bird diversity, richness and evenness in three protected areas with different protection status	Ellen k. Ponsian	
221.	14:41-15:00	The Impact of Composting Behavior Change Campaign for Saving Chimpanzees in Western Tanzania through the TACARE Model	Robert Mkosamali	
	15:01– 15:40	Simba Hall: Key Message: TAWIRI Wildlife Research Matters		DR-TAWIRI
	15:41-16:00	SIMBA HALL: RESOLUTIONS		RAPPORTEURS
	16:01-16:30	HEALTH BREAK		
	16:31-17:00	CLOSING REMARKS- SIMBA HALL		
END OF THE 14TH TAWIRI INTERNATIONAL SCIENTIFIC CONFERENCE				
THANK YOU ALL FOR MAKING THIS CONFERENCE SUCCESSFUL				
SEE YOU IN DECEMBER 2025 DURING THE 15TH TAWIRI INTERNATIONAL SCIENTIFIC CONFERENCE				

DAY THREE: 8th December MORNING PARALLEL SESSION 11 K 204 Hall				
SUB-THEME: Wildlife Ecology and Ecological Interactions				
S/N	Time	Event/Paper	Presenter	Chairperson
222.	9:20-9:40	Distribution of wildlife water points in Mikumi National Park, Tanzania: What are the possible socio-ecological implications	Jerome Kimaro	Dr. Halima Kiwango
223.	9:41-10:00	Monitoring carrying capacity can inform on the status of wild mammal populations: Lessons from spotted hyenas in Ngorongoro Crater	Oliver P. Höner	
224.	10:01-10:20	Phylogeographic patterns of Greater cane rat (<i>Thryonomys swinderianus</i>) populations from eastern, western and southern Africa and implications for wildlife	Shadia I. Kilwanila	
225.	10:21-10:40	New record on capture and consumption of two juvenile red-legged sun squirrels (species) by a female chimpanzee in Mahale Mountains National Park,	Simula P. Maijo	
	10:40 – 11:00	HEALTH BREAK AND POSTER PRESENTATION		

226.	11:01-11:20	Medium and large sized mammal survey in the Northern Highland Forest within Ngorongoro Conservation Area Authority in Tanzania	Rodrigue Batumike	Dr. Gabriel Mayengo
227.	11:21-11:40	Resource partitioning among savanna herbivores: key determinants of forage quality variation	Yuhong Li	
228.	11:41-12:00	Unraveling historical complexities of road development and their impact on the Greater Serengeti Ecosystem.	Philipo Jacob	
229.	11:45-12:00	Vultures population surveys and monitoring in makao wildlife management area, meatu district in simiyu region	Mfilinge A.E	
230.	12:01-12:20	Factors influencing the density of Udzungwa red colobus monkey (<i>Procolobus gordonorum</i>) in Magombera forest reserve, Tanzania	Natasha R. Mamuya	
231.	12:21-12:40	Ashy red colobus (<i>Piliocolobus tephrosceles</i>) current potential suitable habitat distribution in western Tnzania	Hamed J. Kibaja	
232.	12:41-13:00	Movement patterns of rodents associated with spatial-temporal and habitat heterogeneity in rural landscapes, Eastern Tanzania.	Herieth M. Mkomwa	
13:00-14:00		LUNCH		
AFTERNOON PARALLEL SESSION 11 : K 204 HALL				
SUB THEME: Wildlife Ecology and Ecological Interactions				
S/N	Time	Event/Paper	Presenter	Chairperson
233.	14:00-14:20	Investigating the daily activity, morphometrics and diet of the Pancake Tortoise <i>Malacochersus tornieri</i> in Tanzania	Zac McMenemy	Donatus Gadiye
234.	14:21-14:40	Diversity and Richness of Butterfly Among Various Habitat of Msolwa, Nyerere National Park	Lyaka Dinah	
235.	14:41-15:00	Habitat suitability modeling for sustainable conservation of the endangered red colobus in lower Tana River Delta, Kenya	Johnstone Kimanzi	
	15:01 – 15:40	Simba Hall: Key Message: TAWIRI Wildlife Research Matters		DR-TAWIRI
	15:41-16:00	Simba Hall: RESOLUTIONS		RAPPORTEURS
	16:01-16:30	HEALTH BREAK		
	16:31-17:00	CLOSING REMARKS- SIMBA HALL		
END OF THE 14TH TAWIRI INTERNTIONAL SCIENTIFIC CONFERENCE				
THANK YOU ALL FOR MAKING THIS CONFERENCE SUCCESSFUL				
SEE YOU IN DECEMBER 2025 DURING THE 15TH TAWIRI INTERNATIONAL TAWIRI SCIENTIFIC CONFERENCE				

DAY THREE: 8th December 2023 MORNING PARALLEL SESSION 12**K 222 Hall****MIXED SUB-THEME**

S/N	Time	Event/Paper	Presenter	Chairperson
236.	09:20-9:40	Rangeland degradation – the threat of invasive species infestation in northern Tanzania	Jane Ploechl	Dr. Freya St John
237.	09:4-10:00	The challenges of visitation by domestic tourists in Tanzanian national parks	Pascal Shitobelo	
238.	10:0-10:20	Current situation of human-elephant conflict in western Tanzania	Emmanuel Pagiti	
239.	10:2-10:40	Effect of Urbanisation on Avian Community in Tanga Metropolitan Areas, Tanzania	Jimminus P. Kakoko	
10:40–11:00		HEALTH BREAK AND POSTER PRESENTATION		
240.	11:01-11:20	The Ban on Trade in Live Wild Animals: Emerging Coping Strategies amongst Butterfly Farmers in Amani Nature Reserve in Tanzania	Oswald Mkalawa	Dr. Cathbet Nahonyo
241.	11:21-11:40	Human Migration into Rufiji Delta Wetlands as Climate Change Adaptation Strategy: Effects and Mitigation Measures	Emmanuel Mwainunu et al	
242.	11:41-12:00	Linking biodiversity conservation and community livelihoods in rural Tanzania: A comparative analysis of parks and Wildlife Management Areas	Fidelcastor F. Kimario	
243.	11:45-12:00	Using survival analysis from telemetry and transects to assess short-term population trends in vultures	Corinne Kendall et al	
244.	12:01-12:20	Mapping Potential Areas for Avitourism in Ruaha National Park, Tanzania: Key Updates for Biodiversity Conservation and Tourism Diversification	Ally K. Nkwabi	
245.	12:21-12:40	Harnessing the Power of social media: Promoting Wildlife-Based Tourism in Tanzania	Rebecca and Nyinond	
246.	12:41-13:00	Community-Based Wildlife Management Area as a tool for conflict resolution between Conservation Practices and Livelihood needs in Loliondo Game Reserve, Tanzania	Ruth W. John	
13:00-14:00		LUNCH		

AFTERNOON PARALLEL SESSION 12 : K 222 Hall

MIXED SUB THEMES

S/N	Time	Event/Paper	Presenter	Chairperson
247.	14:00-14:20	Women leading rangeland restoration in Northern Tanzania	Erick Swai	Dr. Oliver P. Höner
248.	14:21-14:40	Alleviation of Calotropis procera infestation in Ruaha National Park, Tanzania	Pius Kavana et al	
249.	14:41-15:00	Assessment of the impeding factors behind humans and wildlife co-existence in Katavi and Saadani national parks of Tanzania	Elieza Musana	
	15:01-15:40	Simba Hall: Key Message: TAWIRI Wildlife Research Matters		DR-TAWIRI
	15:41-16:00	RESOLUTIONS		RAPPORTEURS
	16:01-16:30	HEALTH BREAK		
	16:31-17:00	CLOSING REMARKS- SIMBA HALL		

END OF THE 14TH TAWIRI INTERNATIONAL SCIENTIFIC CONFERENCE

THANK YOU ALL FOR MAKING THIS CONFERENCE SUCCESSFUL

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ABSTRACTS FOR ORAL PRESENTATIONS

DAY 1

WEDNESDAY 6TH DECEMBER, 2023

PLENARY PRESENTATION PAPER 1

Wildlife corridors: status, threats and implications for sustainable biodiversity conservation and community livelihood in Tanzania

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Abstract

Wildlife corridors have major ecological values in protected areas as well as for biodiversity conservation and community livelihood. In order to show its commitment to maintain and restore wildlife corridors, the Tanzanian Government passed the Wildlife Conservation (Wildlife Corridors, Dispersal Areas, Buffer Zones, and Migratory Routes) Regulations 2018 (known as “Corridor Regulations”). In 2022, Tanzania produced a Tanzania wildlife corridor assessment, prioritization and action plan for 2022-2026, where a total of 61 corridors were identified. In the assessment report, 41 of these corridors were threatened of which 20 were prioritized for conservation or restoration. This paper reviews the status, threats and consequences of wildlife corridors in Tanzania using the case of the Tarangire-Manyara (Kwakuchinja), Ruaha-Mpanga Kipengere Game reserve (UMEMARUWA), Selous-Niassa corridor, and Nyerere-Wamimbiki Game reserve wildlife corridors. Generally, the results have shown that the many wildlife corridors are at a cross road and the country will soon lose many due to a number of threats including agriculture, human settlement, livestock grazing, and logging/ charcoal making. In many wildlife corridors, land use land cover maps have shown that agriculture, bare land and shrubland are increasing while woodland, grasslands and water are

decreasing, an indication of loss of habitat quality. It is concluded that the future of wildlife corridors in Tanzania is black and prevention of their loss is a fundamental action; if we will continue with business as usual, most of wildlife corridors will disappear; the ongoing threats and loss of corridors is a wakeup call, that Nature is calling to abet habitat and biodiversity loss. More importantly, it is high time to solve the fundamental issue, that is to conserve and open the corridors by all means, the rest are just temporal measures. It is recommended that it is imperative to embark on community education on importance of wildlife corridors as well as community engagement in conservation at all levels, people who have encroached corridors should be relocated and that all human activities in the corridors should be stopped, valuation of community assets (houses, land, etc.) should be conducted for compensation and relocation of people, conduct participatory boundary demarcation and placement of permanent beacons, and last but not least villages to develop/ revisit or enforce Village Land Use Plans and include in the pans areas set for wildlife corridors.

Keywords: corridors, corridor regulations, habitat loss, wildlife, Tanzania

PARALLEL SESSION PRESENTATIONS

SUB-THEME: Human-Wildlife Interactions

Using social and biodiversity sciences to co-design restoration for biodiversity and people in the Kilombero Valley, Tanzania

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Abstract

We recently introduced a novel method framework to measure and map the effects of land management, governance and configuration on biodiversity, crop yield, microclimate and human wildlife conflict in tropical rural crop production landscapes. It provides a clear set of indicators and integrates biophysical with social pathways in ways that can be measured and modelled. Here, we will present how we applied the method framework to data collected in 141 vegetation plots, 194 and 72 bird survey and camera trapping points, and 499 household surveys in the Kilombero Valley. The landscape is part of an agricultural growth corridor, where smallholder farmers sit alongside industrial sugarcane and rice farming and are targeted for sustainable intensification of agriculture as well as area based conservation and restoration interventions. Mapped predictions under a riparian buffer restoration scenario suggest spatial changes in biodiversity indicators and crop damage risk. At landscape scale, we predict larger benefits of tree restoration for mammal biodiversity, likely smaller losses for birds, and increase in

the risk of crop raiding (assuming no mitigation measures are implemented). These predicted changes are directly linked to changes in landscape configuration. Crop loss to wildlife incurs local costs to people's livelihoods. Yet, impacts on the wellbeing of people across the wellbeing dimensions are currently negligible and do not affect people's perception on the value of nature for people's livelihoods. This may suggest that tree restoration, if managed carefully, can have positive net outcomes at landscape scales. We have subsequently explored how trade-offs between costs and benefits may influence decision-making by stakeholders in government and communities and we will outline our perspective on the steps in this co-design process. We hope to stimulate forward looking debate on the development of National Biodiversity Strategies and Action Plans that integrate biodiversity and social outcomes.

Keywords: socio-ecological systems, scenario modelling, trade-offs, human wildlife conflict

The role of social values and time preference on biodiversity conservation: A case of ecological corridors of Tanzania

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Abstract

Many environmental problems involve social dilemmas, where individual self-regarding interests are at odds with societal goals. Institutional and behavioural

economic analyses of social dilemma have shown that individuals make choices based not just upon self-regarding, but also on other-regarding preferences. These

preferences are often guided by personal values and are intrinsic in nature. Intrinsic motivations are considered powerful than extrinsic reinforcement in inducing sustainable conservation behaviour. On the other hand, classical economic theory suggests that individuals weigh their utility derived from land use in the current time period against the utility derived from conserving for future public benefits. In this way, time preference enters an individual's decision-making process in the form of discount function. This study sought to understand the effects of personal values (egoistic, hedonic, altruism and biospheric) and time preference of farmers on conservation behaviour. We defined biospheric as valuing the environment, altruistic -valuing the welfare and wellbeing of other human beings, egoistic -valuing personal resources and hedonic -valuing pleasure and comfort. Time preference explains individuals' perception

of discounting the future (i.e., low or high). We used framed field experiment with 384 Tanzanian farmers in two ecological corridors that are highly threatened by agricultural expansion to estimate the conservation behaviour. Social survey was used to elicit personal values and time preference of farmers. Results show a contrasting effect of egoistic and biospheric values on conservation. While the former appeared to lower the conservation, the latter was enhancing. Farmers who care more about the future (high time preference) conserved considerably. These findings show the relevance of activating biospheric and perception of future conservation benefits in policy making to restore ecological corridors in Tanzania.

Keywords: Conservation behaviour, Ecological corridors, Framed field experiment, Personal values and Time preference.

Influence of deforestation and drought on human-elephant conflict intensity

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Abstract

Climate change and human population growth in Africa, are reducing and fragmenting historical ranges of large animals. In particular, land conversion to agriculture is leading to coexistence challenges between humans and African elephants, whose 50% of historical range is outside protected areas, mostly due to the foraging activity of elephants on subsistence crops. In this study we investigate the factors affecting the intensity of elephant crop damage in the

farms of 4 villages in the Selous-Niassa Wildlife Corridor (southern Tanzania). We also explore the deforestation occurred in village land in the last 30 years and the loss of waterbodies and compare frequency and damage intensity for each village. Our results show that intensity of elephant damage (% farm area affected by elephant) increased with crop palatability, and former land use, particularly when the farm is located in an area that was previously (~30 years ago) covered by

forest. On the other hand, the intensity of elephant damage decreased higher proportion of settlements and farmland, and distance to waterbodies. Most farms affected by elephants (65%) are at short distances (<250 m) from waterbodies. We also identified the most palatable crops out of 32 crop types in the area. We conclude that crop palatability, deforestation and water availability strongly affect elephant crop damage. On the other hand, forest loss has been intense in the last 30 years

and waterbodies had been reduced in more than 90% in the majority of the villages. The elephant presence in the 4 villages as a complex, is very frequent around 2/3 of the 365 days in a year. We hope these results will contribute to a better implementation of management strategies in order to enhance long-term peaceful coexistence between humans and elephants.

Keywords: crop damage, HEC, deforestation, land use, waterbodies

Characterizing Elephant Use of Human dominated Landscapes in the Greater Serengeti Ecosystem

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Abstract

Human elephant conflict is one of the most challenging conservation issues facing protected areas in Tanzania. In the Greater Serengeti Ecosystem, conflict between communities and wildlife, particularly elephants, is prevalent. In order to create opportunities for co-existence between elephants and people, a clear understanding of how elephants utilize human dominated landscapes is required, and this knowledge can aid in identifying where conflict is likely to occur. We investigated how elephants select resources within and adjacent to protected areas across dry and wet seasons by analyzing GPS locations of 35 adult elephants monitored via satellite collars between 2018-2022 in the Greater Serengeti Ecosystem. Taking advantage of large gradients in anthropogenic and environmental variables, third order resource selection functions (RSF's) were used to investigate elephant use in response to land cover type, distance from the

protected area, slope, distance to buildings, roads, and rivers, and forage quality. We fit RSFs for each individual-season-year in order to examine variability in strategies across individuals, seasons, and years. Our results indicate that elephants demonstrate significant individual-level variability in response to environmental and human dominated features, and individual animals demonstrate high levels of behavioural plasticity by employing varying strategies over time. However, certain features, primarily rivers, roads, forage quality, and the timing of use within human dominated areas elicit consistent responses. We discuss our results and how our findings can be used to prevent human-elephant conflict and promote coexistence in the Greater Serengeti Ecosystem.

Keywords: Human wildlife conflict, Coexistence, Elephant, Resource selection, Habitat use

Efficacy of bio-acaricide for management of ticks in domestic and wild animals in Ngorongoro Conservation Area

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Abstract

Chemical acaricides are commonly used for management of ticks. Their uses have increased acaricide resistance and various hazardous effects on wildlife and environment. The current study aimed at assessing the efficacy of a novel registered entomopathogenic fungus *Aspergillus oryzae* with commercial name; VB-IN/1249 against six species of cattle ticks. Efficacy was evaluated by spraying 5×10^5 conidia/L of *Aspergillus oryzae* and the Control group with water + (0.5% surfactant) on infested cattle which was monitored under controlled environment. In each treatment 10 cattle were selected for treatment and the experiment was replicated thrice. The infested cattle were assessed on the number of ticks, ticks' species and the skin damage. Data were recorded after every 24 hours for four (4) days. Thereafter, ticks dropped from both control and treated with VB cattle were collected for further observation and identification. Results showed high mortality of ticks in Bioacaricide treated group than the control group. In addition, Bio-acaricide caused >70% mortality in

different species of ticks such as 96.81%, 92.31%, 87.88%, 84.08%, 73.14%, 66.37% in *Rhicephalus appendiculatus*, *Rhicephalus microplus*, *Boophilus anulatus*, *Hyalomma marginatum*, *Ambylomma variegatum*, and *Ambylomma gemma* respectively. In contrast, mortality in control group was 1.3%, 2.1%, 4.1%, 2.3%, 2.8% and 5.3% in 4 days for *Rhicephalus microplus* *Rhicephalus appendiculatus* > *Ambylomma variegatum* > *Boophilus anulatus* > *Hyalomma marginatum* > *Ambylomma gemma* respectively. The finding of this study revealed that *A. oryzae* was effective in controlling various species of ticks and is environmentally safe. It is therefore recommended to be applied for tick management as it is safe, effective, less costly and eco-friendly. Its use will reduce tick burdens and incidences of tick-borne diseases towards improving livestock and wildlife productivity to enhance conservation in the wildlife-livestock interface.

Keywords: Ticks, Wildlife diseases, Livestock, Conservation

Wildlife and trees distribution, vegetation change and their potential to support investment in transforming lives of surrounding communities in Nyonga reserve, Tanzania.

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Abstract

The study was conducted in Nyonga reserve to establish the vegetation change for the past 20 years, type and distribution of wildlife and trees and their contribution to socio-economic activities of surrounding communities. Vegetation change was observed for the past 20 years using remote sensing. A total of four (4) images were acquired in USGS earth explorer website ranging in the four epochs 1990, 2000, 2010 and 2020 as observed having a gap of 10 years apart sequentially. For wildlife population and type, aerial point survey was carried out in which 29 transect of 5 km apart was adopted, and 7200 georeferenced photos captured. For trees types and distribution, a biophysical survey was carried out coupled with literature review. Results indicate that there was vegetation change and currently the area is dominated by shrubs 45%, woodlands 21%, grasslands 25% and bareland 9%. In terms of tree resources, the area is dominated in m³ by *Brachystegia spp.* (3,736,133) *Julbernardia globiflora* (3,060,787),

Pericopsis angolensis (1,384,653), *Burkea africana* (136,753), *Pterocarpus tinctorius* (119,594), *Pterocarpus angolensis* (124,568) and *Swartzia madagascariensis* (18,898). These are distributed all over the area. In terms of wildlife, there are different types of wildlife dominated by buffalo (340), elephant (270), eland (70) and giraffe (70), others are hartebeest, sable, hippo and duiker found in small numbers that is, less than 10. Concentration of wildlife were mainly in the eastern southern side. The area is surrounded by 11 villages with estimated population of about 32,000. The main social economic activities include subsistence farming, animal husbandry, beekeeping, fishing, traditional hunting, collection of medicinal plants and foods like mushrooms and wild fruits. The study recommends investment in commercial beekeeping, tourist hunting, logging, photographic tourism, and processing of bee products, forest foods and eco-tourism as the country is aspiring to build its economy.

Assessing the societal benefits of the Mngeta wildlife corridor restoration program using the ecosystem services approach

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Abstract

Current wildlife corridor restoration programs are characterized by a participatory project design with a vision of co-creating spaces of mutual benefit for animals and humans living along the corridors. This study employed the ecosystem services approach in assessing the societal benefits that arose from the restoration program of the Mgeta wildlife corridor. The study employed remote sensing and GIS analysis to examine land use/cover change trends from 1990, 2005, 2016, and 2021. Also, the social sampling of

250 respondents was conducted to explore the social-demographic characteristics, social perceptions, and preferences for ecosystem services provision and associated trend with the Mngeta corridor restoration program. The results show that area under forest and woodland increased by 2.7% and 9.2% respectively in the year 2021, while the area under agriculture decreased by 4.5% in the period between 2016-2021, this justifies the success of the restoration program that put more emphasis on reforestation and agriculture intensification

rather than agriculture expansion. Crop production, livestock, fuel wood, and habitat of the species are observed as the most important ES that the corridor resources provide. And less is considered important for the cultural services and regulating services. And the trends of ES show that cultural services and regulating services have increased ensuring the future security of the livelihood activities and overall human well-being in the Mngeta wildlife corridor. The aged people and

people with high education attributed more important values to cultural services and regulating services while those with low education because of low knowledge identified more provisional ES. These results can serve as a social indicator of the importance of ecosystem restoration for sustainable natural resources management.

Keywords: Ecosystem services, Wildlife corridor indicator, Remote sensing, Social perception,

SUB-THEME: Vegetation Ecology, Invasive Species and habitat Conservation

Understanding and managing rangeland degradation in Northern Tanzania

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Abstract

One third of the global population live in rangeland areas, including millions of pastoralists who rely on savanna areas to meet their daily needs. However, rangelands are under significant threat from climate change such as more frequent and prolonged droughts, and anthropogenic change leading to fragmentation and sedentarisation of communities. These threats have led to degraded rangelands that are unsuitable for pastoralists and their livestock and have reduced biodiversity. Combining high resolution satellite data and field observations, we aimed to identify the drivers of rangeland degradation with the rangelands of Northern Tanzania to help inform sustainable management. We find that rangeland degradation occurs in areas that respond more during drought periods. Importantly these areas maintain the ability to recover, but due to the increasing pressures of climate and anthropogenic change, these areas are

unable to completely recover prior to the next environmental shock, leading to a gradual decline in rangeland condition over time. Having identified how rangeland degradation happens and how they recover, this helps to identify solutions to best manage rangelands and ensure that they can sustainably support pastoralists, their livestock and the iconic wildlife that live there. From a recent Darwin Initiative project to empower local women to implement rangeland restoration, we then show that community led management of rangelands is possible and that it can lead to improvements in vegetation and biodiversity and benefits to pastoralist communities – these communities can drive rangeland recovery in a sustainable and scalable way.

Keywords: Climate change, rangeland, restoration, sustainable management

The effect of temperature and precipitation on native and non-native herbaceous flowering plants' abundance across elevation zone in the Tarangire-Manyara Ecosystem

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Abstract

Biological invasion is one of the major factors across the globe that threaten biodiversity and humans are implicated for the introduction of new plant species outside their native geographical range (non-native plant species). This study examined the abundance (measured in terms of percentage cover) of native and non-native forbs (broad-leafed herbaceous plants) species and related them to temperature, precipitation and land use that change along elevation gradient. Forbs percentage cover was sampled using a quadrat method at nine different locations across three elevation zones spanning from 900 – 1800 meters above sea level in the Tarangire-Manyara Ecosystem. R statistical program was used to analyze data and determine variations in herbaceous plant cover. We also determined relationships between herbaceous plant cover, species richness, and climatic parameters (temperature and

precipitation). The study recorded nine non-native (alien and invasive) species and 72 native species in the study locations. However, there was no significant ($p = 0.6$) variation in the percentage cover of native and non-native herbaceous plant species across elevation zones. Findings also revealed significant positive relationships between the percentage cover of forbs and temperature ($p = 0.05$) and precipitation ($p = 0.001$), suggesting that as temperature and precipitation increase, percentage cover of forbs also increase. Our findings shade light on how future increases in temperature and precipitation would favor invasion of forbs and severe effects would be felt by communities whose livelihood depends on non-forbs herbaceous plants such as livestock keepers.

Keywords: Elevation, Invasive Species, Precipitation, Temperature, Plant Cover .

First record of thermophilization in Afromontane forests

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Abstract

Thermophilization of plant communities (i.e., directional changes in composition towards greater relative abundances of species associated with warmer environments) is well-documented in the Neotropics, but it is uncertain whether this phenomenon also occurs in tropical Africa, where lower tree diversity and different biogeographic history could affect species' responses to climate change. Here we use re-census data from 17 forest plots spread across three mountain regions of Africa to show that thermophilization is widespread. Mean rates of thermophilization [thermal

migration rate (TMR)] across all censuses were $+0.0082\text{ }^{\circ}\text{C}\cdot\text{y}^{-1}$ in the Kigezi Highlands (Uganda), $+0.0028\text{ }^{\circ}\text{C}\cdot\text{y}^{-1}$ in the Virunga Mountains (Rwanda-Uganda-DR Congo) and $+0.0012\text{ }^{\circ}\text{C}\cdot\text{y}^{-1}$ in the Udzungwa Mountains (Tanzania). Unlike in the Andes, recruitment was an important component of thermophilization in the African plots, indicating that the observed shifts were attributable to both range shifts and contractions. The African montane forests studied currently act as a carbon sink but changes in species composition may imperil this vital ecosystem function.

The role of herbarium and its database in plant diversity conservation in Tanzania

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Abstract

The study on collection and species patterns using computer-based specimen data sets in the National Herbarium of Tanzania (NHT) might be used in setting conservation collection priorities with the limited resources available. Computer-based collection records were studied in 2020 at NHT in order to understand the collection patterns in the country in relation to Tanzanian mainland floral regions namely T1 to T8. The computer program called Botanical Research and Herbarium Management System (BRAHMS) was used for creating data sets and for analyzing the patterns of specimen and species collection. From all the data sets there were 108,571 specimen records composed of 13,699 species. The region with the highest proportion of specimens and species records are T2 (Arusha, Rombo, Hai, Moshi & Manyara) with 25517 (11504 species) followed by T7 (Mbeya, Iringa, Songwe, Njombe,

Sumbawanga & Nkasi) with 21918 (5546 species) and T6 (Dar es Salaam, Morogoro & Pwani) with 18688 (5022 species). The region with the lowest records is T1 with 5492 (2916 species). Among 352 families, the most represented in collection records for all floral regions are Fabaceae with 12258 (13% frequency) specimen records followed by Rubiaceae with 9612 (10.2% frequency) and Graminaea with 5687 (6% frequency). The most frequently collected/recorded species are *Acacia nilotica* (2.3% frequency) and *Xymalos monospora* (1.5% frequency). Herbarium computer-based data may be used to provide an understanding of specimen and species collection patterns, thus, priorities can be established for conservation and future specimen collection and botanical research gaps.

Keywords: Herbarium, specimens, species patterns, Tanzania.

The effects of extreme climate on the invasive plant *Gutenbergia cordifolia*: implications for its future management in savannah ecosystems

Herieth A. Nyarobi, Issakwisa B. Ngondya and Linus K. Munishi

Abstract

The aim of this study was to assess the effects of varying water stress levels on morphological and physiological parameters of an invasive plant *Gutenbergia cordifolia*. The assessment was conducted in the screen house at the Nelson Mandela African Institution of Science and Technology following a completely randomized design (CRD). Both morphological and physiological parameters were variable under water stress levels. While the maximum (159 cm) and minimum (9 cm) plant heights for *G. cordifolia* were observed under flood and drought water stress respectively, its maximum root collar diameter of 5 mm and the minimum of 1.3 mm were observed under moderate flood and drought water stress respectively. Generally, the number of leaves was highest under moderate flood stress (194 leaves/plant), and lowest under drought stress (13 leaves/plant). Similarly, the largest and smallest leaf surface area of 9×10^3 and $1 \times 10^3 \text{mm}^2$ were observed under flood and drought water stress respectively due to *G. cordifolia*'s

tendency to retain water when exposed to water stress through a reduction in number of leaves and leaf surface area when under drought stress condition. While a decrease in leaf chlorophyll was observed across water stress levels with the lowest chlorophyll levels of 0.02 under drought water stress, an increase in leaf anthocyanin levels ($0.29 \text{ Abs g.DM}^{-1}$) was observed particularly under flood stress due to increased chlorophyll breakdown and plants' water stress, respectively. This study informs that extreme climatic events such as excessive floods will likely facilitate invasions by *G. cordifolia* leading to decreased biotic resistance of native communities in savanna rangelands. Efforts to manage *G. cordifolia*'s effects in a changing climate must therefore include the development of strategies and action plans that account for catastrophic events like floods and drought.

Keywords: Climate change, East Africa, Invasion, Ngorongoro conservation area, Water stress

Calotropis procera (apocynaceae) invasion on wildlife foraging rangelands in Ruaha National Park

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Abstract

The relation between invasion of *Calotropis procera* and the abundance of herbaceous plants, along with various environmental factors of recipient grasslands was studied in the wooded grasslands of northern east of Ruaha National Park (RUNAPA), in southern Tanzania. The study focused on determining whether the presence

of *C. procera* influenced particular environmental variables and/or growth of herbaceous plants in understory. We designated two sampling areas; one being invaded by *C. procera* and another control area with native tree/shrub species without *C. procera*. Herbaceous plants cover and environmental variables (soil pH, soil

moisture, air humidity, soil temperature and light intensity) were measured thrice (in December 2022, March and July 2023) on 21 sample plots. Results revealed that *C. procera* had a negative impact on herbaceous plant cover in the invaded area, whereas the native tree/shrub species in the control area positively influenced herbaceous plant cover. *C. procera* also negatively influenced soil temperature and humidity. In the control area, native shrubs/trees had positive influence on light intensity. Interestingly, for both the invaded and control areas, herbaceous

plants cover and other variables showed no significant variation in plots located away (at 5m) from either *C. procera* or native tree/shrubs. These findings emphasize the necessity of habitat manipulative control measures for the widespread invasion of *C. procera* and related plants in RUNAPA. Furthermore, detailed studies on feasible and cost-effective methods for such control actions are recommended.

Keywords: forage resources, invasive plants, plant invasion, protected areas

SUB-THEME: Wildlife Ecology and Ecological Interactions

Re-assessment of chytridiomycosis disease in the kihansi gorge spray wetlands in Tanzania

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Abstract

Chytridiomycosis is a world-known amphibian fungal disease caused by *Batrachochytrium dendrobatidis*. This disease can be fatal to some species, while others occurring in the same ecosystem are not affected. Kihansi Spray Toad (KST), *Nectophrynoides asperginis*, is among amphibian species that are vulnerable to chytridiomycosis disease. The KST is endemic to Kihansi gorge spray wetlands, part of Udzungwa Mountain Block in South-Central Tanzania. In 2009, KST became extinct in the wild due to *B. dendrobatidis* infection. The species survives well in captivity but restoration to its natural habitat has not yet succeeded. Nevertheless, re-introduction experiments are ongoing as efforts to ensure successful restoration in the wild. As part of KST's restoration program, this study aimed to re-reassess the status of chytridiomycosis disease in the wild, 20 years after its

detection in the area. Time-constrained, day and night surveys were conducted in the spray wetlands for three days in December 2022. The survey involved searching for amphibians on rocks surfaces, leaves and under vegetation. Observed individuals were swabbed following a protocol developed at University of California and samples were preserved in cryovials (3mm). Encountered dead amphibians were preserved in 70% Ethanol. All samples were shipped to Animal Disease Labs at Sokoine University of Agriculture (Tanzania) and San Diego Zoo (USA) for analysis. A total of 44 samples of skin-swab and dead specimens were obtained from seven species of amphibians, namely *Arthroleptis xenodactyloides*, *N. asperginis*, *Hyperolius mitchelli*, *Arthroleptides yakusini*, *Afrivalus fornasini*, *Hyperolius substriatus*, and *Ptychadena anchietae*. Lab results re-confirmed the presence of *B. dendrobatidis*

in the spray wetlands, and three of the seven species were infected: *N. asperginis*, *P. anchietae* and *A. yakusini*. We recommend continued research and experiments to identify options that can enable KST to survive with the *B. dendrobatidis* in their

habitat, and/or introduce them to a habitat with similar environmental conditions as their original habitat.

Keywords: Spray toad, chytrid fungus, Udzungwa, captive breeding, spray wetland

Dynamics of herbivore distribution and habitat selection in the Greater Serengeti Ecosystem, Tanzania

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Abstract

Understanding herbivore's spatio-temporal distribution and habitat selection are important aspects in the ecology and management of species in protected landscapes. This study was conducted in the Great Serengeti Ecosystem, in Northern Tanzania. The objective of this study was to determine the dynamics of herbivore's distribution and habitat selection of seven medium to large sized herbivores (Impala, Grant's gazelles, Wildebeest, Zebra, Buffalo, Giraffe, and Elephant). Herbivores aerial survey data and remote-sensing-based habitat quality maps covering two study periods (1995 and 2015) were used to assess habitat selection and use. Herbivores were aggregated according to their feeding guilds: browsers (Grant's gazelles and Giraffe), grazers (Wildebeest, Zebra and Buffalo), and mixed feeder (Impala and Elephant), and habitats characterized into low, medium, and high qualities, derived from quality habitat maps generated from Integrated Valuation of Environmental Services and Tradeoffs (InVEST) model. We utilized the kernel density to map species distribution range. Bonferroni confidence interval and Chi-square goodness-of-fit test were

used to assess habitat selection and use. We observed a significant clustered distribution pattern for all herbivores at the ecosystem level across space and time. We recorded high mean species observations in Serengeti National Park (NP), followed by Game Reserves (GRs) and least in Wildlife Management Areas (WMAs). The herbivores mean sightings were higher for 2015 than for 1995. Herbivores distribution ranges contracted for browsers and expanded for grazers and mixed feeders for 2015 in comparison to 1995. Our data suggest that, herbivores showed a significant avoidance of low-quality habitats and favored high-quality habitats across space and time. Information on specie's distribution, habitat selection and use are useful in determining high priority areas for effective conservation practices. Our study recommends a continued protection efforts and halting habitats degradations in the ecosystem.

Keywords: Protected area, ecosystem, habitat quality, InVEST model, Census data

Female transfer in olive baboons at Gombe.

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Abstract

Savanna baboons live in multi-female multi-male groups (troops). Sons reaching adulthood emigrate. That is, the consistent members of groups are related to females and their young, and females do not transfer. Indeed there is often antagonism between groups of different females. Thus, regular observations of olive baboons in Gombe National Park since 1967, monitoring known individuals of up to eleven different groups, did not detect a single case of confirmed female transfer for 48 years. However, in 2016, one adult female transferred into a neighbouring group for four weeks, then returned to her mother's group. Seven months later, she moved back there again, following another female her close kin who had just emigrated. They stayed there, apparently unmolested, for two years; but then they returned, both pregnant. Three years later, the second of these two females started temporary residences in another neighbouring group. Apart from these unprecedented emigrations, there have also been immigrations. Three unknown

adult females joined another of the study groups in 2016. There was no antagonism by the females in the host group, and they have now been there for seven years. These immigrant females even attained middle-upper ranks in the dominance hierarchy, and are breeding successfully. All these cases of emigration and immigration are contrary to the established wisdom that female baboons do not transfer. Examination of each case study suggests interactions among some of the following factors a) females at the bottom of the hierarchy avoiding social challenges, b) females failing to breed for long periods, c) swollen (oestrus) females being attracted to strange males, d) adult males failing to restrain females from emigrating, e) adult males acting possessively to new immigrant females, f) females relaxing their antagonism toward females of some neighbouring groups, and overall g) loosening of social structure of groups which are declining in size.

Keywords: Baboons Female-transfer Gombe

Dry season water use by mammals in viramba baboons range, Mikumi national park

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Abstract

Water resources are very important for the survival of biological species. The determination of dry season water use by mammals was done using the camera traps.

This determination was made in the range of Viramba habituated yellow baboon troops for long-term studies at Mikumi National Park. The baboon range was divided into

two categories namely the current use and the abandoned. Ten cameras were set to run continuously with 5 seconds delay between consecutive photos from August to November, 2022 making the effort of 900 trapping days. The setting of the camera and placement on water sources in the dry season aimed to maximising getting photos of each mammal species going for a drink. The camera recorded a total of 35 mammal species from 17 families. Family Bovidae had the largest number of species recorded (11) followed by families Herpestidae (4), Felidae (3), Viveridae and Suidae (each 2). The remaining 12 families were last, recorded 1 species each. About 19 mammalian species were photographed both in the abandoned and current range of the habituated Viramba yellow baboons. Out of the total 35 mammalian species recorded, 22.8% were recorded in current range and not in the abandoned range and another 22.8% of species were recorded in the abandoned

range and not in the current range. The difference in the records of the mammalian species between the two categorised ranges couldn't explain any fact for the baboons to abandon the range that was previously known to use. The mammalian species had temporal differences in water use, a fact explained by behaviour ecological theories and evolution. Also, several behavioural-ecological aspects of the mammals photographed were recorded through the photos taken. The inability of differences in mammalian species to explain the reason for baboons to abandon part of their range indicates other factors are behind this change rather the occurrence of mammalian species, however information from camera traps can be relevant in planning for the conservation and management of wildlife in Mikumi National Park.

Keywords: Viramba, Yellow baboons, Camera traps, Dry season water, Mikumi National Park

Home range and survival probability of two dominant rodent species on the slopes of Mount Kilimanjaro, Tanzania

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Abstract

Home range size and survival probability are important parameters that influence the behavioral and ecological characteristics of small mammals including rodents. Little is known about the effects of increased habitat destruction and fragmentation on the home range size, survival and distribution of rodents. This study aimed to determine the home range and survival probabilities of two dominant rodent species (*Lophuromys aquilus* and *Rhabdomys dilectus*) on the western slopes of Mount Kilimanjaro, Tanzania. Trapping was conducted in both

dry and wet seasons using medium-sized Sherman live traps in four Capture-mark-recapture grids for a period of two years (2020 - 2022). Traps were baited with peanut butter and set for three nights every month. It was found that the home range size of *Rhabdomys dilectus* was significantly higher in moorland than in fallow ($p < 0.05$). *Lophuromys aquilus*'s home range was mainly influenced by the variations in habitat, season and sex whereby, it was significantly higher in Moorland than in fallow land ($p < 0.05$). Moreover, there

were significant differences in the survival of the two rodent species ($p < 0.05$). Whereby, survival of *L. aquilus* was higher than that of *R. dilectus*, indicating that *L. aquilus* could be more adapted to live in cooler conditions of Mt. Kilimanjaro than *R. dilectus*, this was evident from lower capture probability due to trap shy behavior which serves as a mechanism of predator avoidance as compared to *R. dilectus* which is a trap lover. For both species female's survival was higher than males ($p < 0.05$).

This suggests that females spend most of their time in the nests during breeding season hence reducing predation risk. It can be concluded that habitat quality and sex influence home range size and survival probability of rodents due to variations in food resource availability, mating behavior and reproductive fitness.

Keywords: Capture, home range, Kilimanjaro, reproductive fitness, survival.

SUB-THEME: Water resources and wetland conservation, climate change and Vegetation Ecology, Invasive Species and habitat Conservation

Human migration into Rufiji Delta Wetlands as climate change adaptation strategy: Effects and mitigation measures

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Abstract

The Rufiji Delta Wetlands has the largest single remains of mangrove forest in Eastern Africa, with higher biodiversity. However, the health of the delta mangroves is threatened by the immigration of people. This study, therefore, aimed at assessing the effects of human migration to the delta's wetlands and mitigation measures. Specifically, we assessed human migration patterns into the delta, their socioeconomic activities and land cover changes. Qualitative data were collected from Focus Group Discussions and Key Informants Interviews, while land cover changes were obtained through Satellite images using Remote Sensing. While qualitative data were analyzed using the ethnographic content analysis technique, ArcGIS Pro's Change Detection Wizard assessed the land cover changes. Four migration patterns were found, including Inter-village, inter-district, and inter-region migration to the Rufiji Delta wetlands. Deforestation for rice

farming and cattle grazing was the major socioeconomic activity that negatively affected the wetlands ecosystem. About 4500 farmers farming in the delta wetlands contributed to the loss of 7000 ha of mangroves from 1991 to 2016. A total of 123 pastoralists with 24,967 cattle were reportedly taken to the delta wetlands, owned by pastoralists from Western and Northern parts of Tanzania, more than 800 km from the delta. Farmers and pastoralists continued invading the delta despite awareness-raising and alternative livelihood support from Government and non-government organizations. Therefore, more mitigation measures are needed to sustain the conservation of the Rufiji Delta wetlands in the Rufiji Delta.

Keywords: biodiversity, cover change, migration patterns, socioeconomic

Woody vegetation structure, floristic composition and species richness along the elevation gradient of Mt. Meru, Tanzania

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Abstract

Understanding how vegetation composition changes along elevational gradients is crucial for species conservation in a changing world. In this study, we focused on protected habitats along the eastern slope of Mount Meru to examine how species richness, tree height, and floristic composition of woody plants change with elevation. Additionally, we analyzed the combined influence of temperature and precipitation on these vegetation variables. Data on vegetation were collected from 44 systematically placed plots across five transects, covering an elevation gradient ranging from 1600 to 3400 meters above sea level (m a.s.l). Using ordinary linear models and multivariate analyses, we investigated the effects of mean annual temperature and precipitation on woody plant species richness, tree height, and floristic composition. Our findings revealed that as elevation increased, species richness, mean tree height, and maximum tree height showed a steady decline. Models considering only mean annual temperature as an explanatory variable performed best

in predicting changes in species richness and tree height along the elevation gradient. Furthermore, significant alterations in woody plant floristic composition occurred with changing elevation, driven by the interaction between mean annual temperature and precipitation. While temperature consistently influenced plant communities along the elevation gradient, precipitation played a more critical role for plant communities at lower elevations compared to those at higher elevations. Based on our study, we propose that ongoing climate change-induced shifts in temperature and precipitation patterns will reshape elevational gradients of diversity, tree height, and carbon storage correlations in ecosystems. Consequently, the sequence of tree communities on East African mountains is likely to undergo transformation.

Keywords: Arusha national park; floristic diversity; mean annual precipitation; mean annual temperature; woody plant community.

Strategies of Rural Women in Coping with Effects of Climate Change in North Tanzania

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Abstract

The climate change is affecting human health, food security and livelihoods, quality and availability of land, water and other natural resources. It poses a serious threat to every aspect of human life. The consequences of climate change are not experienced evenly, women are said to be likely and disproportionately affected. Furthermore, women capacity to cope with effects of climate change is said to be as well more disadvantageous. However, empirical evidence on capacity of the indigenous and remote women are scarce. Therefore, this study specifically examines the strategies used by rural women in coping with effects of climate change, business opportunities emerging out of coping strategies and the challenges facing rural women in coping with effects of climate change in North Tanzania. This study used quantitative approach with descriptive cross-sectional survey design. The data were collected from 500 Maasai rural women in Kilimanjaro, Arusha and Manyara sampled through convenient sampling technique. The data were collected using a questionnaire being triangulated with in-depth interviews. The findings reveal that, the strategies used by rural women in coping with effects of climate change

include development and diversification of income sources, cost management, social capital management, and environmental stress management. Furthermore, the business opportunities emerging out of such coping strategies include opportunity to formulate business groups to access loans; do small businesses related to herbs, ornaments and firewood; participating in some trainings and meetings; generating income through cultural tourisms; meeting and networking with foreigners like tourists and urban people. The capacity to cope with the effects of climate change is hindered by overrepresentation among the poor, barriers to decision-making, experience disproportionate mobility challenges and unequal access to resources. In general, rural women practically deal with coping strategies and not strategies for building up livelihood assets. This study advocates for serious engagement of concerned stakeholders in supporting the rural women to not only practice beyond coping strategies on the effects of climate change but also on strategies for building up livelihood assets.

Keywords: Coping Strategies, rural women, climate change, livelihood assets

Use of macroinvertebrates to assess the impacts of anthropogenic activities on pinyinyi river around lake natron ramsar site, Arusha Tanzania

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Abstract

Rivers are important for aquatic biodiversity such as bird and fish. However, anthropogenic activities such as agricultural activities and livestockkeeping degrade rivers and decrease their capacity

to offer ecosystem services. This study used macroinvertebrates to assess the impact of anthropogenic activities on the Pinyinyi river during dry and wet season. Pinyinyi river pours its water into

Lake Natron Ramsar Site. Abundance of macroinvertebrates, average score per taxon and Shannon Weiner Species Diversity Index was used to state the ecological status of Pinyinyi river. A macroinvertebrates hand net was used to collect the macroinvertebrates per sampling point. A total of 164 macroinvertebrates were collected. The most abundant taxa were mosquito larva, (41.07%) and aquatic carterpillar (23.21%) during dry season representing about 64.28% of the total macroinvertebrates whereas the least abundant taxa were dragon flies (19.64%) and pouch snail (16.07%) during dry season representing about 35.72% of the total macroinvertebrates. The most abundant taxa collected during wet season were aquatic earthworm (19.44%), midges (17.59%), black flies (15.74%) and creeping water bugs (12.96%) whereas the least abundant were pigmy back swimmers

(2.78%), snail (3.7%), predacious dividing beetle (4.63%) and coleopteran (4.63%). Average Score per taxon of Pinyinyi river during dry season was 5.25 and 3.6 during wet season. The Shannon Weiner Species Diversity Index was 1.318 during dry season and 2.138 during wet season. Based on the abundance, average score and diversity index indicate that Pinyinyi river is moderately polluted during dry season and seriously polluted during wet season. It was found that, agricultural activities, livestockkeeping, bathing and washing alter the quality of water. The study therefore, recommends that the source of pollutants should be controlled and the river regularly monitored by the relevant authorities.

Keywords: Anthropogenic activities, bioindicators, diversity, macroinvertebrates, s, wriver ater.

Assessment of the mangrove degradation and community involvement in its restoration at Mtwara-Mikindani Municipal Council, Mtwara Region

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Abstract

Mangrove ecosystems plays crucial role in protection of coastlines and preserve the coastal scenery. Most people living adjacent to mangrove ecosystems depends on their resource to meet their livelihoods. This article is designed to assess the mangrove degradation and community involvement in its restoration in Mtwara-Mikindani Municipal Council. This paper answered four specific objectives; to identify major mangrove species and their uses in Mtwara-Mikindani Municipal Council; to ascertain the main factors causing mangrove vegetation degradation; to investigate how communities are involved in mangrove forest management

and to determine benefits accrued by communities from mangrove forest. The data were collected using questionnaires, key-informant interviews, observations and documentary literature review. About 301 heads of households answered the questionnaires where key informants were 11. The study revealed that, people living proximity to mangrove ecosystems gets different resource to meet their livelihood such as firewood, poles, fish, bee-products, fish and crabs. The accessibility of the products is through permits which are obtained from the Tanzania Forest Services (TFS). In some cases people violates procedures and illegally accessed the

mangrove ecosystems. The degradation of mangroves is caused by illegal cutting of mangroves for firewood used in their homes and for salt making. Other activities causing mangrove degradation include poles cutting for building and clear cutting of mangroves to establish salt making pans. In conclusion, alternative means of livelihoods should be emphasized in order to enhance contribution of mangroves on the environment including carbon sequestration, control beach erosion and beautify the coast beaches. The study

suggests that, massive mangrove planting is a must to increase the coverage of the mangroves as well as strengthening the local institutions and increasing people's awareness on sustainable utilization of mangrove ecosystems in order to increase positive attitude on conservation and hence increase availability of products, income and improve their livelihoods.

Keywords: Community, Degradation, Mangroves, Mtwara-Mikindani, Restoration

Tracking establishment and spreading of an invasive tree *Prosopis juliflora* in Tanzania

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Abstract

The aggressive spread of alien species such as *Prosopis juliflora* is disrupting grazing land resources, thus impacting livestock keeping and wildlife in the Northern Tanzania (NT). Therefore, a survey was carried out in about 40 areas in Tanzania where *P. juliflora* was deliberately introduced between 1950s and 1980s to determine if the species established and is spreading. Habitat suitability for *P. juliflora* was used to screen out areas where *Prosopis* was planted but do not favor its growth and spread. It was found that about 60% of the areas with previous deliberate introductions have been invaded with *P. Juliflora*. Of this, 25% have been heavily infested. Forty percent (28%) of the areas with previous introductions are now

settlement and well managed farmlands that do not allow spread of the species and in the remaining 12%, the species have either not established or have naturalized but not spreading at all. Only 2% of the areas with previous introduction were unsuitable for the species growth. Eighty percent of the areas where *P. juliflora* was deliberately introduced are now protected areas and there is no active management of the species. This study recommends for the *P. juliflora* to be managed by preventing its spreads from previously introductory areas.

Keywords: Invasive plants, management, rangelands, , Tanzania

A land systems data product for biodiversity and socio-economic analysis

Lazaro Johana Mangewa, Forrest Stevens, Andrea Gaughan, Rekha Warriar, Felister Mombo, Fadhili Bwagalilo & Jonathan Salerno

Abstract

Health and Monitoring, Human-Wildlife Interactions, Remote Sensing and GIS

Biodiversity conservation and socio-economic development are directly linked to dynamic land systems. Land systems are terrestrial socio-environmental systems where human and natural components interact through land use and management. Advances in land systems science approaches, particularly the integration of remote sensing technologies to understand land change and its drivers, show great potential to support wildlife conservation science and practices. In this talk we present a technical framework for creating user-generated gridded data products in a spatiotemporally consistent format using Google Earth Engine. Data products include proxies for vegetation cover and condition, precipitation, temperature, and various trend and temporal patterns. Data products are suitable for simply statistical

summarization aggregated to any spatial extent, thereby creating a temporal database resolved to a user-provided spatial boundary or dataset. We demonstrate the application of the framework and data using a case example of human migration and settlement around protected areas in selected landscapes across Tanzania since 1980. We conclude by discussing the relevance of the work to other pressing issues of conservation in Tanzania, including habitat change, wildlife corridor design, and human-wildlife conflict mitigation, all of which have direct links to climate and land systems change. The data products and framework for producing them are freely available, open source, and transferable to other systems.

Keywords: Climate Change and Ecological Resilience, Ecological Interactions, Ecosystem

Symposium 1

Non-*Apis* Pollinators in Tanzania: Stingless and Solitary Bees

Talk1: Solitary Bees and Wasps in Avocado

Kathrin Krausa

Abstract

Insect-mediated pollination and natural pest control are invaluable ecosystem services for food security. Avocado (*Persica americana*) is an important crop in Tanzania, grown by smallholder as well as commercial farmers. In big avocado monocultures, honeybees (*Apis mellifera*) are supplemented and have been shown to improve pollination. Which role solitary pollinators play, is widely understudied in this part of the world. Besides, solitary wasps can play a vital role in the control of

insect pests. Some species of both, solitary bees and wasps use hypogean nests in the form of hollowed plant stems. To assess the diversity of these species, we have installed trap nests that consist of hollowed bamboo stems of different diameters. We conducted this survey on two Avocado farms, on the Western slopes of Mt. Kilimanjaro and in the lowlands in Usariver. Traps placed on the edge of the orchards and in their centre. Monthly, we monitor the nests, remove occupied nests, and allow occupants to

hatch in the laboratory. Monitoring started two months before the avocado flower and continued 2 months after the flower.

This study contributes to

1. The identification of avocado pollinators in Tanzania

2. The identification of pest control agents in Tanzania
3. Gaining insights into the species' lifecycles and reproduction
4. Gaining insights into the key needs of solitary bees and wasps.

Talk2: Meliponiculture - Chances and Challenges

Kathrin Krausa and Warren Steyn

Abstract

Stingless bees (Meliponini) are widely distributed in the tropical regions of the world. As social bees, they contribute to the pollination of flowering plants as well as agricultural crops. Besides, their honey is highly valued as medicine against several diseases. In Tanzania, around ten species of stingless bees exist. Meliponiculture, the practice of stingless beekeeping, is performed predominantly in Northern Tanzania, on the slopes of Mt. Kilimanjaro and Mt. Meru. Species in focus are *Meliponula ferruginea* and *Meliponula togoensis*. While indigenous

knowledge about stingless bee honey and its medicinal properties is big, knowledge about sustainable practices is widely lacking behind. The demand for stingless bee honey is on the rise and more and more people want to engage in meliponiculture. Hence, there is a strong need for more research and training of meliponists to allow meliponiculture to grow sustainably and long term. In this talk, we will discuss the multiple chances and challenges of a growing culture of stingless beekeeping.

Talk3: What new technologies or techniques to build a national collection of insects?

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Abstract

As in all science, we see an evolution of tools and considerable progress in the way we study insects. We will review the new technology used, both to collect them and to study them, and what are the more innovative applications. This involves new trapping or monitoring techniques, the use of digital for photography, the digitization of data to produce distribution maps, molecular methods to establish phylogenies or detect cryptic species, access to the literature on the internet,

and even the creation of scientific paper. These technologies can help us to better understand insect populations, identify threats to their survival, and develop more effective conservation strategies. Most of these techniques are currently implemented for the constitution of a national collection of invertebrates in the new entomological laboratory of TAWIRI in Arusha. The training of students and trainees has already brought together an impressive number of specimens now available for study. This

project was initiated in 2021 with funding from the Global Taxonomy Initiative (GTI) and continued with funding from the JRS Biodiversity Foundation (2022-2025) for the monitoring of invertebrates in mountain forests and the alpine zone. We will provide some concrete examples where these new technologies have revolutionized our approach to entomology. It is important

to note that while emerging technologies offer exciting possibilities for insect conservation, their implementation should be approached carefully, considering potential ethical, social, and environmental implications.

Keywords: technology, techniques, insects, collection, conservation

Talk4: Effectiveness of sampling designs for assessing insect diversity in Njiro Urban forest

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Abstract

Given the increased interest of the scientific community to assess the insect diversity, standard techniques are required. Based on the ecosystem services provided by insects and the decline of insects reported, it is very crucial to study insects using different sampling techniques in order to understand their status, hence their conservation. This study was conducted to assess the effectiveness of different sampling techniques used to assess insect diversity. The study was conducted in Njiro of insects Forest situated at TAWIRI Headquarters in Njiro Arusha City. Different sampling

techniques were used to assess insect diversity in the forest including pan traps, hanging traps, sweep nets, pitfall traps, light trap and beating method. The diversity of insects differed significantly across the different methodologies used. Overall, we conclude that the use of sampling techniques is depending on the group studied and the sampling period.

Keywords: Insects, traps, diversity, ecosystem services, urban forest, insect decline.

Talk 5 BEEtopia

Warren Steyn

Abstract

Besides the omnipresent honeybees (*Apis mellifera*) Tanzania is home to about 1000 other bee species. These bees, however, receive very little attention from research and the general public is widely unaware of their existence. Bees in general contribute greatly to the pollination of flowering plants and crops – hence are important for

food security. The pollination service they deliver is greatly taken for granted while pollinator declines are observed around the world. In this talk, BEEtopia is introduced. A place where research, training, education, and ecotourism meet to raise awareness for bees in Tanzania and around the world. Located on the boundary of the Arusha

National Park, BEEtopia is the ideal location to study bees in their natural environment, perform training for meliponists and farmers, provide an outdoor classroom for local and international schools, and be a destination for tourists. Guests will receive

intriguing insights into the lives of solitary and stingless bees and learn about their role in the ecosystem which will encourage them to contribute to their conservation in Tanzania and beyond.

SEMINAR 1: Climate change analysis

A climate change analysis of selected wildlife management areas and municipal districts in Northern Tanzania

Chris Zganjar
The Nature Conservancy

Abstract

The connectivity of the rangelands across Northern Tanzania is essential to wildlife and pastoralist communities' livestock as they move between wet and dry seasonal ranges. The wildlife and livestock that northern Tanzania's rangelands support also underpin critical elements of the national and local economy. Community livelihoods, including a tourism industry that is one of the country's leading engines of northern Tanzania's economy, as well as grazing require a resilience to climate change. Understanding the future climate change likely to occur will enable communities to better cope and adapt thereby reducing many negative impacts associated with climate change. Integration of climate impact information, vulnerability assessments, and adaptation is critical because the co-existence of wildlife and livestock in the landscape enables these lands to produce a diverse range of economic and environmental values. Sustaining ecological values and rural economies across these landscapes in an integrated manner is thus critical to Tanzania's economic future as well as the conservation of some of the world's most significant remaining large mammal populations. This high level climate change summary presents results from

a Climate Wizard (Girvetz et al., 2009) analysis generated to forecast future climate changes in five wildlife management areas (Burunge, Enduimet, Lake Natron Basin, Makame, and Randilen) and three municipal districts (Kiteo, Monduli / Longido, and Simanjiro) in Northern Tanzania over the next 50 and 100 years. This analysis was generated using a standardized set of 9 daily downscaled General Circulation Model (GCM) projections from the World Climate Research Programme's (WCRP's) Coupled Model Intercomparison Project phase 3 (CMIP3) multi-model dataset. The projections were from 9 global climate models (GCMs) and represent all daily GCM data available from the CMIP3 archives. Downscaled results were produced on a global domain (land areas only), with daily time resolution on a spatial grid of 0.5° in latitude by 0.5° in longitude. Because of limited availability of daily-timescale GCM output, downscaled results were produced for three limited time windows: 1961-1999 (referred to below as the historical reference period), 2046-2065 (mid-century), and 2081-2100 (end-of-century). Results are presented as ensemble analyses for the A2 emissions scenario



PRENARY PRESENTATION PAPER 2

Innovation and Technology for Conservation and Sustainable Tourism development

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Abstract

This keynote presentation introduces innovation and technology among the key drivers for managing conservation and sustainable tourism in tourist developing destinations with particular interest on Tanzania. The choice of the country is based on its comparative advantage that rests on its natural assets. Tanzania has the highest percentage worldwide (about 32.5%) of its land in a protected natural state, compared to the world average of 4%. Over 307,800 square kilometers of its land is protected in the form of national parks, game reserves, forests, beaches and archeological sites and so forth. The presentation answers the key question “Why innovation and technology in managing conservation and sustainable tourism development?”

It derives the meaning of sustainable tourism from the economic, social and environmental impacts; and provides empirical evidences of innovation in tourism focusing on product, process, managerial, marketing and institutional perspectives. Major trends in technologies shaping the future of conservation and sustainable tourism development including artificial intelligence, internet of things and digital tourism have been highlighted. The presentation concludes by providing practical implications for policy making and managerial decisions.

Keywords: Innovation, Technology, Conservation, Sustainable Tourism, Tanzania

PARALLEL SESSION PRESENTATIONS

SUB-THEME: Wildlife Ecology and Ecological Interactions

Are Wildebeest movement patterns triggered by rainy clouds?

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Abstract

Long-distance seasonal migrations taken by herbivores in African savannas are largely determined by seasonally driven forage or surface water linked to rainfall events.

However, the actual environmental cues that triggers these long movement decisions from one area to another are often unclear. It's believed that large African herbivores

may respond to rainfall triggers, such as the large scale perception of rain generated by rain clouds. Therefore we aim to determine whether large African herbivores changed their movement behaviour with changes in the rainfall regime and whether the changes in movement were in response to some large-scale perception that may drive wildebeest to move out of local resource patches. Relatively few studies have contributed to our understanding of movement by linking adaptive behavioural responses to environmental variability with today's satellite technology. For this study we will focus on using integrated Step-selection Functions (iSSF's) to discern how

animals respond to different spatial patterns of cloud formation and remotely sensed rainfall estimates and their ability to track these at different distances. GPS data from collared wildebeest collated by AfriMove from Serengeti, southern Kalahari, central Kalahari, Okavango Delta, and Kruger will be statistically linked to radar satellite imagery. These findings may increase our understanding of how environmental triggers may influence complex emergent phenomena such as animal migration.

Keywords: rainfall, animal movement, environmental triggers

Population density of lion and leopard in the Selous-Nyerere landscape

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Abstract

Accurate estimates of population status are an important component of evidence-based conservation efforts. This presentation will provide much-needed information on the population status of lion (*Panthera leo*) and leopard (*Panthera pardus*) in the globally-important Selous-Nyerere ecosystem, using data from surveys conducted from 2020 to 2022 in Selous Game Reserve and Nyerere National Park. We use spatially explicit capture-recapture (SECR) modelling of camera trap data to estimate population density of lion and leopard at seven sites across the Selous-Nyerere landscape. We compare the resulting population density estimates to estimates produced using

similar methods elsewhere in Tanzania, including in the Ruaha-Rungwa landscape. We discuss how our results can be employed to inform evidence-based conservation, and identify research and management priorities highlighted by our findings. This research was carried out in collaboration by the University of Oxford's Wildlife Conservation Research Unit (WildCRU), Lion Landscapes, the Tanzania Wildlife Research Institute (TAWIRI), Tanzania Wildlife Management Authority (TAWA), Tanzania National Parks Authority (TANAPA), and Frankfurt Zoological Society (FZS).

Ecological conditions, wildlife distribution and anthropogenic disturbances in the Selous-Niassa Wildlife Corridor, Tanzania

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Abstract

The Selous-Niassa Wildlife Corridor is an important pathway for the movement of wildlife between the Selous Game Reserve and Nyerere National Park (Tanzania) and the Niassa Special Reserve (in Mozambique). The study's general objective was to undertake ecological conditions, assess wildlife distribution and anthropogenic disturbances in the Selous-Niassa Wildlife Corridor, Ruvuma landscape, Tanzania. Specifically, the study aimed to: (i) Assess ecological conditions in the corridor, (ii) Assess the population trend and distribution of wildlife populations, (iii) Determine the anthropogenic disturbances in the corridor, and (iv) Determine the spatial extent of the corridor. This corridor is a critical area for species mobility, hence maintaining gene flow and biodiversity in the region, and as such, it is important to understand the ecological conditions and anthropogenic related activities and associated impact to the corridor. Land use and land cover (LULC) analysis revealed that the area is predominantly covered by woodland (30.2% for the year 2020), mosaic (32.8% for the year 2020), shrubland (9.5% for the year 2020), and least for water bodies and swamps (0.1% for the year 2020). Spatiotemporal comparisons of LULC types between 2001 and 2020 suggest that there have been significant LULC changes. Specifically, there has been an increase in bareland, cultivation, and mosaic and a decrease in water bodies, swamp, and woodland cover types. The Enhanced Vegetation Index (EVI) analysis showed a stable vegetation condition between 2001 and 2012, and an increasing condition from

2013 to 2020. Rainfall patterns in the area are fluctuating, with an average of 1086 mm/year. The mean annual temperature in the corridor is around 25°C, whereas, the soil moisture analysis from remotely sensed data indicates areas with higher soil moisture corresponded with areas of higher vegetation greenness. Incidences of livestock encounters increased from 22 (between 2000 and 2010) to 145 incidences (between 2011 and 2020). The impact of livestock grazing on the ecological conditions of the corridor is a concern, as overgrazing can lead to the degradation of vegetation. Fire incidences increased from 3,046 (in 2001) to 16,081, and burnt area increased significantly over the past two decades. Implementing conservation and management strategies that prioritize maintaining connectivity within the area is crucial to safeguard the corridor. These strategies may involve mitigating human-wildlife conflicts and regulating land use practices. Gaining a comprehensive understanding of the ecological conditions within the corridor is vital for informing effective conservation planning and management strategies. In addition, active engagement of local communities in conservation efforts is essential to ensure their awareness of the corridor's significance and active participation in its protection. In summary, this report offers a comprehensive analysis of the corridor's ecological conditions and emphasizes the importance of well-informed conservation and management strategies that consider both conservation goals and the livelihoods of the communities within the Ruvuma landscape.

The need for establishing Rangeland Management Areas (RMAs) in Tanzania

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Abstract

Tanzania's successful preservation efforts have included establishing National Parks (NPs) and Game Reserves (GRs) that prohibit human settlement, agriculture, and livestock grazing. Surrounding these vast protected areas are currently regions designated for sustainable resource use, such as Game Controlled Areas (GCAs), Forest Reserves (FRs), Wildlife Management Areas (WMAs), and the Ngorongoro Conservation Area (NCA). These were initially designed for soft transition zones between human habitation and wildlife, but escalating conflicts and rapid wildlife decline in GCAs, WMAs, and FRs point to an increasing breakdown of coexistence between humans and migratory wildlife. This, in conjunction with unrestricted livestock population growth and climate change, threatens both future wildlife and pastoralist community livelihoods. In this presentation, I will advocate for a new protection model: Rangeland Management

Areas (RMAs). Rather than persuading local communities to allocate space for wildlife at the expense of grazing land for livestock, RMAs prioritize improving livestock grazing opportunities in an open rangeland model while maintaining the resilience of pastoralist communities to fluctuating climatic conditions. Key RMA strategies include habitat restoration, rotational grazing, priority livestock quality over quantity (diary production, cattle instead of increasingly sheep and goats) and reintroduction of savanna fires to control bush encroachment. This model expects to create indirect benefits for wildlife and ecosystems services, rather than putting such benefits of nature directly central. The novel approach is exemplified with cases from northern Loliondo, Ngorongoro district.

Keywords: Livestock, protected Areas, population growth, range lands, wildlife,

Evaluation of the Non-invasive Genetic Sampling for estimating lions' population size in Ngorongoro Conservation Area (NCA)

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Abstract

Estimating the population sizes is crucial for effective wildlife management and conservation, particularly for endangered species where even small population fluctuations may be critical. Nevertheless, the assessment of carnivore population size has encountered numerous methodological challenges, with index-based counts revealing significant flaws that undermine the effectiveness of carnivore management decisions. Finding alternative methods to accurately estimate the size and trends

of the remaining low-density populations is increasingly urgent. In this study, we assessed the feasibility of estimating the population size of lions using non-invasive genetic sampling (using hair and faecal samples) in NCA. For a start, we evaluated the quality of non-invasively collected samples compared to higher-quality tissue samples. We then tested a new non-invasive genetic sampling protocol for reliable population size estimation using Capture-Mark-Recapture in *Capwire* using

Single Nucleotide Polymorphism (SNP) genotyping.

Noninvasively collected samples matched tissue samples by an average of 99%, showing that they were of good enough quality for individual identification and population size estimation.

By using the R package *allelematch*, we identified 179 unique individuals from 284 samples collected during a 10-year period. We used a subset of 38 samples collected in the crater in 2014-2015 to estimate the population size. We estimated a population size of 100 lions in the Crater. This was higher than the population based on the minimum total count and our long-term monitoring based on the individual

identification of 75 lions. An essential difference between our estimate and the minimum total count is the few re-sampling cases needed for the Capture-Mark-Recapture assessment. While population assessment, in this case, was restricted, it holds the future for population size estimations. We recommend short periods of multiple sampling sessions to meet the closure assumption of the Capture-Mark-Recapture. We further propose using scat-detecting dogs to maximise the capture rates and reduce sampling bias.

Keywords: Amplification success, Capture-Mark-Recapture, Sampling intensity, SNP Genotyping.

Drivers of Rodent Community Structure in an Urban National Park, Kenya

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Abstract

Nairobi National Park's ecosystem is among Kenya's most vulnerable because of the extreme pressure of urbanization. Understanding the structure of the rodent community in Nairobi National Park is important because rodents are sensitive bioindicators of ecosystem health. The association of vegetation type, vegetation metrics, seasonality, and anthropogenic disturbance with rodent community structure was also evaluated. To achieve this, rodent samples were collected from 15 sites during the wet and dry seasons to assess rodent diversity and relative abundance. Capture-release method was used to trap rodents in the savannah, forest, and riverine vegetation types of Nairobi National Park during the dry and

wet seasons. From 56 rodents trapped, five species identified were *Lemniscomys striatus*, *Hylomyscus sp*, *Rattus rattus*, *Mus mus* and *Otomys tropicalis*. Rodent diversity at NNP was low (Simpson=0.7130; Shannon Weiner=1.40; Brillouin index=1.27) while Pielou's species evenness, was moderate=0.44 indicating near equity in species distribution. Univariate Generalised linear models showed that rodent abundance was influenced by season, vegetation type, and vegetation metrics but not by human disturbance/edge effects. The multivariate model indicated that rodents were abundant in the wet season compared to the dry season, and that abundance was also positively associated with increased tree and shrub densities. Rodent species

richness was positively associated with higher tree density, while vegetation types influenced rodent species diversity. Rodent abundance was influenced by vegetation type, vegetation metrics (density and cover), and season but not by human disturbance. It was observed that the diverse anthropogenic activities occurring in NNP, do not significantly influence rodent abundance as compared to the biotic

and abiotic factors. Factors that influence vegetation and season, like climate change, are thus a threat to the faunal diversity in NNP. This first rodent survey in this Park, provide preliminary data for continued monitoring of this ecosystem.

Keywords: Ecosystem, Habitat structure, Population composition, Rodent abundance and diversity, Urbanization

Elephant Conservation at the Cross Road

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Abstract

African elephant faced a serious poaching event since colonial time when were hunted for the ivory trade and later poaching surge that occurred at a certain period cycle. While worldwide elephant protection is an agent agenda and alarming support to stop trade, its habitat receives almost no attention that has incited the growth of human elephant interaction that become the new agent in reduction of elephant population, change in elephant culture and behavior and create the risk of managing African elephant. Based on reported elephant incidents countrywide there is a significant population of elephants resides in village lands and large-scale plantation, some of the areas exceeding 100km from nearby designated wildlife protected area. This increasingly fragmentation of

their habitat and skewed investment and discussion in international platform on elephant. Also, political support is under tension when come to elephant human interaction as its affects directly the life and livelihood of the people, whom determine the political position during the change in tenure. Therefore, the uncheck continuation of human-elephant interaction is creating unprecedented response to people and elephants as such elephant will be affected in number through problem animal control, retaliatory response, and poaching. We developed a logical model that explaining important components from existing countrywide reported data, collared elephant data and wildlife population monitoring in key ecosystems.



Spatio-temporal distribution of Tsetse and Human Infective Trypanosomes in Serengeti National Park, Tanzania

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Abstract

Tourism is the leading foreign currency earner contributing about 16-25% of Tanzania's GDP. However, a tsetse fly-transmitted Human African Trypanosomiasis (HAT) negatively impacts tourism in most protected areas. From 1995 to 2010, 2,897 HAT cases occurred countrywide and about 60% of world HAT cases involved international travelers who visited Africa. The current longitudinal study was conducted using block sampling technique during dry and wet seasons to determine the abundance, distribution, and infectivity of tsetse flies with Human Infective Trypanosomes (HIT) in Serengeti National Park. Biconical tsetse traps were deployed and mapped by GPS while the number, species, and sex of tsetse flies from 4 blocks were recorded. The data were analyzed by R-software at 95% confidence interval and critical probability of 0.05 whereby the mean tsetse fly catch rates with and without acetone were compared by Student T-test. SRA-LAMP detected *Trypanosoma brucei rhodesiense* genes and distribution maps

produced by ArcGIS software. A total of 82,631 tsetse flies were caught of which 38,277 flies (40.3%) from four randomly selected blocks were identified as *Glossina swynnertoni* (96.5%) *G. pallidipes* (3.5%), *G. longipennis* (0.04%) and *G. brevipalpis* (0.01%). Simiyu, Kirawira, Ikoma, Bilila, Serena, and Nyamuma blocks had higher catch rates than the rest and the least was Moru (short grass plains). Higher mean catch rates (71 flies/trap/day) were during wet season than dry (33 flies/trap/day) while mean catch rates of acetone-baited traps was higher (60 flies/trap/day) than that without (49 flies/trap/day). *Trypanosoma brucei rhodesiense* was detected in 40% of the blocks during dry season than wet (30%). The well-known 'Death Valley' is hereby confirmed as an active HAT hotspot and, for the first time, report Kirawira and Simiyu as new hotspots. More efforts are needed to control tsetse and HAT in the Serengeti.

Keywords: Distribution, tsetse, trypanosomes, humans, Serengeti

Moon phase and season alter road use by lions

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Abstract

Roads within protected areas facilitate management and tourism but can also alter animal movements and foraging opportunities. Animal tracks observed along roads are also used to index species distributions and abundance. We investigated the influence of roads on lion (*Panthera leo*) movements within the Serengeti ecosystem of Tanzania. We used hourly locations from 18 GPS-collared lions to quantify the influence of temporal periodicity (diel, lunar, and seasonal) and land covers on lion road use and road crossing frequency during 2018–2019. Lion road use and crossings did not differ between day and night but varied up to 63% across lunar illumination and 82% between seasons. Greater lion road use and road

crossing incidences observed during the dry season and greater lunar illumination can be attributed to reduced foraging because lion preys are less common during the dry season and acquired at a lower success rate during periods of greater lunar illumination. As lion road use varied between seasons and across lunar phases, we recommend consideration of these variations when indexing lion populations using data derived from track surveys that use roads as transects.

Keywords: GPS–Collar, lion *Panthera leo*, lunar illumination, Serengeti National Park, road use, road crossing, lion population estimate

Application of stable isotope ratio analysis to study movement and dietary preferences of migratory ungulates

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Abstract

Migratory ungulate species are experiencing global declines and local extinctions due to increased anthropogenic activities. Expanding coverage of protected areas has proven unsuccessful in reversing this trend. Restoring migratory corridors offers a permanent solution to this problem. However, understanding of critical historical information on the extent of animals' movement and their dietary preferences is limited, due to methodological challenges. Use of tracking devices has proven expensive and precludes studying movement retrospectively. Using stable isotope analysis, this study demonstrates how tail hairs from migratory ungulates

can be used to study movement, life history strategies and their dietary interactions. The study develops a sulfur ($\delta^{34}\text{S}$) isoscape for the Serengeti ecosystem and uses it to test the hypothesis that $\delta^{34}\text{S}$ in tail hair reflects dietary $\delta^{34}\text{S}$, and can therefore be used as a geolocator. Our study utilizes state-space models to demonstrate how variation of $\delta^{34}\text{S}$ in wildebeest tail hair can be used to differentiate resident versus migrant life-histories. Finally, using Stable Isotope Mixing Models (SIMMs), stable isotope ratios of carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) in tail hairs of wildebeest and zebra are used to understand seasonal periods of dietary convergence and partitioning for the co-

migrating ungulate species. Our findings suggest that the Serengeti ecosystem has strong spatial variability in $\delta^{34}\text{S}$ across its range. Results suggest that $\delta^{34}\text{S}$ values in tail hair strongly reflect $\delta^{34}\text{S}$ values in diet, suggesting that variation of $\delta^{34}\text{S}$ in tail hair can be used as a natural geolocator of animal movement. The findings further suggest that variation of $\delta^{34}\text{S}$ in tail hair is effective in differentiating resident from migrant life history strategies. Results from SIMMs

suggest that periods of diet convergence and diet partitioning are detectable between co-migrating animals. This study helps to address a major methodological challenge of studying movement and diet retrospectively using isotopic methods.

Keywords: Isoscape, Serengeti, Stable Isotope Mixing Models, Tail hair, Wildebeest.

Artificial Intelligence for Smart Wildlife Conservation in Africa: A Transformative Approach

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Abstract

Wildlife conservation is of paramount importance in Africa due to its rich biodiversity and unique ecosystems. However, traditional wildlife monitoring methods can be challenging and resource-intensive, especially with the increasing threats to wildlife populations. To address these challenges, the integration of machine learning and artificial intelligence (AI) in wildlife conservation has emerged as a revolutionary solution. Smart wildlife conservation leverages AI algorithms to streamline monitoring efforts, predict threats to wildlife populations, and optimize conservation strategies. This paper aims to assess the role of AI technology in wildlife conservation to enhance the protection and preservation of African wildlife. A systematic literature review was conducted, gathering relevant studies from various databases. The findings revealed that AI technology plays a pivotal role in wildlife conservation, offering diverse applications such as species monitoring, behavior analysis, habitat assessment, poaching detection, and disease surveillance. Additionally, AI aids in real-time data collection, automated image analysis for species identification,

and predictive modeling to prevent human-wildlife conflicts. Furthermore, AI-enabled camera traps and sensors allow for efficient and non-invasive wildlife monitoring, reducing human disturbance to the natural habitats of animals. This technology also enables data-driven decision-making, allowing conservationists and wildlife managers to allocate resources effectively and implement targeted conservation interventions. In conclusion, this study proposes an artificial intelligence-based framework for wildlife conservation in Africa to enhance animal productivity and sustainability. The adoption of AI in wildlife conservation can revolutionize the sector, leading to increased efficiency, reduced resource requirements, and enhanced overall animal welfare, ultimately benefiting both wildlife and the communities that depend on their conservation efforts. The adoption of AI technology, African countries will strengthen their wildlife conservation initiatives, safeguarding their natural heritage for future generations.

Keyword: Africa, Artificial intelligence (AI), Biodiversity, Machine learning, Wildlife conservation

Promoting Coexistence and Addressing Conflict between Humans and Carnivores in the Eastern Serengeti

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Abstract

Conflict between humans and carnivores is a pervasive issue worldwide and the problem has been exacerbated in recent times due to increasing human populations, which leads to habitat destruction and depletion of prey for carnivores. As a result, carnivores are often forced to live in close proximity to human settlements, posing threats to the lives and livelihoods of local communities. Therefore, the objective of this study was to assess the potential for coexistence between the Maasai and Sonjo people and carnivores, while also identifying effective measures to minimize conflicts. Six villages were randomly selected based on the distance gradient from the Serengeti National Park boundary. Three villages were from the Maasai tribe and three from the Sonjo tribe. Data were collected using a questionnaire survey with closed- and open-ended questions. The questions

examined the likelihoods of Maasai and Sonjo people coexisting with carnivores in their vicinities. Significant differences were observed between the Maasai and Sonjo tribes in terms of the proposed coexistence measures that they were willing to adopt, as well as the measures they believed the government should undertake ($\chi^2(\chi^2 = 17.014, df = 3, P = 0.001; \chi^2\chi^2 = 83.713, df = 4, P < 0.001, respectively)$). A higher proportion of the Maasai people proposed the use of herders (35%) and erecting wire mesh around their bomas (32%), while more than half of the Sonjo people suggested using wire mesh around their bomas (55%). Furthermore, the majority of Maasai people proposed that the government should provide conservation incentives (69%) while the majority of Sonjo people proposed a translocation approach (55%). The study highlights the importance of

implementing measures from both local communities and the government in order to achieve harmonious coexistence between humans and carnivores.

Keywords: coexistence; conflict; carnivore; mitigation measures; Serengeti



Migratory routes, home range sizes and site fidelity of GPS satellite collared Western White Bearded Wildebeest in the Serengeti-Mara Ecosystem

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Abstract

This study is based on the GPS collaring data collected for eight wildebeest in the Serengeti-Mara Ecosystem for the period January 2021-June 2023. The study documents the movement of two key migratory herds of wildebeest, their home ranges located in Laetoli/Kakesio and Kheri. The collars enable us to track the precise routes taken by the migratory herds during wet season, dry season and the transition season. The collars were fitted to female wildebeest, on the basis that the females tend to remain with their herds. Satellite data from the Laetoli/Kakesio herd showed a migratory range up to 1800 km with two different divergent migratory pathways. One of the routes, interestingly, was linear rather than a previously documented circular-type clockwise journey with a preferred range for these

herds located in the Southern Serengeti for calving and grazing. The tracking data from the Kheri Herd covered up to 450 km showed a restricted wet season range followed by a migration from Angata Kheri Grasslands to Kenya's Maasai Mara Plains. Establishing and monitoring the dynamic migratory movements within these herds using satellite trackers will be useful in developing a deeper understanding of the actual routes taken by these wildebeest as well as investigations of familial connections within the herds. The study's overall thesis is to determine the increasing anthropogenic impacts to the Great Wildebeest Migration in The Serengeti.

Keywords: Migration, Wildebeest, satellite tracking, Serengeti-Mara,

An update on African wild dog status in Selous-Nyerere

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Abstract

The Selous-Nyerere ecosystem in southern Tanzania is believed to be home to one of Africa's largest remaining African wild dog (*Lycaon pictus*) populations. Although the subject of an intensive study in the early 1990s, virtually no research was carried out

into this critical wild dog population in the subsequent thirty years. Here, we present an update on the status of African wild dog in Selous-Nyerere from surveys carried out in the landscape from 2020 to 2022 by the University of Oxford's Wildlife

Conservation Research Unit (WildCRU), Lion Landscapes, the Tanzania Wildlife Research Institute (TAWIRI), Tanzania Wildlife Management Authority (TAWA), Tanzania National Parks Authority (TANAPA), and Frankfurt Zoological Society (FZS). We present insights into wild dog distributions and pack structure in the landscape, using a combination of data from camera trap surveys, large-scale spoor surveys, and direct sightings. We

compare our findings from Selous-Nyerere to those from similar efforts in Tanzania's Ruaha-Rungwa landscape to suggest that wild dogs are widespread and abundant in Selous-Nyerere, across both habitat types and management strategies. We conclude by presenting a summary of the management insights obtained from our research, and delineating future research priorities and next steps.

Is the new generation of Tanzanian captive bred spray toads able to locate local prey in the wild?

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Abstract

Kihansi Spray Toad, *Nectophrynoides asperginis*, an amphibian endemic to Kihansi gorge in Tanzania, became extinct in the wild in 2009, due to habitat destruction and chytridiomycosis disease caused by *Batrachochytrium dendrobatidis*. The pathogen was detected in mid-2003 in Kihansi spray wetlands, the natural habitat for spray toads. Fortunately, a small captive population was already established since 2000, as insurance policy of their survival, following a 98% diversion of Kihansi River flow, that sustained their habitat, for Kihansi hydropower generation. While the toads are doing well in captivity, the challenge has been their re-introduction back to their natural habitat, restored through the installation of mist irrigation systems. Of 37,000 KSTs bred since 2000, over 22,000 have been released to their restored habitat but their survivorship has been poor. It was argued that the lab-reared toads are not surviving in the wild because they lack ability to locate food on their own, hence suffer from starvation. To test the hypothesis, a six-month experiment was established in the spray wetlands,

where 1,200 toads including babies (280), juveniles/subadults (260) and adults (660) were kept in 12 cages (92 cm x 62 cm x 62 cm x 62 cm) each with 100 animals. Half of the population were supported with food following a feeding protocol used in captive facilities, and the other half supported without food. The number of survivors after six months were compared with paired-samples t-test and were not significantly different [$P > 0.05$; Mean \pm SD: fed, 10.5 \pm 11.131; non-fed, 7.5 \pm 9.094]. Hence, the poor survivorship of the KST in their natural habitat is not related to starvation as this experiment demonstrates that captive bred toads can locate prey in the wild. Depending on availability of funds, we recommend continued KSTs' experimental releases to allow survivors adapt to the environment; assist KSTs acquire immunity by pre-exposing to low virulent fungi; introducing KSTs to a *chytrid-free* habitat but with similar conditions to Kihansi wetlands.

Keywords: Spray toad, Kihansi, spray wetland, *Batrachochytrium dendrobatidis*

Vehicle-wildlife collision monitoring through a citizen science approach

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Abstract

Collisions between vehicles and wildlife is one of the main threats to wild animal populations leading to injuries, material damages and even death of wildlife and humans. The impact of roads networks on wildlife is very little known and studied worldwide, including in Tanzania. Since May 2023, Oikos East Africa has developed an innovative approach to collect information on wildlife ecology and vehicle-wildlife collisions on the highway between Arusha and Namanga, monitoring 71km of road from Oldonyosambu to Namanga. A buffer of 250 m on each side of the road is also monitored to inform distribution and density of animals and capture data on the individuals which are hit on the road and moved to die nearby. Data is collected in a participatory way, involving the Village Game Scouts of the communities living along the road, each month for 5 continuous days,

using KoBoToolbox© and Naturalist© applications installed on smartphones. This citizen science approach offers to communities the opportunity to learn how to monitor wildlife, as well as understand the impact of the highway on wildlife and livestock populations. The data collected are georeferenced and include species of living and dead wildlife, dead livestock, date, time, species, and number of individuals segregated per sex and age (adult/juvenile). By November, we expect to have collected enough data for wildlife population and roadkill density analysis including spatial and temporal distribution aspects. In addition, maps will be produced to help visualize the hotspots of wildlife crossing points and of vehicle and wildlife collisions. The results will lead to the design of a mitigation plan with the relevant national authorities and stakeholders by identifying appropriate measures to avoid vehicle-wildlife collisions that will be tested in high-risk collision areas.

Keywords: citizen science, road ecology, roadkill, vehicle-wildlife collision, wildlife population density



Seminar 3

Trends in Human-Elephant Conflict in the NCA and Surrounding Communities

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Abstract

The Ngorongoro Conservation Area (NCA) is a priority area for conservation in Tanzania. The NCA is a designated UNESCO World Heritage Site and an important reservoir of large mammal biodiversity, including a significant number of African elephants. The most significant threats to elephants in the NCA are related to habitat fragmentation and increasing human-elephant conflict (HEC) [3]. It is thus critical to find a balance between the needs of local agro-pastoral communities and those of wildlife. In partnership with the NCAA and Karatu District, TPW trained 9 human-elephant conflict officers in Daa and Oldeani wards on conflict monitoring via the mobile data collection application, Survey123. From March to June 2023, HEC officers responded to 565 reports of crop raiding. In the 212 reports of elephants raiding crops, farmowners reported nearly 334 acres of crops damaged by elephants out of a total 2,250 acres of farmland owned

by these individuals. The officers rate their perception of the severity of the incident on a 5-point Likert scale where 1 is “not severe at all” and 5 is “extremely severe”. The most significant factor driving conflict severity appears to be length of time the raiding animals spent on the farm before dispersing. Incidents where the elephants spent between 1 and 2 hours on the farm were rated at an average severity of 2.7. By contrast, incidents where the elephants spent less than 10 minutes on the farm were rated an average of 1.2 in severity. In 58% of incidents with elephants, the officers reported that the elephants dispersed because people chased them away, either with noise or light deterrents. Through improved understanding of the factors affecting elephant behavior and incident time, farmowners can employ more effective measures for deterring elephant incursions and reduce the severity of HEC in and around the NCA.

SUB-THEME: Ecosystem health and wildlife diseases

Treatment response of Giraffe Skin Disease (GSD) to Ivermectin, Antibiotic and their combination in Ruaha National Park

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Abstract

A treatment trial to determine the efficacy ivermectin, antibiotic and their combination to control Giraffe Skin Disease (GSD) was conducted in giraffes in Ruaha National Park from October 2022 to February 2023. A total of 18 giraffes were immobilized using 20mg Etorphine HCL (M99) each and reversed with Diprenorphine (M5050) at 3

times the dose of M99. The immobilized giraffes were treated as follows; 5 giraffes were treated with long acting 20% Oxytetracycline injectable solution (Alamycin LA 300, Norbrook Laboratories Ltd, Northern Ireland, UK) at a dose of 20mg/kg; 3 giraffes were treated with 1% w/v ivermectin injection per subcutaneous

(Bimectin, BIMEDA AMEA Ltd, Dublin, Ireland) at a dose of 200mcg/kg, equivalent to 1ml/50kg); 6 giraffes were treated with a combination of 20% long-acting antibiotic and 1% ivermectin, 4 giraffes were left as untreated control (2 negative control and 2 positive control). All immobilized animals were fitted with Savanna tracking GPS collars on the tail and ear tags with numbers to enable tracing of giraffes for assessment of treatment efficacy. Results on the efficacy of drugs against GSD three months after treatment showed that 50% of giraffes treated with ivermectin alone completely recovered while 50% had little/ low improvement; 50% of giraffes treated with antibiotic alone had significant recovery while 50% had moderate recovery, and that 66% of giraffes treated with a combination of ivermectin and antibiotic had significant recovery while 33% had

moderate improvement. One of the two uninfected control giraffes with collar number 4044 and ear tag 2555 was infected with GSD three months after commencement of the study. Based on data collected, it was concluded that GSD responds well to treatment with ivermectin-antibiotic combination or ivermectin alone, and that the efficacy of drugs was high for fresh cases and it might be even high for repeated treatments. To overcome challenges of finding treated giraffes for assessment, costs of repeated giraffe immobilizations, and in order to conduct repeated treatments, a controlled treatment trial using giraffes kept in an animal capture facility (boma or kraal) is recommended.

Keywords: Giraffe Skin Disease, GSD, Giraffe, Ruaha,

Efficacy of bio-acaricide for management of ticks in domestic and wild animals in Ngorongoro Conservation Area

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Abstract

Chemical acaricides are commonly used for management of ticks. Their uses have increased acaricide resistance and various hazardous effects on wildlife and environment. The current study aimed at assessing the efficacy of a novel registered entomopathogenic fungus *Aspergillus oryzae* with commercial name; VB-IN/1249 against six species of cattle ticks. Efficacy was evaluated by spraying 5×10^5 conidial/L of *Aspergillus oryzae* and the Control group with water + (0.5% surfactant) on infested cattle which was monitored under controlled environment. In each treatment 10 cattle were selected for treatment and the experiment was replicated thrice. The infested cattle were assessed on the number of ticks, ticks' species and the skin damage. Data were

recorded after every 24 hours for four (4) days. Thereafter, ticks dropped from both control and treated with VB cattle were collected for further observation and identification. Results showed high mortality of ticks in Bioacaricide treated group than the control group. In addition, Bio-acaricide caused >70% mortality in different species of ticks such as 96.81%, 92.31%, 87.88%, 84.08%, 73.14%, 66.37% in *Rhicephalus appendiculatus*, *Rhicephalus microplus*, *Boophilus anulatus*, *Hyalomma marginatum*, *Amblyomma variegatum*, and *Amblyomma gemma* respectively. In contrast, mortality in control group was 1.3%, 2.1%, 4.1%, 2.3%, 2.8% and 5.3% in 4 days for *Rhicephalus microplus* > *Rhicephalus appendiculatus* > *Amblyomma variegatum* > *Boophilus*

anulatus> *Hyalomma marginatum*> *Ambylomma gemma* respectively. The finding of this study revealed that *A. oryzae* was effective in controlling various species of ticks and is environmentally safe. It is therefore recommended to be applied for tick management as it is safe, effective, less costly and eco-friendly. Its use will reduce

tick burdens and incidences of tick-borne diseases towards improving livestock and wildlife productivity to enhance conservation in the wildlife-livestock interface.

Keywords; Ticks, Wildlife diseases, Livestock, Conservation

Zoonotic Disease Risk Analysis Along the Game Meat Trade Value Chain in Northern Tanzania

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Abstract

Risks from pathogens of zoonotic origin with the potential to ‘spillover’ from animals to humans frequently attributed to the wildlife trade. Much remains to be learned regarding the nature and magnitude of these risks from the wildlife trade. This is coupled with the rise of attention to SARS-CoV-2 and other zoonotic disease-related public health concerns. The concurrent legalization of game meat trade in Tanzania in 2020 has been a driver for this study. Qualitative methods that employed desk reviews and stakeholder interviews gathered value chain information including people, place and processes involved. Expert opinions were elicited to characterise information on diseases, estimates for probabilities of release, exposure and its magnitude of consequences. Game meat trade provides livelihoods and income, in some situations the utilization of wild animal meat is associated with social, cultural and beliefs. Despite the presence of laws and regulations, poaching remains a major source of illegal wild meat. Irregular practices along the game meat value chain translate into public health

risks as they increase exposure of actors to potential zoonotic pathogens. Priority zoonotic diseases ranking in descending order of importance showed anthrax, rabies, brucellosis, bovine tuberculosis and Rift Valley fever as priority diseases. Risk assessment of human infection with wild meat derived zoonoses focusing on four different infections anthrax, brucellosis, rift valley fever and less studied pathogens revealed that there is a high risk posed by those pathogens to different actors in the value chain. Despite substantial contribution of protein from game meat, the estimated risk in this study indicate game meat trade could contribute to severe consequences of human infections linked to game-meat derived zoonoses. Policy and regulation amendments, collaboration of regulatory authorities using a One Health approach will be of help in minimizing health risks, improving sustainability and legality of game meat trade in Tanzania.

Keywords: Game meat trade, Wild meat, Supply chain, Zoonosis, Food safety, Tanzania

Crimean-congo haemorrhagic fever virus in Tanzania: A one health investigation into a tick-borne zoonosis

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Abstract

Crimean-Congo haemorrhagic fever (CCHF) is a tick-borne zoonosis with sporadic reporting in sub-Saharan Africa. CCHF virus (CCHFV) has a multitude of wildlife and domestic animal hosts but does not impact animal health. CCHF in people can be fatal, with an estimated mortality rate of 30%. Little is known about CCHFV in Tanzania, although the principal tick vectors, *Hyalomma* spp., are present in the ecosystem and there is evidence of CCHF in Uganda and Kenya. This study aimed to estimate the (sero)prevalence of CCHFV in wildlife and livestock hosts, humans and ticks in Tanzania. We built a One Health team to conduct a serological survey across Arusha region and Serengeti National Park. Blood samples were collected from small mammals (rodents and shrews), cattle and people. Ticks were collected from small mammals, cattle and the environment. Serum samples were tested by ELISA for CCHFV antibodies, and ticks identified morphologically and tested by CCHFV RT-PCR. To date, 42.9% (223/520) of cattle were seropositive for CCHFV exposure. For small mammals, 1.3% (1/75) were seropositive. Testing of

samples for human exposure is in progress. Of 2133 ticks identified, 64.0% (n=1364) were larvae, 22.0% (n=470) nymphs, and 14.0% (n=299) adults. Of these ticks, 81.8% (n=1744) were from environmental sampling, 16.0% (n=341) from cattle, and 2.2% (n=48) from small mammals. Of 2130 ticks identified to genus, the most common were: *Rhipicephalus* spp. 81.8% (n=1743), *Hyalomma* spp. 11.6% (n=247), and *Amblyomma* spp. 6.5% (n=139). Of 113 tick pools, 0% CCHFV prevalence has been detected. Detection of seropositivity indicates that some animal species have been exposed to CCHFV, but this is not indicative of active cases. These results will inform disease prevention strategies across environmental, animal and public health sectors. Outbreak preparedness would likely include understanding and mitigating impacts of environmental disturbance on CCHFV (sero) prevalence in vectors and hosts.

Keywords: Crimean-Congo haemorrhagic fever virus; One Health; outbreak preparedness; tick-borne zoonosis

Biodiversity and distribution of flea (Siphonaptera), rodent (Rodentia), and Crocidura (Insectivore) species associated with plague epidemiology in eastern Zambia

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Abstract

Fleas (Siphonaptera) are important vectors of several animal and human disease pathogens, while rodents are considered as reservoirs of most pathogens, including *Yersinia pestis*. Factors that influence parasitism rate of fleas, ecological aspects that modulate their distribution and host-flea relationship in Eastern Zambia remain unknown. Fleas were collected from rodents and domestic mammals, stored in 70% alcohol, processed and identified. A total of 1212 mammals were sampled and examined. These included rodents (n=329), *Crocidura* (n=113), domestic pigs (n=254), small ruminants (n=346) and carnivores (n=168), and 1578 fleas, where five species were identified. There were nine genera and species of rodents with one genus of *Crocidura* captured. The results showed that 27(8.2%) and 19(5.8%) rodents and 8(7.0%) and 2(1.8%) *Crocidura* were positive for antibodies and *pla* gene for *Y. pestis*, respectively. *Echidnophaga larina* were the most mean abundant (MA=8.58), while *Xenopsylla cheopis* had the least mean abundant (MA=0.14), nevertheless it was

the most infected with *Y. pestis*. *Mastomys natalensis* was highest in plague positivity 31/56, followed by *Crocidura spp* 10/56 and *Rattus rattus* 6/56. The results indicated that three flea species were infected with *Yersinia pestis*. Shannon-Weiner (H) and dominance (D) indices of rodents were 1.5 and 0.2789, while the flea indices were 0.5310 and 0.8389, respectively. There was a strong association between richness of fleas and plague disease ($p=0.01$; $\chi^2=65.3$). It's established that rodents were more biodiversity than fleas while both were unevenly distributed. It's recommended that control measures of fleas be intensified and sustained to lessen the spread of their associated diseases.



Effect of ivermectin® on intestinal helminths in multimammate mouse (*Mastomys natalensis*)

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Abstract

Rodents are reservoirs of various zoonotic pathogens, including parasitic helminthes. Moreover, some zoonotic helminthiasis are of public health significance. These include: Echinococcosis, taeniasis, trichinosis, schistosomiasis, filariasis, and opisthorchiasis. In this study the effect of Ivermectin® against gastrointestinal helminths of the multimammate mouse (*Mastomys natalensis*) was investigated under field condition. It is hypothesized that Ivermectin® is effective against a broad spectrum of gastrointestinal helminthes such as, *Physaloptera* Spp., *Strongiloides* Spp. and *Trichuris* Spp., however, no controlled studies have been carried out to assess its effectiveness in *M. natalensis* in the field. The rodents were live captured using Sherman® traps from an open field as well as free ranging rodents from an enclosed field (Fence) near Sokoine University of Agriculture. The animals were marked and housed individually in a clean cages and supplied with feed and water *ad libitum*. After collecting fecal samples from every rodents, the animals were released into two enclosed plots in the Fence, each containing 45 animals. The animals in the first plot received a single dose of an aqueous suspension of Ivermectin®. Animals in the group were

left untreated. Thereafter the rodents were captured biweekly from the plots and fecal materials were collected for screening of helminth eggs. Five different species of intestinal parasites were identified which were; *Hymenolepis diminuta* (42.6%), *Physaloptera* Spp. (28%), *Strongiloides* Spp. (12%), *Hymenolopsis nana* (10%) and *Trichuris* Spp. (7%). There was no significant difference in mean worm infection before and after treatment in *Strongiloides* Spp., *H. nana* and *Physaloptera* Spp. However, there was a significant reduction in the number of *H. diminuta* and *Trichuris* worms in the treated animals. For the untreated group, no significant increase in the number of worms were observed across eight weeks. The overall prevalence of helminthes infection in *M. natalensis* before treatment appeared to be significantly higher in male than female rodents. This study has revealed a greater diversity of helminthes infection in *M. natalensis*, especially in male individuals. Also, Ivermectin® has shown to be effective against *H. diminuta* and *Trichuris* worms but not the other worms found in this study.

Keywords; Anthelminths, Helminths, Ivermectin®, *Mastomys natalensis*

Prevalence of *Campylobacter* and *Brucella* species isolated from a diversity of rodent in Kasulu district, Tanzania

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Abstract

Zoonotic pathogens originate from wild animals contribute approximately about 60-70 % of all emerging human infections. Rodent reserve and transmit zoonotic bacteria including *Campylobacter* and *Brucella* to susceptible hosts. However, the prevalence of bacterial species they reserve remains unclear. This study aims to assess prevalence of *Campylobacter* and *Brucella* species with reference to rodent as their reservoir. A cross sectional study was carried out in three villages of Kasulu District in Kigoma. Rodent were captured from four different habitats by using baited traps then counted and identified to species level using morphological keys. Rectal swabs were collected for isolation of *Campylobacter* and *Brucella* species. Conventional microbiological methods were employed for initial species isolation. Further confirmatory was done by conventional PCR. Sanger sequencing was employed to generate sequences whose phylogenetic reconstructions were obtained with aid of MEGA X software. Wilcoxon's – Mann-Whitney Rank sum test was employed for statistical inference. Diversity was determined using standard Shannon Wiener. A total of 182 rodent from 11 species were captured. *Mastomys natalensis* was the most abundant species (54/182) while *Lophuromys* and *Arvicanthis* species were the least. Species diversity was highest in wild areas ($H' = 1.83$) and lowest in households ($H' = 0.28$). No statistical significance between diversity and habitats (p-value >0.05). Prevalence of

Campylobacter and *Brucella* species was 1% (2/182) and 2% (4/182) respectively. *Campylobacter jejuni* and *Brucella pseudogrignonensis* strains were identified from phylogeny. The results revealed that *Mastomys natalensis* and *Rattus rattus* as species harboring the pathogens of interest. These species distinguish from others by their closer proximity and interactions to human habitats where they were most abundant. This close association between reservoir and susceptible host positively influences the chain of transmission between the two. This information will be used in planning for rodent control and zoonosis management in the area.

Keywords: *Brucella pseudogrignonensis*, *Campylobacter jejuni*, diversity, rodent, zoonosis.



Traumatic Ventriculitis in an Adult Ostrich: A case report from Dodoma, Tanzania

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Abstract

An adult male ostrich (*Struthio camelus*) was reported to be sick in one of the wildlife gardens in Dodoma. The sick ostrich was among the three transferred ostriches from another farm in a period of five months ago. Loss of appetite, lethargy, weight loss, frequent sternal recumbences and vomitus-like fluid materials were clinically observed. Haematology, Coprology and bacteriology revealed the presence of lymphocytic leukocytosis, monocytic leukocytosis, gastrointestinal worms, and *Escherichia coli*. The ostrich died after five days of treatment, after which the necropsy was performed. During the necropsy, all organs were normal except for the gizzard and peritoneum. The metal objects with different sizes ranging from 1.5 to 5.5cm intact puncturing all muscle layers, ropes of about half a kilogram and pieces of clothes were found in the gizzard, while a blackish/blueish discolouration was

found in the peritoneum. Pathologically, the gizzard was atrophic, necrotic, traumatic with metals, oozing contents into the peritoneum, with peritoneal discolouration. This was confirmed to be a chronic traumatic ventriculitis, resulting in impaired gizzard activities, feeding, nutrient balance, peritonitis and hence death of the ostrich. Behavioural problems such as disorientation stress, desertion stress or frustration concerning finding food and keeping the ostriches in areas with multiple activities that include pieces of sticks/wood, rubber tubes, bolts, nuts and nails, predispose the ostriches from foreign bodies into proventriculus and ventriculus due to their feeding behaviour.

Keywords: E. coli, Hardware disease, Hymenolepis nana, ostrich, semi-intensive system

Assessing the Role of Domestic Dogs and Wildlife in Rabies Transmission: A study in Southeast Tanzania and Its Impact in Control Measures

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Abstract

Understanding the role of different species in the transmission of multi-host pathogens, such as rabies virus, is vital for effective control strategies. Across most of sub-Saharan Africa domestic dogs are considered the reservoir for rabies, but the role of wildlife has been long debated. Here we explore the multi-host transmission dynamics of rabies across southeast Tanzania. Between January 2011 and December 2022 data on probable rabies cases were collected in the regions of Lindi and Mtwara. Hospital records of animal-bite patients presenting to healthcare facilities were used as sentinels for animal contact tracing. The timing, location and species of probable rabid animals was used to reconstruct transmission trees to infer who infected whom and the relative frequencies of within- and between-species transmission. During the study, 1244 probable human rabies exposures were identified, resulting in 79 deaths. Of these exposures, 875 were from domestic dogs (70.3%) and 350 from jackals (28.1%). Over the same period 1011 probable animal rabies cases were traced: 708 in domestic dogs (70.0%) and 269 in jackals (26.6%). Although dog-to-dog transmission was most commonly inferred (55.3%) of

transmission events), a third of inferred events involved wildlife-to-wildlife transmission (18.9%), and evidence suggested some sustained transmission chains within jackal populations. A steady decline in probable rabies cases in both humans and animals coincided with the implementation of widespread domestic dog vaccination during the first six years of the study. Following the lapse of this programme dog rabies cases began to increase. Despite a relatively high incidence of rabies in wildlife and evidence of wildlife-to-wildlife transmission, domestic dogs remain essential to the reservoir of infection. Continued dog vaccination alongside improved surveillance would allow a fuller understanding of the role of wildlife in maintaining transmission in this area. Nonetheless, dog vaccination clearly suppressed rabies in both domestic dog and wildlife populations, reducing both public health and conservation risks and, if sustained, has potential to eliminate rabies from this region.

Keywords: dog-mediated rabies, vaccination, lyssavirus, One Health, spillover, surveillance, Zero by Thirty, zoonoses

SUB-THEME: Tourism Development and diversifications for social-economic development

Leveraging Tourism Potentials of “*the Past*” in Tanzania

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Abstract

This paper reviews tourism and the socio-economic potential of tourist attractions associated with the origin and development of humanity “*the past*”, which include the archaeological sites in Tanzania and the

kind of approaches employed to develop and market them for tourism. It adopts the theoretical point of view of destination experience management and argues for its adoption in the development and marketing

of archaeological sites to reinforce their integration with mainstream nature-based tourism experiences. The paper employed a qualitative approach and methods including semi-structured interviews with purposefully selected key informants (KIs) and documentary and content analyses in order to identify key themes related to tourism and the socio-economic potential of archaeological sites, the kind of approaches currently employed to develop and market them for tourism, and the ways in which they can be strategically integrated with the mainstream tourism industry. The findings indicate that Tanzania is a warehouse for the resources that document the origin and development of humanity “*the past*”, often referred to as archaeological sites. While tourism policy and goals in the country encourage the diversification of tourism by emphasizing the integration of cultural tourism including archaeological attractions and the dominant nature-based tourism, the archaeological sites are unfortunately marginalized from the mainstream tourism marketing strategies. Thus, their tourism potential

and contributions to socio-economic development are unrealized. The findings also indicate that, while the archaeological heritage institutions are limited with their conservation-based strategies, the tourism entities employ a conventional attraction-focused strategy in marketing tourism, especially with reference to product development, promotion and distribution. These strategies unfortunately reinforce the disconnection of the archaeological sites from the dominant mainstream nature-based tourism industry. The paper proposes an integrated destination experience model that can leverage the tourism potentials of archaeological sites and boost overall tourism benefits in the country including increasing revenues, tourist expenditure and length of stay. It also offers practical recommendations to tourism and heritage management practitioners and policymakers and recommendations for further research.

Keywords: Tourism potentials, tourism strategy, archaeological site, integrated destination experience, tourism marketing.

SWOT analysis for apitourism potential in southern Tanzania

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Abstract

Apitourism is assumed to be practical in various parts of Tanzania. However, we lack sufficient information about the existing potential for its successful implementation. In this study, we assessed the suitability of apitourism in the villages adjacent to Mikumi and Udzungwa National Parks in southern Tanzania using SWOT analysis. The data was collected through household interviews, focus group discussions, and key informant interviews. At the end of the

SWOT analysis, the strengths, weaknesses, opportunities, and threats of apitourism in southern Tanzania were determined. It was found that most study villages were endowed with suitable climates and habitats for beekeeping. Additionally, beekeepers were well knowledgeable about the practices and uses of bee products. However, apitourism is limited by inherent social-cultural factors, uncoordinated market strategies, and a lack of formal

cross-sectoral linkages between beekeeping and the tourism sector. Moreover, ongoing disturbances like deforestation and uncontrolled wildfires threaten its future sustainability, even where some efforts to improve beekeeping practices have been implemented. Concerted efforts from different stakeholders, including

beekeepers, decision makers, the business community, are needed for the successful implementation of apitourism in southern Tanzania.

Keywords: conservation, beekeepers, poverty, policies, rural



Leeway of developing wine tourism in Tanzania: The prospective opportunities and challenges

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Abstract

Wine tourism is a growing global phenomenon that offers opportunities for wealth generation and social development in rural areas. However, Tanzania's viticulture sector has primarily focused on grape production and wine marketing, overlooking the potential of wine tourism. This study aimed to investigate the potential of wine tourism as a driver for community development and rural economic growth in Tanzania focusing on the wine-producing

region of Dodoma. The study employed a combination of surveys, interviews, and case studies to examine the current status of wine tourism in Dodoma and its economic contribution to the region. Data were collected from key players in the industry, including tourism stakeholders, farmers, wine producers, wine traders, NGOs and policy makers. The results show very high potential for wine production in Dodoma and its role in attracting tourists to

the region. The study underscores the need for improved promotion, infrastructure development, and policy support to harness the economic benefits of wine tourism. This is mainly due to the limited research on wine tourism in Tanzania that provide insights to compare with other destinations. Finally we conclude that, wine tourism presents opportunities for community development, economic diversification, fostering entrepreneurship,

and enhancing cultural exchange that can lead to sustainable development and job creation in wine value chain in Tanzania. Strategic planning, capacity building, and policy initiatives are crucial for the successful development of wine tourism in the region.

Keywords: Community Development, Viticulture growers, Wine route, Wine Tourism, Tanzania

Local Inclusion in Tanzanian Tourism: A comparison of Coastal and Southern Circuit

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Abstract

Inclusive tourism is the main global agenda particularly in the less developed countries like sub-Saharan Africa. This study aimed at comparing the local participation at two levels including personal participation and community participation between a coastal (Bagamoyo) area and the southern tourism circuit (Ruaha) in line with the Arnstein's ladder of citizen participation model. Surveys were undertaken using a structured questionnaire that yielded 141 and 150 responses in which independent sample t-tests were employed as the inferential tests. The results indicate that locals in coastal area participate more into tourism as an individual compared to those in the more remote southern tourism circuit with the former group participating more into tourism as a community. Also leadership is more inclusive southern tourism circuit, compared to the coastal peri-urban area of Bagamoyo. The results provide contextual factors that those in remote areas to participate as community while those in peri-urban who are

more exposed to urbanism to participate more as an individual. Also they provide theoretical extension to the Arnstein's ladder of citizen participation in tourism by bifurcating participation into individual and group that reflects modern neoliberal tourism paradigms. Policy and managerial implications are derived to reflect the contextual differences in the areas.

Keywords: Local inclusion, coastal area, southern tourism circuit, personal participation, community participation



Experiences, Enjoyment and Novelty in National Parks

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Abstract

Tourism development involves improvements of national parks. However, more research is needed to assist in further development of national parks particularly understanding experiences, enjoyment and novelty aspects of tourists visiting national parks. Therefore, this paper examines experiences, enjoyment and novelty in national parks with a specific objective of analysing the moderating effect of novelty on indirect experiences and enjoyment of southern national parks among domestic tourists. The study area is Nyerere National Park in Tanzania. Applicable methods are quantitative and qualitative. Partial Least Square Structural Equation Modelling (PLS-SEM) and content analysis assists in

the analysis of data from a sample size of 360 domestic tourists. The findings reveal that there is a moderation effect of novelty on the relationship between indirect experiences and enjoyment of national parks among domestic tourists. This study can conclude that novelty in terms of change of routine involving “unique”, “different from previous experiences”, and “experienced something new” have a significant moderating effect on the relationship between indirect experiences and enjoyment of southern national parks.

Keywords: experiences, enjoyment, novelty, national parks, Tanzania

Corporate Social Responsibility Practices by Tanzania Tour Operators: A local Community Perspective.

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Abstract

Tour operators are the key actors in the tourism destinations as their actions affect the environment, cultural and economic condition of a place. However, little is known about the Corporate Social Responsibility (CSR) practices of Tanzania tour operators especially from the perspective of local community. This study was therefore conducted in Karatu and Western Serengeti in the villages of Robanda, Ikoma and Natambiso to assess the local community perspective on corporate social responsibilities as practiced by Tanzanian tour operators. Purposive sampling technique was employed to select the study sites whereby simple random sampling technique was used to select the

households. The study used a mixed design whereby both qualitative and quantitative approaches were employed. Data was collected through questionnaire survey, semi-structured interviews and field site observations. Content analysis was used to analyze qualitative data while quantitative data was analyzed by using the Statistical Package for Social Sciences (SPSS). Findings show that, although tour operators have provided employment opportunities, majority of them are low cadre occupations with poor pay, such as the security guides, cleaners, dish washers, room attendants and others. Other CSR practices include provision of environmental education, helping with antipoaching activities in the

village reserves, purchase of vegetables for staff, building of classrooms, building of hospitals and road infrastructures. The findings highlight the need for tour operators to strengthen community support especially in the economic dimension. The researcher suggests the introduction of

laws and policies to enforce the practices to bring societal development as tourism is occurring in their inherited land.

Keywords: Corporate Social Responsibilities, Sustainability, Local Community, Tourism

“Diet composition and niche overlap of four sympatric rodents; *Beamys hindei*, *Grammomys cometes*, *Lophuromys machangui* and *Praomys delectorum* inhabiting mount Rungwe forest nature reserve”

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Abstract

Understanding animal feeding behaviour is key in determining coexistence mechanisms which are vital for conservation and management. The coexistence mechanisms of sympatric species in Mount Rungwe are unknown. From 2020 to 2021 a study on the dietary contribution, overlap and niche breadth of four rodents residing in Mount Rungwe Forest Nature Reserve was conducted. Random sampling was employed with the removal method, whereby captured rodents' stomachs were removed and their contents analyzed. Dietary contribution, overlap and niche breadth were calculated. Both species consume diverse food resources. There were variations in food categories among species example *Beamys hindei* had a significantly

high number of seeds/grains while *Grammomys cometes* and *Lophuromys machangui* contained a significantly higher number of invertebrates. Narrow niche breadth was observed for *G. cometes* while *Praomys delectorum*, *L. machangui*, and *B. hindei* had a moderate niche breadth but the dietary overlap was high in all four species. Our results conclude that *L. machangui*, *P. delectorum*, and *B. hindei* can coexist without competition as they have >0.5 niche breadth and high overlap, while *G. cometes* might experience competition because of low niche breadth and food diversity. Further investigation regarding seasonal diet partitioning and the micro identification of food items is recommended.



SUB-THEME: Wildlife ecology and ecological interactions

Persistence of lions *Panthera leo* groups in unprotected landscapes adjacent to Selous Game Reserve and Nyerere National Park, southeastern Tanzania

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Abstract

African lion global status is characterized by plummeting numbers and space use contractions, where designation of protected areas has reduced, but not successfully halted the status of decline in contemporary time. Using the largest, single occupancy of lions, the Selous-Nyerere ecosystem (SNE), we inferred a the real-time numerical and occupancy decline. The SNE population segmented with a non-nominal lion population comprising of extraterritorial groups linked to the Selous GR/Nyerere NP core that continued to co-occur with rural communities in a traditional setting. Persistence (in time) of lions, at multiple sites was measured over the contemporary period of 1990-2021, a) using historical conflict records reviewed in multiple, large-scale social surveys conducted between 2004-2020, that revealed demographics of resident lion groups over four successive generations, b) inferring range contraction through measured land cover and use changes, resulting from farmland expansion, introduced pastoral grazing area concessions and settlement expansion. Our study indicates a numerical decline in lions at rates of 30-60% over generation time. Concurrently, the home range of groups has contracted by a

magnitude of 43% over the four-generation period. Persistence was estimated at mean of 0.45 over the observed generation time, showing statistically significant variation across multiple groups. However, current generation had higher persistence rate of 0.96 (2021) with similarity across the groups. We found significant effects of human-lion conflict on the persistence of groups over the generation time resulting from human-induced mortality, where lion groups with experienced high levels of conflict tend to have a low persistence. Finally, the spatial persistence of remnant lions was predicted by geolocations of livestock, in particular where there was a combination of cattle and goats, indicating lion selectivity for foraging habitat with presence of livestock, explained in part by the to prey depletion. Our findings indicate an overall ecological decline in the non-nominal lion population of the SNE, with remnants showing resilience in now WMAs and GCAs. Further study is warranted to determine how the current groups persistence is ecologically tied with the nominal, core SNE population.

Keywords: Human activities, Lion groups, Persistence, Selous-Nyerere ecosystem.

Habitat Inversion due to Habitat Invasion: More Wildlife within Settlements than in the Wild and on Farms

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Abstract

The phenomenon of habitat inversion, where more wildlife is found within human settlements than in the wild or on farms, has become an increasingly important issue in recent years. This paper aims to provide a comprehensive overview of the topic, covering the reasons for habitat inversion, the potential benefits and drawbacks, and strategies for addressing the challenges associated with this phenomenon. One of the key reasons for habitat inversion is the availability of resources within settlements. Urban and suburban areas often provide a variety of food sources for wildlife, such as ornamental plants, bird feeders, and pet food. The presence of artificial structures, such as buildings and bridges, can also provide shelter and nesting sites for a variety of species. In addition, the absence of predators such as wolves and large cats in urban and suburban areas allows prey species to thrive. Human presence can also deter some predators, as they may view humans as a threat or avoid areas with high levels of human activity. While the presence of wildlife in urban areas may provide some benefits, there are also potential drawbacks. These include conflicts with humans, such as damage to property, disease transmission, and attacks on pets or humans. In addition, the loss of natural habitats can have long-term negative impacts on wildlife populations, as they may become more susceptible to disease and predation. To address the challenges

associated with habitat inversion, various strategies can be employed. One approach is to promote the creation of green spaces within urban areas, such as parks and nature reserves, which can provide important habitats for wildlife. Another strategy is to implement policies and regulations that encourage the preservation of natural habitats and discourage urban sprawl. In conclusion, habitat inversion is a complex issue that has important implications for both wildlife conservation and urban planning. By understanding the reasons for this phenomenon, the potential benefits and drawbacks, and strategies for addressing the challenges associated with it, we can work towards promoting sustainable human development while also preserving natural habitats and protecting wildlife populations.

Keywords: Conservation strategies, Human-wildlife conflicts, Wildlife populations; Urban resources; Predator absence



Habitat suitability modeling for sustainable conservation of the endangered red colobus in lower Tana River Delta, Kenya

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Abstract

Tana River red colobus (*Piliocolobus rufomitratu*s) is an endangered primate species endemic in 34 patches of fragmented forest that stretches 60 km from Kipende to Mitipani in the lower Tana River delta in Kenya. Despite various conservation efforts and measures on these fragments, red colobus still face diverse anthropogenic threats, yet a new group of red colobus that was discovered in a communally owned land 70km away from their already known range is thriving well. This study sought to determine if the area between the newly identified group and the known range is suitable for red colobus and come up with ways of promoting contiguous suitable habitat for the red colobus meta-populations in Tana delta. Data were collected by mapping biogeophysical features using GIS techniques and recording red colobus movement via ground tracking. Biogeophysical maps were prepared in ILWIS software and habitat suitability map determined using Logistic regression models. Results showed that red colobus prefers habitats in forests, near

surface water, far away from settlements and roads. Most of the area between the newly identified group and the known range is not suitable for the red colobus. The factors contributing to the degradation of the red colobus habitat in this area include: harvesting of trees, charcoal production, fire, abstracting river water for agriculture, infrastructure development and changing river course. The following strategies have been identified for improving the habitat suitability: reforestation of indigenous trees; zonation for different land uses and establishing alternative livelihood projects. If the government and non-governmental conservation bodies work together with local communities on these intervention strategies, there is great possibility of creating a contiguous suitable habitat for all red colobus groups in Tana River delta and thus boost their population and avoid extinction of this species.

Keywords: Endangered Primates; Habitat Suitability Modeling; Logistic Regression; Tana River

Restoring grazing value for livestock and wildlife through fire. The case of Loliondo plains in the eastern part of Serengeti-Mara Ecosystem.

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Abstract

Rapid and extensive woodland expansion on rangelands clearly reflects the essential role of fire in the maintenance of historical rangeland ecosystems. The African continent has a wide variety of habitat types, but savanna ecosystems cover roughly half. And where there is savanna,

there is fire. "It's an important part of the ecology of the system," Burning allows grasses to dominate by keeping taller shrubs and thorn bushes from encroaching on the landscape. Loss of grasses could push out species such as wildebeest, which are famous for their spectacular annual

migration. In Tanzania, fire is normally used in the Protected areas as a management tool in rangelands but is not common in the village lands that borders Protected areas although they play a big role as wildlife corridors, migratory routes and dispersal areas that used by animals from conserved areas. The Loliondo region in the eastern part of Serengeti- Mara ecosystem is one of the important rangeland where wildlife coexist with livestock. Also the area forms a migratory route that connects Ngorongoro Conservation Area, Pololeti Game Reserve, Serengeti National Park

and Masai Mara National Reserve. The study aims to bring back fire to Loliondo rangeland after disappearing in the last 20 years. Demonstration plots were established in black cotton soil as well as in red soil habitat for the purpose of getting a best approach of using fire in reshaping rangeland that affected by the increase of bush and invasive species and reduced the quantity and quality of grass in the area. Bringing back fire to Loliondo rangelands will influence sustainable rangeland management that benefits both wildlife and livestock in the area

Annual home range sizes and movement behaviour of African elephant in Ngorongoro Conservation Area

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Abstract

Home range sizes and movement patterns for African elephant (*Loxodonta Africana*) has been reported to vary across different ecosystems. In this study, we have studied the variation in annual home range sizes and movement behaviour by using a Minimum Convex Polygon (MCP) for 17 elephants fitted with GPS satellite collars (VECTRONIX AEROPSACE, GERMANY) in the Ngorongoro Conservation Area. We analyzed the data covering wet and dry seasons from March 2022 to February 2023 for the purpose of annual home range comparisons (MCP 100%) and distance moved using QGIS 3.10. The results showed large home range sizes for males MCP (largest MCP of 6667), while that of females (Largest MCP of 1036 for females) were smaller between seasons. Smaller home range sizes for females were due to mixed herds and calves contributing to significant reduction in the movement of females. Moreover,

ten collared elephants (eight females and two males) were, at the entire (100%) time using the core protected areas while the rest of the elephant use 60-98% of the protected areas. Less time were spent outside the protected areas adjacent to the boundary with exception of two elephants: one male (45%) and female (44%). The annual longest distance covered were recorded in both females (n=5) and males (n=2) covering a distance of > 1000 km and the rest of the individuals covered a distance of <1000 km. The study concludes that some elephant in Ngorongoro Conservation Areas (NCA) utilize their time and live in highland forests while others can cross border to Serengeti National Park, Mwiba Ranch, Makao Open Area and Maswa Game Reserve which may contribute in explaining the population homogeneity.

Keywords: African elephant, Home range, MCP, movement behaviour, NCA

Potential threats at the Amani-Nilo Corridor in East Usambara, Tanga, Tanzania

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Abstract

Wildlife corridors are areas of habitat that connect wildlife populations that are otherwise separated by human activities, structures or other natural features. They are essential for maintaining biodiversity and ecosystem services in fragmented landscapes. However, wildlife corridors in East Usambara, Tanzania, face various threats from human-induced factors, such as habitat loss, degradation, fragmentation, poaching, climate change, invasive species, and diseases. These threats can reduce the quality and availability of corridor habitats, increase the mortality and isolation of wildlife populations, and disrupt the ecological processes and services that corridors provide. Threats assessments on these corridors are, therefore, essential for identifying and mitigating the factors that affect the connectivity and functionality of these habitats to inform policymakers, forestry and wildlife management. In this paper, we map the major threats on the Amani-Nilo Corridor (ANC) in the East Usambara mountains, which is home to many endangered and endemic wildlife and plant species. We conducted

a baseline survey to determine the status of key management indicators using the Management Effectiveness Tracking Tool (METT-4) in three Community-based Protected areas including Kwengogo, Antakae, and Mzungui Village Land Forest Reserves (VLFR), and three government-based Protected Areas (PAs) of Amani Nature Forest Reserve (ANFR), Nilo Nature Forest Reserve (NNFR), and Derema Forest Reserve (DFR). Despite the potential of these PAs, there were several threats affecting the PAs. Illegal hunting, invasive species and forest encroachment through spice farming were identified among the main threats across almost all sites. The most affected values were biodiversity and water catchment. Improving the management aspects of the PAs within the ANC, and the identified threats have implications for improving forest values and, thus, ecosystem services.

Keywords: Wildlife corridors, threats, habitat loss, connectivity and functionality, East Usambara

Decoding the Major Factors Behind Active Wildfire Occurrences in Woodland Ecosystems Using Remote Sensed Data and GIS Analysis Techniques.

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Abstract

Wildfires are natural phenomena that significantly impact terrestrial and aquatic ecosystems worldwide. Various factors influence them, including ignition sources, weather conditions, vegetation types, topography, and human activities. Africa,

including Tanzania, experiences many wildfires, with the Miombo woodlands of the country's land area being particularly susceptible to such incidents. This study focuses on the Masito-Ugalla ecosystem (MUE) in Tanzania, a region heavily

affected by wildfires. The research aims to assess the influence of human intensity, topographical features, and biophysical factors on wildfire incidents in MUE from 2008 to 2019. Data from diverse sources, including MODIS satellite data, Climate Hazards Group Infra-Red Precipitation, and population density data, were collected and analyzed to comprehend the spatio-temporal patterns of wildfires and their significant drivers.

The findings reveal variations in the number of active fires in MUE over the years, with the highest incidents recorded in 2010 and the lowest in 2018. Wildfires are distributed across almost all regions of MUE, with certain areas exhibiting clustering, potentially attributed to factors such as vegetation cover, population density, and political and biophysical elements. The multiple linear regression analysis highlights the significant influence of human intensity, represented by population

density and distance to roads, on the number of active wildfires in MUE. Additionally, topographical factors, including elevation and slope, and biophysical factors, such as temperature and rainfall, play pivotal roles in predicting wildfire occurrences. For instance, higher population density and proximity to roads increase the likelihood of wildfire incidents, while higher temperatures and lower rainfall decrease their occurrence. The insights gained from this study hold valuable implications for wildfire management and conservation strategies in the Masito-Ugalla ecosystem. Understanding the drivers of wildfires will aid in formulating effective policies and frameworks to mitigate the adverse impacts of human-induced fires on the ecosystem's biodiversity and promote sustainable conservation efforts.

Keywords: Regression Analysis, Remote Sensing, Spatial Analysis and Wildfires.

Breeding population, success, and nesting preferences of the critically endangered White-backed vulture (*Gyps africanus*) in Western Serengeti, Northern Tanzania

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Abstract

The White-backed Vulture, *Gyps africanus*, is a critically endangered species due to its decline across their range in Africa, largely due to poisoning. The western corridor of the Serengeti ecosystem in Northern Tanzania hosts a significant number of individuals of this species. However, there is no published information on its breeding population status and breeding success. Here, we report findings from five riparian aerial surveys conducted between 2013 and 2021 in Ikorongo and Grumeti Game Reserves

and the Ikona Wildlife Management Area and examine changes in nest encounter rate. Nest surveys were conducted in 2021 and 2022 to examine breeding success and nesting site preferences. To better understand potential drivers of observed trends we assessed changes in riparian tree cover between 2012 and 2020 using remote sensing techniques. The nest encounter rate within the survey area declined from 0.99 nests/km in 2013 to 0.43 nests/km in 2021. Breeding success was 29.4%, significantly

lower than reported in other sites. Tree cover declined during the study period and results suggest that habitat loss may be a contributing factor to the observed declines in the breeding population, but further investigation is needed. White-backed vultures in the Serengeti ecosystem require

continued monitoring and investigation on breeding population dynamics and the key factors influencing breeding success.

Keywords: breeding success, population trend, Serengeti, white-backed vulture

SUB-THEME: Human wildlife Interactions

Perceptions of the community on Indian house crow (*Corvus splendens*), its potential impacts and the way forward

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Abstract

The Indian house crow (*Corvus splendens*) is native to the Indian subcontinent. Its geographical range extends from southern Iran across Pakistan, India, Bangladesh, Sri Lanka, and Bhutan, bordering southern Nepal, extending eastward through Myanmar and southern China. Currently, the genus *Corvus* is found on all continents apart from their original geographical ranges, from North America, Europe, Australia, and Africa, through shipping by the colonialists in the late 1880s in order to reduce waste in the environment on islands such as Zanzibar. This study aimed to assess the impact of *Corvus splendens* on the people in selected wards of the Dodoma and Tanga regions. Moreover, the study intended to investigate the perceptions of people toward this species. The data were collected through key informant interviews, semi-structured questionnaires, and focus group discussions. The data were analyzed using Microsoft Excel and SYSTAT (V-13.2). The findings indicated that 24.5% and 11.7% of all respondents across study

wards reported being highly and lowly affected by the bird in different ways, respectively (Kruskal-Wallis, $H = 21.23$, $p = 0.001$). Some of the effects reported by respondents include eating chicks (2.7%), staining clothes (0.5%), stealing food (9.6%), and being unhygienic (0.8%). Moreover, about 19.1% seem to neither like nor dislike seeing this bird around their areas, while only 1.9% strongly liked the bird (Kruskal-Wallis, $H = 47.44$, $p < 0.001$). In general, many respondents (43.4%) recommended the bird as unimportant to them, while few (1.6%) argued the bird to be very important in the environment. The current study found that local people from both regions of Dodoma and Tanga face a lot of problems with *C. splendens*. Our findings call for all stakeholders to be involved in designing methods for reducing the impacts of the birds on the communities to reduce enmity between the two sides.

Keywords: Community, *Corvus splendens*, Impacts, Indian house crow

Extending Serengeti National Park to Lake Victoria: ecological opportunities and challenges

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Abstract

The recent expansion of human activities adjacent to protected areas is a growing concern because it is linked to loss of connectivity as wildlife corridors are cut-off from protected areas. Currently, most protected areas are squeezed in-between human settlements, farming and livestock areas. Access to key environmental resources such as water and pastures during times of scarcity becomes more uncertain as dry seasons become longer and drier. These pressures are pushing ecological systems to their limits and impairing their long-term potential. We explore the ecological potential of the Speke Gulf Game Controlled Area as a connection between Serengeti National Park and Lake Victoria to address future uncertainty on the availability of the Mara River as a water source and pastures for wildlife in the Greater Serengeti Mara Ecosystem. We conducted a transect study from

November 2021 to April 2022 to compare vegetation and herbivores occurrence at three landscape positions within the national park and game-controlled area. We also mapped the consequences of the strong rise in the level of Lake Victoria due to the high rainfall from 2018-2021 which has flooded extensive zones of lakeshore habitat previously used for agriculture. We use multivariate multiple regression and QGIS to analyze the data. The study expects lower grass biomass and higher tree density in the game-controlled area. While this study is useful as a baseline, follow-up studies are recommended on the ecological resilience and effectiveness of the link between Serengeti National Park and Lake Victoria.

Keywords: connectivity, ecosystem resilience, restoration, Serengeti National Park.

Dry season hourly motorcycles activity patterns during the day in villages adjacent to northwestern Serengeti ecosystem, Tanzania

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Abstract

It is globally known that protected areas are important in conservation of biodiversity and are great pillars for sustainable development strategies in most countries. Apart from their environmental benefit which is one of the values of biodiversity, the world protected areas also generate significant economic profit through ecotourism as well as food resources for local communities that surround them.

Bushmeat which is derived from wild ungulates is an important source of meat protein that are consumed and traded among communities adjacent to, as well as communities located distant from protected areas. Using motorcycles in bushmeat hunting and transportation would increase the volume of bushmeat packages and frequency of delivery at distant market places, that might be in rural or in urban

areas as compared to those days when the donkeys and bicycles were used. Thus, the use of motorcycles will inevitably affect especially resident herbivores population inside the protected areas located close to villages boundaries. The current study analyzed hourly motorcycles activity patterns during the day in the three purposively selected villages adjacent to Serengeti ecosystem for 14 consecutive days. The analyses included hourly movement that also counted motorcycles parked waiting for customers, number of motorcycles found in an established motorbike-wash and those found at the established motorcycles garages (local garages). Analyses of data revealed that

relatively large numbers of motorbikes were either in garages or motorbike-wash early in the morning (6am to 8 am) thereafter good numbers were either at the parking lots waiting for customers or commuting within and or between villages till 16 pm. After 16pm good number of motorbikes were brought back to garage and hence few were at the parking lots. Nothing was recorded during the dusk. The morning pattern and the evening patterns may suggest that good numbers of motorcycles are used at night for unknown business. It is recommended that intensive studies be conducted in villages surrounding the northwestern Serengeti ecosystem to reveal how motorbikes are used at night.

Environmental Resources and Economic Growth: Accounting for Environmental Resources in Tanzania: A Theoretical Review

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Abstract

This paper sheds light on how Tanzania accounts for environmental/natural resources destruction in the calculation of the national income with a view to avoiding an ecological/biodiversity bankruptcy and in so doing attaining greener economic growth. The main objective of this paper was to make an analysis of whether accounting for environmental resources in Tanzania takes care of the negative effects brought about by the exploitation of those resources. Specifically, the study sought to shed light on the extent to which unsustainable harvesting of environmental resources and depletion of natural resources due to unsustainable human activities are indeed taken care of when computing the economic growth (GDP) of the country. The methodology that was employed by this study involved reviewing various documents and publications covering the subject matter. A descriptive critical analysis of the information obtained from various documents and publications on the

subject matter occupied a central place. The results from the review show that Tanzania has not been taking into account environmental/natural resource destruction in the calculation of the national income. Economic growth that has been sustained by Tanzania has not been green growth, since it has been attained at the expense of environment/natural resources destruction, for which, no deductions of the cost to the environmental resources have not been made. Failure to account properly for the natural resource destruction that occurs in the process of national income generation makes the national income unrealistic. Omissions of environmental destruction in the calculation of the national income make the country an ecological bankrupt, even if its GDP may be rising.

Keywords: Biodiversity bankrupt, Deforestation, Environmental resources, Green growth, Tanzania.

Challenges, Opportunities and Involvement of Local Communities in conservation of the Mount Rungwe Nature Forest Reserve

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Abstract

The Mount Rungwe Nature Forest Reserve (MRNFR) is one of the biodiversity hotspots in the southern highlands of Tanzania. The reserve is endowed with a relatively high diversity of wild flora and fauna including the endemic Kipunji (*Rungwecebus kipunji*) and Rungwe dwarf galago (*Paragalago sp*) and the rare Abbott's duiker (*Cephalophus spadix*). Moreover, the reserve serves as a catchment for many rivers flowing into Lake Nyasa, one of the three largest lakes in Tanzania. Despite these vital resources, there is a significant interaction between the MRNFR and the adjacent community though the costs and benefits of that interaction is not well documented. The current study aimed at determining the shared costs and benefits between MRNF and the adjacent community and suggesting the necessary management practices for protecting the nature forest reserve. Data were collected using the semi-structured questionnaires which were administered to 384 respondents from the two study villages namely; Ngumburu and Syukula, key informant interviews

(KII) and focus group discussion (FGD). Data analysis was performed using SPSS software version 26. The results show that the community benefits from quality water sources (90.3%, n=384) and involvement in employment opportunities (90%, n=384) despite incurring the cost of conservation (60%, n=384) through problematic and dangerous animals. The variation between the two villages in terms of observed benefits and costs was not statistically significant at $p=0.392$ and 0.317 respectively. The study found that, while the surrounding community suffers from problematic and dangerous animals, they largely benefit from ecological services particularly clean water and employment opportunities. The current study provides baseline information useful for sustainable management of MRFNR and development of the adjacent community.

Keywords: Ecological Services, Forest resources, Interactions and Local Community,



The Magnitude and Patterns of Human-Wildlife Conflicts in Villages surrounding Mkomazi National Park, Northern Tanzania

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Abstract

Human-wildlife Conflict (HWC) poses serious conservation challenges to the livelihoods and security of people living around wildlife protected areas (PAs). Similarly, these HWC affect wildlife negatively, thus undermining conservation efforts. This study was designed to assess the extent, patterns, and efficacy of mitigation measures used by the people living in the villages surrounding Mkomazi National Park towards HWC. Furthermore, the study investigated land-use/ land-cover change and existing historical wildlife corridors/dispersal areas of the Mkomazi National Park (MKONAPA) and other protected areas and ecosystems. Data were collected from Mwanga, Same, Lushoto, and Korogwe Districts in 21 villages purposely selected with the help of the District Game Officers (DGOs) of those districts. Key informant interviews, focus group discussions, and direct observation methods were used to collect data. Maps of the land-use/ land-cover change were

created using the QGIS desktop 3.20.1. Findings indicate that HWC incidents happened in the villages containing farmlands and water sources regardless of the distance from MKONAPA. Other drivers were blockage of migratory routes and dispersal areas and free elephant movements due to reduced threats. Limited coordination of information for early warning systems has led to decline in proactive response in villages with high incidences of HWC. Respondents obtained training in the use of various methods such as roman candle, chilli bombs, and horns but they did not use these methods due to the cost that they were unable to buy. We recommend the provision of mitigation tools such as roman candles and chili bombs that proved effective in controlling problem animals like elephants.

Keywords: Crop raiding, Elephant, Human-Wildlife Conflict, Land use change, Mkomazi National Parks,

Peoples' Awareness, Consumption and Socio-Cultural Barriers Towards Entomophagy as Climate-Smart Protein Source in Morogoro Region, Tanzania

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Abstract

It is estimated that insects are part of the traditional diets of at least two billion people worldwide. However, awareness and consumption of insects remain low in some societies, especially in developing countries. This study aimed at assessing people's awareness, consumption,

and socio-cultural barriers towards entomophagy as one of the climate-smart protein sources in Morogoro region. The study area was stratified into rural, semi-urban, and urban zones. Across the study area, a total of 210 questionnaires and three Key Informant (KI) interviews were

employed. Overall awareness of protein was low (38%) with an increase in awareness towards the urban zone ($\chi^2 = 31.920$, $df = 2$, $p = 0.000$). Unlike entomophagy, conventional protein sources were commonly used in the study area, where beef was the predominant protein source. Generally, awareness of entomophagy was higher (82%), with more aware respondents in the semi-urban area ($\chi^2 = 11.446$, $df = 2$, $p = 0.003$). Contrary to that, consumption of edible insect was lower (45%, $n = 95$) and more or less constant among zones ($\chi^2 = 6.838$, $df = 4$, $p = 0.145$), in which Termites (76%) and Longhorn grasshoppers (44%) were the most consumed insects. Among the insect consumers, consumption was predominantly driven by deliciousness and availability and not their nutritional and environmental importance. In addition,

some of the socio-cultural barriers towards entomophagy were disgust (40%), traditions and customs (20%), and selectivity (20%). These findings show that with low consumption of edible insects, communities are likely to convert more land for livestock farming, which may contribute to land use conflicts and climate change. Therefore, education on the nutritive value of edible insects and their contribution to environmental conservation should be emphasized for better adoption of edible insects as one of the most environmentally friendly sources of protein.

Keywords: Awareness, Consumption, Entomophagy, Morogoro, Social-cultural barriers.

Conservation benefit-sharing mechanisms and their effectiveness in the Greater Serengeti Ecosystem: Local communities' perspectives

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Abstract

Benefit-sharing mechanisms have been instrumental in securing the support of local communities living on the edge of protected areas to implement protected area goals and enhance biodiversity conservation outcomes. Understanding the acceptability of the types of benefit provided among diverse communities is crucial for co-designing benefit-sharing approaches that accommodate local perspectives. Here we used quasi-structured questionnaires and focus group discussions (FGD) to assess the acceptance of the benefits received by the communities in the Greater Serengeti Ecosystem (GSE) in Tanzania, and the effectiveness of the benefits in securing community support for conservation reserves. We found that the categories of social services provisions,

livelihoods support, and employment described all the benefits provided across conservation institutions operating in the GSE. However, the types of benefit within these categories varied significantly among wildlife institutions in terms of magnitude and frequency of benefits received by communities. Overall, student scholarships were highly rated by respondents as the most satisfying benefit received. Respondents who were dissatisfied with the benefits received thought that the benefits did not compensate for the high costs arising from wildlife incursions onto their land. Communities' acceptance of the benefits received varied greatly among villages but only a small proportion of pooled respondents (22%) were willing to support the existence of a protected area without

benefit. This study suggests that local people are willing to support conservation outcomes but require conservation institutions to give greater consideration to the costs incurred by communities, their livelihood needs and access to natural resources or other benefits. We recommend that benefit-sharing be tailored to the local circumstances and cultures of people

living close to protected areas, particularly communities expressing more negative views, to ensure adequate and appropriate compensation is provided.

Keywords: Benefit-sharing, Conservation, Serengeti Ecosystem, local communities, Livelihood

Symposium 2:

REGROW PROJECT:

Enhancing Tourism through Wildlife Research in southern Tanzania

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Abstract

Tourism in Tanzania is a major component of a source of foreign income and accounts for 17% of the National Gross Domestic Product (GDP) and employs over 1.6 million people which is equivalent to 11.1% of the country's total employment. The country's tourism industry primarily revolves around its natural wonders including the diverse wildlife, protected areas, culture and beaches. Its growth largely depends on the sustainability of the wildlife industry and how research informs and shapes the wildlife sector. Successful wildlife-based tourism requires sound integration of human demands with the dynamic nature of tourism. It is particularly important to use adaptive management approaches for the management of wildlife-based tourism. Research on *wildlife* provides basic information on wildlife management and *tourism*. It helps to outline the core principles of ecologically sustainable *tourism*. Through research, a better understanding of the function and factors for the dynamics of ecosystems will be attained. It will help

to establish critical limits of biological diversity as an outcome of the balancing of human (tourism and social livelihoods) and natural demands in the area. The northern tourism circuit has gained much attention in terms of visitation by tourists as a result of a number of researches executed since the 1950s. This opportunity has made the circuit to be highly developed and improved livelihood for people dwelling within the circuit. The REGROW project is aimed at unveiling the potentials found within the southern circuit to enhance tourism while improving communities' livelihoods.



COCOBA: A microfinance model supporting both conservation and socioeconomic development

Hobokela Mwamjengwa et al-TANAPA

Abstract

Small-scale business (COCOBA) emerges as the best approach for improving livelihood and a conservation approach in areas adjacent to protected areas. It is therefore urged that the allocation of

adequate financial resources for lending to micro-credit institutions with low interest rates will help conservation and therefore enhance wildlife-based tourism in low countries.

Api-tourism: a tourism package for improved livelihood in Southern Tanzania

Emmanuel Mmassy

Abstract

Apitourism is a fast-growing niche tourism that revolves around the observation and participation in activities related to bees and beekeeping. It is one of the best practices for environmental conservation and insurance for food security (pollination services). Visitors are offered with opportunity to learn about the importance of bees and their role in pollination, honey production,

and the ecosystem. Also, communities economically benefit directly from tourists through agreed concessions. The project provides training and equipment to beekeeper groups and how to initiate this activity in their villages. This new tourist package is expected to increase the number of days of tourists and hence, more income to the country.

Artificial intelligence: a tool for improving the use of camera traps on enhancing tourism in Southern Tanzania

Wilfred Marealle et al, -TAWIRI

Abstract

Artificial intelligence (IA) offers a powerful tool to study/ understand wildlife species within the ecosystems. It is an important asset in monitoring and conserving wildlife populations. The analysis of camera trap data has been made easier by the use of IA platforms. The timely and accurate analyses are crucial for conservation efforts, as they help researchers and wildlife managers

make informed decisions about protecting endangered species and managing their habitats effectively. This novel technology was used to determine the distribution of shy and cryptic wildlife species for enhancing tourism in the Udzungwa Mountain and Mikumi (Malundwe Mountain) National Parks.

Improving Human-Wildlife co-existence through the application of Non-lethal mitigation measures in Southern Tanzania

Victor et al -TAWIRI

Abstract

HWC mitigation takes many forms with the majority being financially focused, and lethal. However, the possible mitigating possibilities for co-existence

between humans and wildlife should include creating awareness, provision of preventive measures and training into the local communities.

Improving wildlife information sharing through the National Wildlife Research Information System (NWRIS)

Machoke Mwita et al-TAWIRI

Abstract

As part of its mandate, TAWIRI generates scientific information which is usually used to advise management authorities and communities with the aim to improve conservation and enhance tourism activities. However, for a long period, there has been no reliable information management system

database for data storage and sharing. Here we present the currently developed Data and *information management system* as part of a BioInformatics Platform, which will ensure data quality, *enhance sharing*, and promote access and use.

Research on flora biodiversity for Protected areas will enhance management plans for conservation and tourist attraction in wildlife-based tourism systems

Bukombe et al-TAWIRI

Abstract

In wildlife-based tourism systems, neither tourism nor biodiversity precedes the other. It is usually critical to assess the way that biodiversity can enhance its role as a main resource for tourism destinations. This work presents results from surveys of

flora resources in MINAPA in which recent surveys led to the improvement of the previously recorded list by adding more than 170 flora species including more than 10 of which are of conservation concern.

SUB-THEME: Bee ecology, Beekeeping and Api-tourism development

Non-*Apis* Pollinators in Tanzania: Stingless and Solitary Bees

Kathrin Krausa

Abstract

Insect-mediated pollination and natural pest control are invaluable ecosystem services for food security. Avocado (*Persica americana*) is an important crop in Tanzania, grown by smallholder as well as commercial farmers. In big avocado monocultures, honeybees (*Apis mellifera*) are supplemented and have been shown to improve pollination. Which role solitary pollinators play, is widely understudied in this part of the world. Besides, solitary wasps can play a vital role in the control of insect pests. Some species of both, solitary bees and wasps use hypogean nests in the form of hollowed plant stems. To assess the diversity of these species, we have installed trap nests that consist of hollowed bamboo

stems of different diameters. We conducted this survey on two Avocado farms, on the Western slopes of Mt. Kilimanjaro and in the lowlands in Usariver. Traps placed on the edge of the orchards and in their centre. Monthly, we monitor the nests, remove occupied nests, and allow occupants to hatch in the laboratory. Monitoring started two months before the avocado flower and continued 2 months after the flower. This study contributes to the identification of avocado pollinators in Tanzania, identification of pest control agents in Tanzania, gaining insights into the species' lifecycles and reproduction and gaining insights into the key needs of solitary bees and wasps.

Traditional Beekeeping Practices and their Effects on Community-Managed Forests in Central Tanzania

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Abstract

Traditional beekeeping is one of the subsistence economic activities practised by local communities adjacent to the dry Miombo woodlands of central Tanzania with indigenous knowledge and skills. However, the benefits gained through this activity are often linked with detrimental effects on forest ecosystems owing to its extensive use of live trees and the adoption of low-technology honey harvesting methods. The rampant rate of forest degradation due to poor beekeeping practices adversely affects forest ecosystems and reduces the beekeeping potential as an

important income-generating activity. More importantly, there is a need to better understand traditional beekeeping's destructive impact, particularly in community-managed forests with relatively lower protection statuses. This study was conducted in Kalulu Community Forest located in Sikonge and Itigi Districts of central Tanzania. This area is part of the national wildlife corridor linking the Katavi and Ruaha National Parks. Parallel line transects were established across the Kululu Community Forest to quantify the destructive impacts of human-driven forest

disturbances. Various human activities were recorded along the sampled transects based on visible signs. Meanwhile, a total of 397 beehives were randomly selected and visited for visual observations to learn how beekeepers harvest honey locally from local beehives and whether this contributes to honeybee post-harvest colony absconding. Study results indicate that nearly 35% of total destructive impacts on the forest ecosystem were due to traditional beekeeping practices.

Besides, inappropriate honey harvesting methods caused the absconding of bee colonies in 51% of all visited hives. A forest management plan coupled with effective management actions should be adopted to sustainably utilize forest resources and allow for the proper functioning of life-enabling ecological processes.

KeyWords: Beekeeping, traditional beekeeping practices, community-managed forest

Influence of temperature and precipitation on pollinator diversity and plant-pollinator Interactions in the Tarangire-Manyara Ecosystem.

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Abstract

Studies on pollinating insects, though important, lack attention, especially in third-world countries. Here we examined the effects of climatic (elevation, temperature, and precipitation) and land use variables on the diversity of pollinators (bees, skippers, and butterflies). This study was conducted in April 2023 and deployed a pan-trap method to sample pollinators in three (low, mid, and high) elevation zones across the Tarangire-Manyara Ecosystem. In addition, we studied plant-pollinator interactions and used the visual observation method to record pollinator visitations on forbs' flowers (plant-pollinator interactions). Data was analyzed using R statistical programs, and both linear regression and generalized linear mixed models were used for analysis. A total of 315 pollinators and registered 641 interactions involving 83 plant species were sampled and mid-elevation zone was found to harbor most pollinators than lower and higher elevation zones. Besides,

small-sized bees, medium-sized bees and medium-sized skippers were found to be the most abundant pollinators in low, mid, and high elevations, respectively. Findings also showed that pollinators diversity increased monotonically with temperature ($p = 0.001$) but declined with increasing precipitation ($p = 0.001$). Conversely, mid- and low-land use levels seemed to have significantly higher pollinators' diversity than high-land use level ($p=0.001$). Interestingly, findings revealed a significant variation ($p = 0.002$) in the amount of time spent by different groups of pollinators in pollinating flowers, with medium-sized skippers leading in overall pollination time followed by medium-sized butterflies and medium-sized bees (e.g honeybees). More importantly, plant species of a pollinated flower ($p = 0.001$) and temperature ($p = 0.001$) were found to be influential predictors of the amount of time pollinators spent pollinating flowers. Our study shows how different groups

of pollinators contribute to pollination services in contrasting environmental conditions and underscores the need to craft strategies that promote conservation of a wide range of pollinators.

Keywords: plant-pollinator interactions, land use, elevation gradient, plant visitation, Shannon's Diversity Index,

Exploratory Study of Honey Bee Pest and Predators at Kibaoni Ward, in Mlele District, Katavi, Tanzania

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Abstract

Honeybee colonies are normally faced with numerous disasters, stressing inducing agents and enemies such as pests and predators which cause damages to the life and the products of honeybees. All these disturbances force bee colonies to disappear and migrate to other areas which are more suitable and safe to them. These migrations impact bee keepers by reducing their expected bee products yields and income. This study therefore, explored the types and nature of honey bee pests and predators in Kibaoni Ward, in Mlele District, in Katavi Region, Tanzania. Specifically, the study tried to answer the following questions: What are the common honey bee pests and predators in the study area? Their abundance? And what is their common habitat? Methodologically, two honey bee farms (apiaries) of Vilolo and Nyakasi were selected purposely as study sites. The data collection procedures were direct observation and counting of pests and predators obtained from the study area. The findings show that about ten species representing two phyla, four class, eight

order and nine families were the types of pests and predators found in the study area. These pests and predators do belong to the class Insecta, Arachnida, Mammalia and Reptilia. The findings show further that the common habitats which favour the presence and development of pests and predators were underground area below the beehive stalls, ground surfaces, tree trunks, decaying material and hive constructing material. The study also found that the major effects of pests and predators to the colony were praying on them leading to hives absconding. Therefore, it is concluded that presence of pests and predators lead to low colonies which in turn, lead to low be products and consequently, low income. Beekeepers are therefore recommended to perform regular inspections of their apiaries and surroundings to ensure that they are free from pest and predators for maximum bee products production.

Keywords: Honey bee, pests, predator, apiary, Mlele.

Comparison of honey production between modern and traditional beehives in Ngorongoro Conservation Area

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Abstract

This study aimed to compare honey production between traditional and modern beehives in Ngorongoro Conservation Area while assessing challenges facing the local community in beekeeping activities. Two wards Nainokanoka and Alailelai were purposively selected based on potential and accessibility and then the same procedure was used to select two villages from each ward. In total, 92 beekeepers, of which 79 were males and 13 were females, were sampled using an unknown population formula to compare traditional and modern beehives in honey production. Data were collected using structured questionnaires from the local beekeepers. A total of 2,172 beehives were observed, 133 were modern beehives while the rest 2039 were traditional. The Data were collected using semi-structured questionnaires from the local beekeepers the Kobo toolbox was used as an application tool.

Data were statistically analyzed using Statistical Package for Social Science (SPSS version 25) where Descriptive statistics

were used to analyze demographic variables and challenges faced by beekeepers. Also, an independent sample t-test was used to obtain a statistical value that was used to compare the amount of honey production between the Modern (Langstroth) and traditional (Log) beehives. The study reveal that modern beehives had a higher honey yield than traditional beehives. However, financial constraints, lack of government support, the poor market for bee products, vandalism and theft, human-wildlife conflicts, and climatic changes were identified as challenges facing beekeeping in the area. Therefore, efforts should also be taken to reduce the main constraints that hindered beekeeping development such as the provision of education and training, technical support and monitoring, and loan provision to local beekeepers to adopt the modern beehives that have higher honey yield.

Keywords: comparison, beehives, challenges, Ngorongoro, honey



Promoting high bee diversity in Afro tropical drylands: The impact of agriculture intensification with seasonal fallow lands

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Abstract

The exponential growth of the global human population and its subsequent rise in food demand have led to widespread agriculture, making it the dominant form of land use worldwide. Within Afrotropical drylands, this shift has resulted in the loss of natural savannah habitats and increased agricultural intensification, yet its consequences for bees remain largely unknown. In this study, we investigated the effects of agricultural intensification on bee assemblages in the northern Tanzanian Afrotropical drylands, while disentangling direct impacts from temperature and indirect effects mediated by floral resource changes. Data were collected from 24 study sites, representing three management intensity levels (natural savannah, moderate intensive, and highly intensive agriculture), spanning a wide gradient of mean annual temperature (MAT) in northern Tanzania. By employing ordinary linear models and path analysis, we examined the impacts of agricultural intensity and MAT on bee species richness, species composition, and body-size variation within bee communities. Our findings revealed that bee species richness increased with both agricultural intensity and temperature.

The effects of agricultural intensity and temperature on bee species richness were linked to the positive impact of agriculture and temperature on the richness of floral resources utilized by bees. Particularly during the off-growing season, agricultural land demonstrated an extensive period of fallow land, fostering a high density of flowering plants with unique bee species composition. The increase in bee diversity in agricultural habitats also correlated with greater variation in bee body sizes, which, however, diminished in environments with higher temperatures. Land-use intensification, such as year-round irrigated crop monocultures and excessive agrochemical use, may negatively impact bee diversity and pollination services, as observed in temperate regions. To conserve bee communities and ensure vital pollination services in the region, a balanced mixture of savannah and agriculture, with prolonged periods of fallow land, should be maintained.

Keywords: bee abundance; bee species richness; forage resources; mean annual temperature; species community composition

Beekeeping value chain and community readiness to adopt the Village savings and lending associations in Mwikoro and Kigori Villages, Butiama district in Mara region

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Abstract

Worldwide, there is a growing consensus that beekeeping is critically important for livelihood diversification, sustainable management and conservation of forest resources. In this context, efforts to establish and implement beekeeping initiatives are of critical priority. This study explored insights into the beekeeping value chain and community readiness to adopt a Village Savings and Lending Association (VSLA) in Butiama District. A convergence approach under the mixed method design was employed in data collection. It involved desk review, direct observations, group discussions and interviews with different stakeholders in the area. The results indicated that beekeeping in the area is at the infant stage. The main approach used in beekeeping is a let alone method/natural colonization. The occupancy rate for traditional hives is about 65% while for improved ones is 52%. The beekeeping value chain in the area is characterised by two clusters of value chains. The first cluster is comprised of the following

functions according to their order; input supplying, producing, collecting and storing, processing including packaging and labelling, whole selling, retailing and consuming. The second cluster involves input supplying, producing, collecting and storing, processing including packaging and labelling, retailing and consuming. In both clusters there are various actors involved, these are input suppliers, producers, collectors, processors, whole-sellers (only for the first cluster), retailers and consumers. It was revealed that the community was willing to integrate the VSLA model into the current microfinance services. However, they attested to the need for more training on the proposed VSLA model. The existing beekeeping value chain could be enhanced to improve beekeeping practices in the area and the VSLA model is also suitable in the area.

Keywords: Beekeeping value chain; Community; Mwikoro; Kigori; Village Savings and Lending Association



Exploring drivers for low-hive occupancy in beekeeping high potential areas for beekeeping: A case study of Geita and Tabora Regions.

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Abstract

Beekeeping plays a major role in socio-economic development, conservation and ecosystem. Tanzania is endowed with diverse forests potential for beekeeping industry. However, low hive occupancy is the main challenge to the industry. In addition to that, land degradation in the Western part of Tanzania has significantly affect beekeepers that formerly utilized areas that have been upgraded to National Parks. The aim of the study was to explore factors that contribute to low hive occupancy and assess the impact of conservation status upgrade to livelihood. It was hypothesized that climate change, the use of traditional hives, pests, and livestock encroachment does not have an effect on production; also, there is no significant decline in honey production and evicted beekeeper have alternative sites for hive sitting. The study was conducted in six Districts found Geita and Tabora Regions that has high potentials for beekeeping. Data was collected through questionnaire interviews, Focus Group Discussions (FGDs) and Key

Informants Interviews (KII). Findings showed that one-third of sited hives were unoccupied indicating low hive occupancy. Factors that contribute to decreased hive occupancy were: poor hive quality, unfavorable climate, pests, pesticides and habitat degradation. On the other hand, the upgrade of protected areas caused most beekeepers to be evicted due to restrictions, this substantially impacted beekeeping practices and livelihood. Upgrade of protected areas and Low hive occupancy are problems that have significantly impacted beekeepers in Western Tanzania. Specifically, decrease in honey production and difficulty in finding new areas that are suitable for beekeeping purposes. It is clear that communities should be involved in planning and decision-making together with the provision of extension services to better improve hive occupancy.

Keywords: Beekeeping, Hive-occupancy, Colonization, Conservation, Honey, Protected-areas.

Local knowledge and understanding on pollination service in small scale agriculture

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Abstract

Pollination service is important in flowering plant and agricultural crops it contribute significantly towards food security by 90% of food produced globally, improving people's livelihood and maintaining genetic diversity in plant community.

However, the decline in pollinators population due to anthropogenic changes and limited knowledge of pollination is threaten pollination services. Negative perceptions that is fear and repulsion are common attitude that lead to a lack

of support for pollinators conservation. Understanding local knowledge and people's understanding is vital as it can help in pollinators conservation and proper protection actions.

The study was conducted in Mbukomu ward in Kilimanjaro region to assess the local knowledge and understanding on pollination services using structured questionnaire. About 43% of the respondents have idea and understanding of pollination services and about 57% have low understanding on pollination services, and about 66% of respondents consider and recognize bees as common pollinator. Understanding on pollination

services by respondents is influenced by education level, age and occupation of respondent. Poor farming management and practices example use of fire, poisoning and deforestation were noted by 60% of respondents as the most practices threatening pollinators population and beekeeping, use of traditional technology and fencing of farms by trees were noted by 54% of respondents as the practices related to pollinators management. Overall the study shows low understanding on pollination services and limited knowledge on pollination service.

Keywords: Agriculture, knowledge, pollinators, understanding, service

Honeybees (*Apis mellifera*) navigation efficiency in food collection for colony survival in a savanna ecosystem

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Abstract

Honeybees use the optic flow to navigate in an unaccustomed environment by adjusting their speeds. Honeybee speed and frequency in food collection are critical to the survival of honeybee colonies. Honeybee speed is not well established within the savanna ecosystem, especially in dry, windy and hot conditions. The objective of the study were to: (i) assess honeybee speed to and from a food source, (ii) assess the effect of wind speed and wind direction on honeybee speed and (iii) establish the time honeybees take to collect food from an artificial food source. Foraging honeybees were accustomed to feed on four points which were sited in four cardinal points sited 1 km from the beehive. Bees were marked with different colours for easy identification from the point of feed source. Time and distance were measured to establish bee speeds in relation to the prevailing weather parameters. Temperature, wind direction and speed were measured 7 meters above

the ground surface. Generally, wind speed affects honeybee flight speeds with reduced speeds if honeybees fly against the wind and vice versa. Regression analysis indicates honeybee speeds of 8 and 7 m/sec respectively for unloaded and loaded bees, the difference being significant ($P < 0.05$). The time taken by honeybees to collect food was not affected by either wind speed or direction and on average honeybees took 3 minutes to collect food. The study demonstrated how worker bees effectively work to collect food for the survival of a colony within the savanna ecosystem. The study recommends consideration of obstacles and other weather parameters such as rain and cloud cover conditions on honeybees navigation efficiency on food collection.

Keywords: Honeybees, wind speed, wind direction, food source

Social and Ecological Drivers of Illegal Bird Hunting in the Indawgyi Wetland Ecosystem in Myanmar

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Abstract

Hunting and the illegal killing of birds are among the major concerns for global avian conservation. Unsustainable hunting of birds in wetland habitats, particularly in areas situated along flyways, has caused avifauna defaunation and species endangerment. Since wetlands are primary habitats for migratory birds and interlinked with human-dominated production landscapes such as agriculture and aquaculture, a comprehensive understanding of bird harvesting, and its drivers is essential to reduce threats to avian populations. This study examined the occurrence of illegal bird hunting and its socio-ecological drivers in the Indawgyi wetland ecosystem in Myanmar. To achieve the study objectives, face to face interviews with 384 households, market surveys in local villages and 120 point transects for bird sampling were conducted from June 2021 to March 2022.

Our findings indicate a high occurrence of illegal bird hunting, using nets, traps, and poisonous substances, in areas near water bodies and during the migration season. People who had negative attitudes towards avian species were more likely to engage in bird hunting, primarily because of the conflicts between bird conservation and crop production. Socio-economic needs were not the major driving factors of bird killing. We therefore suggest sustainable management interventions promoting coexistence between bird conservation and agricultural production, accompanied by increasing awareness to improve avian conservation in an internationally important wetland in Myanmar.

Keywords: attitudes, bird and agriculture interaction, illegal bird killing, human-wildlife conflict, wetland



Ecology and control of human-bat conflict in Dar es Salaam City Council, Tanzania

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Abstract

This study was conducted to determine the status and control measures of bats in Dar es Salaam City Council (DCC). The overall objective of the study was to determine the status and impacts of bats, determine effectiveness of tree pruning and use of repellents in the control of bats and propose rational and sustainable control measures. Methods used during the survey were Key Informant Interviews (KII), inspection of bat roosting trees, inspection of buildings and other structures, inspection of bat droppings and bat noises, inspection of caves and other underground structures, netting of bats for bat identification, as well collection of biological samples from bats. Pilot control measures including tree pruning, insecticide or bat repellent spraying, and netting of trees were used and monitored for four months. Results showed that community members have a negative attitude on bats due to their associated impact like droppings, noises and mess, property damage especially coconut trees and potential public health risks as they might carry zoonotic pathogens. The survey noted that households and community members were using a number of bat control measures including use of noises, beating tins or corrugated iron sheets placed on trees, use of bells, use of mist nets, use of spot lights, pruning or cutting of bat roosting trees. The survey recorded three bat species namely straw-coloured fruit bat (*Eidolon helvum*), Egyptian fruit bat or Egyptian rousette (*Rousettus aegyptiacus*)

and small brown insectivorous bat. The most common roosting areas for bats in Dar es Salaam City Council were trees. The most common drivers of bat presence in the affected areas were presence of urban back yards with plentiful roosting trees that have been planted around households; habitat change and loss outside Dar es Salaam due to increased human population coupled with human settlement, infrastructure development, poor tree management especially pruning, tall trees and canopy, etc. Results of effectiveness of tree spraying with insect and bat repellents including Dimethoate 400g/l 40EC (Danken Crop sciences Co. Ltd; Importer: Haphon Company Limited, Mbozi Road, Chang'ombe Dar es Salaam, Tanzania), Bat (CRP) (JOJECKA products Kenya Ltd, Batch No. SFP/003), Naphthalene and Fenthion, an avicide (TPHPA, Arusha) and tree pruning at 30, 50 and 100% are discussed.

Keywords: bats, human-bat conflict, bat repellent



Predation of Indian house crow (*Corvus splendens*) to chickens in Dodoma the cause of Human-Wildlife conflict

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Abstract

The Indian house crow (*Corvus splendens*) (IHC) is an invasive species that was introduced to Zanzibar from India. Currently, it has spread across the country, including Dodoma Urban. However, the wider impacts on livestock, such as chickens, through predation have been less studied. This study aimed at assessing the abundance of IHC, Predation on chickens, the perception of local communities (Chicken keepers), and overcoming strategies. We employed a questionnaire survey to reach 150 farmers in three wards, namely Makulu, Makole, and Nadachi. Makulu and Makole are located in Urban while Ndachi is located in peri-area. We also used point counts to sample the abundance of Indian house crows around the farmers in urban and suburban areas. Farmers in urban areas experienced more predation on their chickens (mean = 18.67 ± 2.74), owing to a higher abundance of Indian house crows, than those in peri-urban areas (mean = 17.00 ± 1.73), which had a low

abundance of Indian house crows ($P < 0.05$). The farmers had their own local means of controlling the challenges of predation on their chickens, such as chasing, shouting, and protecting chickens from predation. Finally, control of predation on chickens should take into account the intensity of predation as well as proximity to urban areas. Furthermore, farmers' local methods were environmentally friendly, but they needed to be studied and improved in an innovative way to maximize their efficiency in controlling predation. Lastly, more awareness and education are needed among farmers on the coping strategies for the challenges encountered from IHC predation to enhance sustainable conservation of IHC and other birds while enhancing chicken production.

Keywords: Indian house crow, invasive species, reduce chicken production, human-wildlife interaction

The contribution of small holders home-garden trees to climate change adaptation, mitigation and resilience

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Abstract

Smallholder farmers in the Northern Kilombero Valley, Tanzania are starting to feel the effects of climate change and face further challenges to their livelihoods due to increases in wildlife crop raiding. Tree planting as part of climate change mitigation activities and biodiversity actions plans, however, involves trade-offs that smallholders must navigate with

limited space, time, access, and knowledge. Our objectives were to understand how trees contribute to climate change adaptation, mitigation, and resilience in smallholder farming systems from a farmers perspective and to identify barriers and opportunities farmers are facing in this context. We use a mixed methods approach, combining tree inventory data

from 65 farmers and home-gardens across 3 villages in the Kilombero Valley with data from semi-structured household surveys and qualitative interviews to answer the research questions. We will show (1) the compositional and functional attributes of trees within home-gardens that contribute to building climate change adaptation and resilience in smallholder farming systems, (2) the carbon stocks in smallholder home gardens that contribute to climate change mitigation, and (3) trade-offs that

exist, for example through increased crop raiding risk when planting trees attractive to wildlife and risk from planting invasive species. We will contribute to evidence as to whether tree planting in smallholder home-gardens can contribute to climate change mitigation, adaptation, and resilience.

Keywords: Small holders, home-garden, climate change, adaptation, mitigation and resilience

Impacts of wildlife migratory corridors' blockage on livelihoods of communities living adjacent to Arusha national park, Tanzania

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Abstract

The Kisimiri-Lendoiya wildlife corridor (connecting Arusha National Park and Kilimanjaro National Park) is highly threatened by anthropogenic activities, mainly cultivation, settlements as well as changes in land use and land cover. This paper assesses the impacts of blockage of wildlife migratory corridor on the livelihoods of communities residing in Kisimiri and Olkung'wado villages adjacent to Arusha National Park. Random Forest Classification was used to analyze changes in land use and land cover (2010-2020), as an indication of the habitat condition. Questionnaires were administered to ascertain existing anthropogenic related activities and effects of wildlife to local communities in the corridor, whereby, a total of 97 households were randomly selected. Linkage Mapper was used to analyze delineation of the corridor, whereas quantitative data were analyzed using the Statistical Package for Social Sciences (SPSS). Qualitative data from the Key Informants were analyzed in content wise. Findings revealed dramatic land use

changes which adversely impacted the natural habitats, causing negative impacts to both wildlife and people's livelihoods. The delineated corridor has a width of 10 Km, and a length of 26.3 Km. Crop production (55.7%) and livestock keeping (23.7%) were reported as the main socio-economic activities. It was further revealed that; crop raiding (97.9%) is the major form of human-wildlife conflict in the area, mostly affecting farmlands close to park boundaries. Different preventive measures; active deterrent (25.7%) and farm guiding (23.7%) are used. The findings of our study suggest that food security is threatened by crop-raiding incidences. Despite negative effects of wildlife to livelihood, still majority of local communities' benefit from wildlife conservation (84.5%). Conservation education and land use planning are recommended in the corridor.

Keywords: Wildlife corridors, land use changes, anthropogenic activities, food security, livelihoods and conflicts.

Linking spatial-temporal change in rangeland resources to agricultural intensification and human-wildlife conflicts in and outside Enduimet Wildlife Management Area, Tanzania

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Abstract

Availability of rangeland resources is essential for sustainable coexistence of humans and wildlife in protected areas particularly in tropical dry lands. However, increasing rangeland degradation coupled with climate change is threatening the existence of rangeland resources. This study investigated spatial-temporal change in grassland and its relationship to land-use change and human-wildlife conflicts. We used Landsat Satellite images to map and quantify land-cover and land-use change from 2000 to 2019 and linking these with livestock and wildlife population change and local perceptions on human-wildlife conflicts. We found a decline in areas under grassland due to encroachment of

bush and woodland inside and outside the Wildlife Management Area (EWMA). Transformation from grassland to intensive cultivation outside the WMA was associated to increase in livestock raiding conflicts but a declining in crop raiding conflicts. Our study suggests management of bushes and woods in order to increase space for pasture and empowering communities to participate in livelihood strategies that are compatible with wildlife.

Keywords: Spatial-temporal change, rangeland, agricultural, human-wildlife conflicts Enduimet Wildlife Management Area.



Socioeconomic drivers for human wildlife conflict in communities living adjacent to protected areas in Ruaha -Mikumi landscape, Tanzania

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Abstract

Socioeconomic drivers for Human Wildlife Conflict (HWC) was studied in communities adjacent to Ruaha - Mikumi landscape in Morogoro and Iringa regions. Four Districts facing HWC challenges from the two regions were selected purposively and a total of 24 villages were visited and qualitative data collected. Secondary data on hydrology were collected from Rufiji Basin Authority. Remote sensed data for rainfall, human population, and wild-fire for the past eleven (11) years (2010 - 2020) were used. Results showed that the amount of rainfall varied with districts in the landscape and years ($P < 0.01$). Water flow rate was influenced by month and year, higher flow rates were experienced in April, May, March, and February ($P < 0.05$) and low rates were measured in October and November. It was further noted that permanent flowing rivers are mostly passing through the villages leaving the protected areas with river and tributaries

that are seasonally flowing. There were variations ($P < 0.01$) in burned area between years and study districts. It was revealed that wildlife loved crops and alcohol making attracts wildlife to the homesteads, thus, increasing HWC. Most of the study villages had Land Use Plans (VLUP) however, no adherence to the VLUP. Human population increased tremendously in the landscape where in 2010 the landscape hardly had 220,000 people inhabiting the area, in 2020 the number increased 4 folds with the population of 920,000. It was generally concluded that rainfall influence water flow rate in various rivers in Ruaha Mikumi landscape, however, water abstraction upstream restricted water availability downstream forcing wildlife to seek water outside protected areas. Human population increase adjacent to protected areas resulted into destruction of historical wildlife habitats. Haphazard establishment of villages in wildlife areas has accelerated

human wildlife conflict. Growing elephant loved crops around homesteads and making of fermented alcohol increase elephant raiding incidences.

Keywords: Human wildlife conflict, conflict causes, Coexistence



Perceptions and willingness of local communities to conserve pangolins in the Burigi-Ibanda-Rumanyika ecosystem

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Abstract

Pangolins are a globally threatened species, with habitat loss and direct harvest for local consumption or traditional use, and international illegal trade, being the primary causes of extinction risk. In Tanzania specifically, three species of pangolin are found across various habitat types, including the Temminck's ground pangolin (*Smutsia temminckii*), white-bellied pangolins (*Phataginus tricuspis*), and Giant ground pangolins (*Smutsia gigantea*). However, information about the species itself, as well as the local community's perceptions of pangolins and their conservation, is generally lacking throughout the country. This report presents a case study of engaging the local community members in the Burigi-Ibanda-Rumanyika ecosystem using a semi-structured questionnaire, in which 202 local people were interviewed to assess their knowledge, attitudes, and support for conservation initiatives they suggest for pangolin conservation. Of the 202 questionnaires administered, about 65% of respondents could correctly identify pangolins from among other similar species, however, about half of respondents (54%) acknowledged a decrease in pangolin sightings over the past 5 years, with the main perceived threat

being habitat loss. We did, however, find that local communities generally held positive perceptions towards pangolins, including their importance to the local ecosystem. About 66% of respondents proposed the need of establishing conservation educational programmes about pangolins in their local community. Our study suggests that the communities in the Burigi-Ibanda-Rumanyika area are aware of the presence of pangolins, and given their positive perceptions towards the species and willingness to be involved in conservation activities, there is a need and value to further engage with local communities to develop pangolin conservation strategies.

Keywords: attitude, conservation, knowledge, local communities, pangolins,



Human-carnivore coexistence is possible: Daytime pastoralism does not negatively affect spotted hyenas inside Ngorongoro Crater

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Abstract

Anthropogenic activity can have dramatic effects on wildlife but the effects may vary depending on the characteristics of the activity and the species involved. Effects on animal behaviour are well studied, but studies of effects on reproductive success, survival and physiology are comparatively scarce, particularly for group-living species. We investigated the effect of diurnal pastoralism on juvenile recruitment and physiological stress in the spotted hyenas of Ngorongoro Crater (Tanzania), over a 24-year period. We exploited a natural experimental setup – conditions before and after the ban on pastoralism inside the Crater. Until 2016, cattle herding was allowed but restricted to certain areas of the Crater which overlapped with the territories of two of the eight hyena clans. We compared juvenile recruitment in exposed and unexposed clans. We also compared faecal glucocorticoid metabolite concentrations (fGMC) — a bio-marker of an organism's physiological stress— between exposed and unexposed clans. We found no detectable difference in juvenile recruitment nor fGMC between exposed

and unexposed clans, indicating that the pastoralism had no substantial deleterious effect on the spotted hyenas, in comparison to ecological parameters like disease outbreaks. The lack of a deleterious effect likely stems from the combined effect of the predictable and largely undistruptive nature of the pastoralism for spotted hyenas, the socio-ecology of spotted hyenas and the Ngorongoro Crater's consistently abundant prey. Our findings demonstrate that exposure to anthropogenic activity can be compatible with the persistence of certain species. This is particularly likely to be the case when there is little spatiotemporal overlap between the human activity and the species' critical behaviours (such as feeding/hunting and nursing of the young). Our study thereby provides new perspectives for ecologists, conservation biologists and stakeholders who seek to assess human–wildlife conflicts and balance the needs of local human communities and wildlife.

Keywords: Spotted hyena; Group-living species; Human-wildlife coexistence; JuvenileRecruitment; Pastoralism

Seminar 4

Promoting coexistence between wildlife and the communities in the Western Serengeti: addressing the symptoms and causes of human wildlife conflicts.

Masegeti Rurai
Frankfurt Zoological Society

Abstract

Human Wildlife Conflict (HWC) is an increasing problem, threatening conservation efforts globally. It occurs when the people who co-exist with wildlife bear the associated impacts but receive none of the biodiversity related benefits such as income from nature-based tourism. These impacts reduce livelihoods through crop damage livestock predation and in extreme cases, attacks on humans and therefore can increase antagonism of the associated communities towards wildlife with reduced tolerance leading to both pre-emptive and retaliatory wildlife killing. Due to the complexity of this issue, single solutions are often not sufficient to resolve the problem and a range of interventions have been promoted to mitigate these impacts. These include those aimed at reducing the opportunity for wildlife impacts (addressing the symptoms), but also to enhance the formal and informal governance structures to empower local communities to develop systems that reduce conflict and enhance coexistence with wildlife (addressing the causes). However, the efficacy of individually combinations of interventions is often not well quantified. Here we present a case study from the western Serengeti Ecosystem to showcase the experience of implementing a range of interventions designed to address crop damage, livestock predation and attack on people by wildlife such as elephants and large carnivores that range out of the protected areas of the Serengeti Ecosystem onto village land. Frankfurt Zoological Society, together with the Serengeti District Game Office and the park adjacent villages are working together to reduce impacts and improve the ability of local institutions

to manage the conflict. Central to our approach, is the collection of data to assess the HWC problem and the effectiveness of the various measures. Strategies to reduce impacts include support for predator-proof bomas, provision of scaring devices, alternative crops and a 'Rapid Response Team' linked to community-based Human-Wildlife Conflict Monitors to respond to reports of wildlife presence and take early action before incidents become impacts. To address some of the underlying causes, the programme has also supported land use planning to secure land for wildlife migratory corridors/routes and spatially segregate wildlife from human activities as well as Community Conservation Banks that provide a funding mechanism for people to develop conservation compatible income generating activities. In this presentation we report on the effectiveness of the mitigation measures based on a monitoring and evaluation system that utilizes the HWCs who are trained to monitor and collect data using smart devices, reporting to the district RRT. The data indicates the trends in wildlife impacts, HWC incidents and retaliatory killings. We also discuss, additional interventions that are needed including studies to understand the attitudes and motivation of livestock herders in relation to HWC mitigation measures, improved education and awareness to enhance the roll out of effective mitigation measures and the introduction of an early warning system based on satellite collared predators using virtual fence technology. Our work shows that coexistence of communities requires not just measures to mitigate impact, but also further efforts to support, develop

and enforce appropriate local governance mechanisms that are communities can buy into. By sharing our experiences and insights, we hope to inspire collaboration among researchers, policymakers, funders,

and conservation practitioners toward achieving effective human-wildlife coexistence, biodiversity conservation, and sustainable socio-economic development in Tanzania and beyond.



DAY TWO: POSTER PRESENTATIONS: 07TH DECEMBER 2023

Population assessment of Maasai giraffe (*giraffa camelopardalis*) in Mkomazi National Park, Tanzania

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Abstract

Tanzania has the highest population of Maasai giraffes (*Giraffa camelopardalis*) among East African countries. Their distribution is limited to protected areas, one which is Mkomazi National Park. Despite being confined to protected areas, the IUCN considers Maasai giraffes to be endangered, and the population has dropped by 52% due to several threats such as poaching, diseases, droughts and changes in land use. Assessing their population dynamics, distribution, food preference and health condition of Maasai Giraffe in Mkomazi National Park is critical for understanding their welfare. Previously, aerial surveys were used to assess giraffe populations in the majority of Tanzanian protected. Ground survey is therefore, required to assess the population dynamics, distribution, preferred food and health condition of Maasai giraffes. The photograph mark-recapture method was used to survey the giraffe population in Mkomazi National Park, an individual-

based data-gathering strategy that is more efficient and reliable than aerial survey. In Mkomazi, 412 Maasai giraffes were encountered during the survey, with an average sex ratio of 1:1.2 and average age ratio of 1:2:6 (per group). They were usually found feeding in dense Acacia commiphora bushlands, mostly near water sources. Direct observation was made for any clinical signs but none had skin or ear disease, most were killed due to poaching and droughts. Therefore, population and threat assessment are crucial for giraffe viability and successful conservation efforts to ensure long-term existence in Mkomazi. Additionally, information on the Maasai Giraffe's population dynamics will provide baseline for long term monitoring, whereas known distribution inside the park is useful in identifying crucial locations for conservation.

Keywords: *Camelopardalis giraffa*, ground survey, population, threats,

Creating a National Tsetse and Trypanosomosis Atlas: Advancing Socio-Economic Progress in Tanzania

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Abstract

African trypanosomes, transmitted by tsetse flies, pose significant challenges in Tanzania, affecting both livestock and human health. The extent of tsetse infestation spans approximately 13,127,000 hectares of grazing land, which, if reclaimed, could accommodate more livestock units. This reclamation would significantly boost the contribution of the livestock to the overall Gross Development Product (GDP). Moreover, it has the potential to reduce conflicts at the wildlife-human-animal interface between conservationists and livestock keepers, as well as the deadly conflicts between livestock keepers and crop producers. However, despite the profound impact of tsetse infestation on livestock and the potential risks to human health, the efforts made by various stakeholders to combat this challenge have not resulted in sustainable outputs. The sustainability and effectiveness of tsetse control have been hindered by the lack of a centralized and harmonized database, impeding comprehensive analysis and proper resource allocation. Consequently, this has led to inefficiencies and duplication of efforts among stakeholders. To address these challenges and promote sustainable rangeland utilization, we propose a geospatial analysis framework. This approach aims to collect tsetse and trypanosomosis data

from all stakeholders involved in tsetse research and control in Tanzania from 2000 to 2022. By doing so, we can quantify the impact of tsetse distribution and control initiatives, as well as other factors influencing its spread. This initiative will enhance the current tsetse control coordination mechanism and foster collaboration among stakeholders engaged in tsetse and trypanosomosis research and control. Ultimately, the optimization of efforts and allocation of resources, along with the formulation of targeted and sustainable tsetse control measures, can pave the way for tsetse control, elimination, and eradication. By investing in sustainable control measures, Tanzania can safeguard livestock health and productivity while mitigating the risk of Human African Trypanosomosis (HAT) outbreaks. This, thus will foster socio-economic development in the country.

Keywords: tsetse, trypanosomosis, Tanzania, atlas



Enhancing East African bee assemblages: The impact of grazing intensity and potential forage resources

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Abstract

The expanding practice of livestock grazing in African grasslands has raised concerns about its impact on bee pollinators, yet the consequences remain largely unknown. To address this, we conducted a study in East African grasslands, examining the direct and indirect effects of livestock grazing intensity on bee assemblages, and investigating whether these effects are influenced by temperature. Our research encompassed 24 study sites in Northern Tanzania, representing three distinct levels of livestock grazing intensity. Utilizing ordinary linear models and path analysis, we evaluated the influence of grazing and temperature on floral resources and bee diversity. Additionally, non-metric multidimensional scaling (NMDS) and permutational MANOVA were employed to analyze changes in bee community composition and bee-visited plant community concerning grazing intensity and temperature. Our findings indicate that moderate livestock grazing had a positive impact on bee species richness, whereas high grazing intensity resulted in a substantial decline. Moreover, bee species

richness peaked at moderate temperatures but significantly decreased in colder and excessively hot environments. Path analysis demonstrated that the effect of livestock grazing and environmental temperature on bee species richness was mediated by the positive influence of moderate grazing on floral resource richness. Furthermore, livestock grazing induced a notable shift in bee community composition, particularly in environments experiencing very high temperatures. Consequently, our study reveals that the bee communities in the African savannah zone can benefit from low levels of livestock grazing, as it promotes the growth of flowering plant species. Nevertheless, intensive livestock grazing leads to significant species losses and alters the composition of bee communities, with these effects potentially exacerbated by climatic warming.

Keywords: Bee abundance; Bee community composition; Bee species richness; Floral resources; Livestock grazing intensity



Factors hindering beekeepers on the adoption of modern beekeeping technologies in Rombo District, Kilimanjaro Region

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Abstract

Beekeeping is one of the essential economic activities that support the livelihood of million people worldwide, and it has different significant results such as poverty alleviation, people's income generation, source of food and medicinal purpose. Despite different significance produced by the activity, 90% of the beekeepers are still adapting to traditional technologies and only 10% are adapting to modern technologies. The study aimed to study the current beekeeping technologies used, perception of beekeepers on modern technologies and challenges that are facing beekeepers on adoption of modern technologies. Cross-sectional design was adopted to collect information from the selected sample of 106 beekeepers on the selected population. Questionnaires were administered to collect the quantitative information to answer the research objectives and semi-structured interview was employed to collect qualitative information to answer the research questions. The quantitative data were analyzed and coded through Statistical Package for Social Sciences (SPSS) version

20, whereby qualitative data were analyzed through content analysis where the information were broken down into form of themes. The chi-square test revealed the statistical significance of the variables in the study. The findings revealed that 76.4% of the current beekeeping technology used are traditional technologies including log hives, bark hives, and smoking. Also 63.21% of the beekeepers have negative perception towards modern technologies by claiming how expensive the technologies are. Also the major challenges that are facing beekeepers on the adoption of modern technologies are high cost and poor marketing strategies. Generally based on the findings beekeeping activity has not been developed to a satisfactory level due to poor technologies which are being used which lower the productivity. Hence support should be given to the beekeepers such as capital, education and trainings to maximize production of bee products.

Keywords: Beekeepers, Beekeeping, Modern technology and Traditional technology

Community adaptation to climate variability and its impact on mnyamasi riverine ecosystem in vikonge and bugwe villages western Tanzania

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Abstract

Ecosystems are faced with challenges as their human inhabitants' struggle adapting to a changing climate, and the survival of other biodiversity depends on how sustainable the adaptation is. Projections

of climate change for western Tanzania indicate that temperatures will continue to rise, wet seasons getting more wet and dry seasons getting more drier and presenting more challenges to ecosystems

and livelihoods systems (Gray, 2011). Rural households are engaging in several livelihood activities including crop production and livestock keeping and off-farm and non-farm depending on seasons for a living. In mainland Tanzania 65.3% are involved in agricultural activities, in an average of farming area of 2.7ha per household (URT, 2021) that is 70% rain fed (Ringo, 2023). Climate shape agriculture productivity worldwide and as it varies several strategies are deployed by communities including cropping drought tolerant varieties, early planting (Ringo, 2023), migrating to new places including moving to riverine ecosystems where there is assured wetness to support agricultural activities. Rivers are an important part of the food system; and play a vital role in ensuring food security, nutrition, and livelihoods of communities around them (Manohar, 2023). What are the livelihood activities around Mnyamasi river system and their contributions to food security, how sustainable and resilient are they And What are legal and policy implication of these activities? These are among the

questions that the paper will be responding to. Rivers are key ecosystem elements for the survival of wildlife in dry seasons in many protected areas Using archival research method, land use analysis reports and satellite image were reviewed. Key activities identified include paddy/rice farming, livestock keeping are the main livelihood activities in flood plains of Mnyamasi River; and threaten its flows and Lake Tanganyika water with sediments and pollutants. Key positive impacts include growth and formation of villages, increased food production, immigration of people and cattle, introduction of new farming techniques. In a changing climate, conflicts arise as to which to prioritize the livelihoods of the people and policies/legal requirements meant to ensure healthy and functioning river ecosystems. It is recommended to provide education on sustainable utilization of river ecosystems and develop rehabilitation plans for degraded.

Keywords: *Climate change, ecosystems*

Adoption of Climate-Smart Agriculture in Small-Scale farming in Africa: Are the pillars for CSA accounted for?

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Abstract

Studies have shown that climate change has a significant effect on the rural landscape and the equilibrium of the agrarian and forest ecosystems resulting into instability disintegration of agricultural-dependent livelihood systems in rural and peri-urban areas. To address these and related challenges, many countries have attempted Climate Smart Agriculture (CSA). CSA has been proven to address the intertwined challenge of increasing agricultural productivity while at the same time maintaining sustainable levels of carbon

emissions from agriculture. Despite its proven benefits, the adoption of CSA in Africa varies across the continent. In some countries the adoption of certain practices is as low as 10% and in others above 60%. Using scoping, narrative and descriptive approaches in the analysis of literature, this study has demonstrated that Climate-Smart Agriculture technologies have proved to be effective in delivering food security, climate change mitigation, and adaptation. However, while researchers working in these areas have attempted

to work on the biophysical aspects of Climate-Smart Agriculture, there are gaps in the understanding of how the adoption of Climate-Smart Technologies has contributed to climate change mitigation and adaptation. The study further revealed that while various factors such as household characteristics, land ownership and gender were considered in the introduction and adoption of CSA technology, little attention has been given to the pillars of CSA, namely food security, adaptation and mitigation. The study recommends that

more work is needed to enhance knowledge on mitigation and adaptation aspects of CSA technologies. The study recommends further that, for farmers to effectively adopt and benefit from CSA, considerations be made on resources endowment, community engagement as well as participation during development and dissemination of CSA technologies.

Keywords: Climate-Smart Agriculture, adoption, climate change, agriculture

Shigella flexneri infection in wild chimpanzees (*Pan troglodytes schweinfurthii*) in the Gombe-Masito-Ugalla Ecosystem, Tanzania

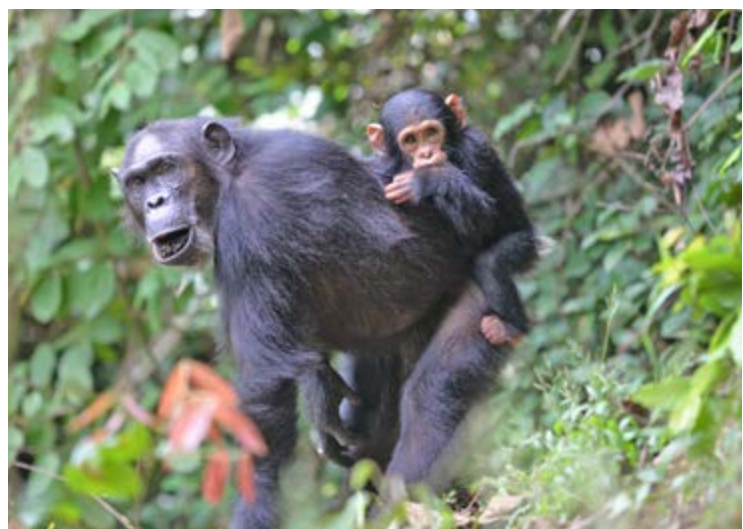
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Abstract

Shigella flexneri is a leading cause of dysentery, causing 80–165 million cases of human disease and approximately 600,000 deaths annually worldwide, with most cases and deaths among children. The bacterium typically spreads via fecal contamination of water or food and, as a zoonotic pathogen, also has the potential to transfer to and from wild primate populations. In this study, we examined whether *S. flexneri* was present among chimpanzees living in and around Gombe National Park (GNP), Tanzania. Fecal samples were collected noninvasively and subsequently tested for *S. flexneri* using conventional polymerase chain reaction (PCR) and gel electrophoresis. Patterns of infection were compared for chimpanzees inside and outside GNP. Our results confirm that *S. flexneri* is present in both the Kasekela and Mitumba chimpanzee communities of GNP. This highlights the need to align public health and conservation efforts in and around GNP to protect human and wildlife

health. The recent expansion of the Gombe Ecosystem Health Program to include on-site diagnostics allows for a quicker detection of pathogens in chimpanzee samples collected in the park. Our ongoing efforts throughout the Gombe-Masito-Ugalla Ecosystem (GMUE) aim to understand and mitigate the impact of zoonotic pathogens on people and wild primates in the region.

Keywords: Chimpanzees, pathogens and conservation



Lungworm infection: host behavior and lungworm burden in wild ungulates

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Abstract

Host behavior can change the transmission dynamics of directly-transmitted pathogens and represents major challenge to our ability to predict disease emergence and forecast disease spread. Wild ungulates have evolved behaviors (e.g. migration, group living and habitat and seasonal forage selection) to maximize nutrient acquisition and reduce predation risk. These behaviors change ungulate distributions and exposure to different abiotic conditions, and should also influence parasite and pathogen transmission. We investigated the impact of (1) the wildebeest migration and (2) variation in abiotic conditions on the non-migratory wild ungulates in the Serengeti National Park. We focused on lungworms (Dictyocaulidae and Protostrongylidae) that are important parasites of both domestic and wild animals. Lungworms typically reside in the respiratory tract of their hosts, where they lay eggs. Eggs or

larvae are coughed up and swallowed and larvae are passed into the environment in host feces. We collected fresh fecal samples from topi, hartebeest and wildebeest and quantified lungworm burdens using a beaker-modified Baermann technique. We found that; lungworm intensity in non-migratory topi and hartebeest increased after the wildebeest migration and animals feeding in areas with different habitats had consistently different infection burdens. Our results suggest that migratory wildebeest can input feces with lungworm larvae into resident home ranges and increase resident infection rates. However, the abiotic conditions of the local habitat can also mediate the intensity of host infections, likely as a result of larval survival in the environment.

Keywords: host, infectious diseases, parasites, Serengeti ecosystem, wildebeest

Coccidia infection: host behaviour and coccidia burden in wild ungulates

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Abstract

Host behaviour can change the transmission dynamics of directly-transmitted pathogens and represents a major challenge to our ability to predict disease emergence and

forecast disease spread. Wild ungulates have evolved behaviours (e.g., migration, group living, habitat and seasonal forage selection) to maximize nutrient acquisition

and reduce predation risk. These behaviours change ungulate distributions and exposure to different abiotic conditions, and should also influence parasite and pathogen transmission. The aim of this study is to assess the impact of wildebeest migration on coccidian parasite-dissemination to the resident herbivores. We investigated the impact of (1) the wildebeest migration and (2) variation in abiotic conditions on the coccidia burdens of non-migratory wild ungulates in the Serengeti National Park. We focused on coccidia including members of the genera *Eimeria* and *Isospora*, that are important parasites of both domestic and wild animals. Coccidia typically reside in the gastrointestinal tract (GIT) of their hosts, where sporozoites invade gut cells and develop into schizonts that release merozoites (male and female gametes) that fuse and produce unsporulated oocysts

(non-infectious stage) that are shed through faeces. Sporulation occurs outside the host, and depends on temperature, moisture and oxygen. Sporulated oocysts (infectious stage) are then be transmitted to new hosts via ingestion. We collected fresh faecal samples from wildebeest and three non-migratory species, topi, hartebeest, Grant's gazelle and quantified coccidia oocysts burdens using the McMaster floatation technique. We found that topi, hartebeest and Grant's gazelle occurring in different regions of the Serengeti had different coccidia infection rates. Future analyses will examine the role of wildebeest migration and environmental factors in contributing to these differences.

Keywords: coccidia, host, infectious diseases, movement, Serengeti ecosystem, wildebeest

Porcine Cysticercosis Sero-prevalence and Factors Associated with its Occurrence in the Southern Highlands, Tanzania

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Abstract

Porcine cysticercosis is endemic in Tanzania, especially in the Southern Highlands, Central areas and Northern Highlands regions of the country. The condition reduces pork quality and suitability for human consumption hence pig industry, ecosystem and public health are affected. The disease causes neurological effect in the affected human, primates, pigs and even dogs. The prevalence and possible

associated factors for porcine cysticercosis occurrence in pigs of the three wards of Iringa region in southern Tanzania, was investigated to assist in planning for suitable and sustainable control measures. Collected blood samples from 346 pigs in 88 households were analysed using an enzyme-linked immunosorbent assay (ELISA), to detect for *Taenia solium* antigens (Ag). Questionnaire and observational checklist

assisted in collecting household information concerning pig management, sanitation and hygiene practices. In average, 22.3 ± 3.44 per cent pigs were seropositive for porcine cysticercosis in the surveyed wards, and 53.4 per cent surveyed households had at least one seropositive pig. Seropositivity was associated with scavenging pig rearing method (OR=2.426; $p \leq 0.05$) and poor-quality pig housing (OR=1.75; $p \leq 0.05$). Scavenging pigs and those living in poor-quality pens had two times chances of being infected. Having pig units

with positive case(s) indicates limited inputs in pig feeding and sheltering thus were exposed to infection vulnerability. Scavenging seropositive pigs, demonstrate the environment is contaminated with *T. solium* eggs, of which the wild primate animals and the ecosystem near by the surveyed region is affected by the parasite.

Keywords: Cysticercosis, Primate, Risk-factors, Sero-prevalence,

Environmental controls on parasite infection dynamics in a multihost community at the wildlife-livestock interface

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Abstract

Infectious diseases are of great concern for the health sector, wildlife conservation and the global economy. Increasing human population and activities that lead to changes in ecosystems and climate can increase the risks of infectious disease and presents a pressing need to understand host-parasite dynamics in a variety of ecological contexts. This study intends to explore: (1) the role of animal movement, particularly wildebeest, in disseminating parasites within the Serengeti ecosystem and its effect on resident host species (2) how different environmental factors and disturbances such as grazing intensity, soil moisture, as well as vegetation affect parasite survival and distribution. Our preliminary results suggest wildebeest movement contributes to transport effect of parasite i.e., dissemination of parasite within the Serengeti ecosystem, and

the strength of parasite dissemination/availability is highly affected by the trophic effect i.e., wildebeest grazing. Observed data suggests more larvae will be found in habitat patches which were occupied by large number of animals and had less/no trophic effect from particular group of animals compared to site that had high trophic effect. Furthermore, our data suggest small sized wildebeest group that occupies habitat patch for longer period will slightly have dilution effect of parasite that they had self-deposited (reducing parasite load for resident species) compared to small group that occupied similar habitat for a short duration. Our findings provide evidence of the role of animal movement in parasite dissemination, and how ecological factors such as grazing mediate the development and availability of parasites within the ecosystem.

Control and monitoring of sustainable hunting of free-ranging lion: lessons learnt from a 12-year long programme in Tanzania

Or else?

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Abstract

Trophy hunting of free-ranging lion (*Panther leo*) has remained a topical issue among scholars across the world. Many of them have been questioning whether hunting of lion contribute to conservation or negatively affects their survival. The debate about lion conservation has centred on the lion population decline in much of their historical range due to many factors including illegal killing (humans vs. lions conflicts and trade in lion body parts), prey depletion, habitat degradation, livestock encroachment, unregulated locally poorly managed trophy hunting, the latter being less impactful than all other drivers. As home to about 50% of the remaining wild lions, Tanzania conducts sustainable hunting of free-ranging lion. Safari hunting is a crucial component of Tanzania's lion management strategy because this activity sustains very large tracts of lion habitat, lion prey populations and lion populations which would be simply replaced – in the absence of trophy hunting - by other economic activities (mining, logging, pastoralism,

cotton production etc.), most of them being environmentally unfriendly. Safari hunting generates socio-economic revenues needed for wildlife conservation, anti-poaching efforts, and community livelihood. In order to maintain harvest of lion at levels that are not detrimental to lion conservation, Tanzania has adopted an age based lion hunting mechanism as part of the adaptive management of the

species. The age based harvest of lion is underpinned by Regulation 27 (1) of the Wildlife Conservation (Tourist Hunting) Regulations of 2015 as amended in 2017, 2019 and Guidelines for the Administration of Lion and Leopard Safari Hunting, 2020. To implement this legislation, Tanzania has launched the lion control and monitoring programme with a view of ensuring that any lion hunted meets the minimum age requirement, hunting of lion in Tanzania is sustainable and lion quota is set at levels that are not detrimental to the survival of the lion. This control and monitoring program uses a wide set of both antemortem and post-mortem criteria for determining the age of lion at harvest. Experience accrued by the lion control and monitoring programme shows that (i) the vast majority of stakeholders fully complies with the legislation in place, (ii) the application of the multi-criteria method in lion age determination is appropriate and effective, (iii) professional hunters very much improved the precision of their antemortem age diagnosis, (iv) the knowledge in lion biology and trophy quality keeps going improving. The lion hunting control and monitoring programme is continuously working at contributing to (i) conservation of lion, lion prey and natural habitat, and (ii) improvement of community livelihood and conservation efforts.

Keywords: Lion ageing, safari hunting, lion conservation, control and monitoring

What forms of militarised conservation are morally acceptable? Perspectives from Sub-Saharan Africa, the US and the UK

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Abstract

Protected areas are on top of the global conservation agenda. Using military-style tactics and equipment to protect wildlife in and around protected areas, also known as militarised conservation, is extremely controversial. Understanding how different groups of people, particularly those who live near protected areas, perceive militarised conservation could help identify socially acceptable or unacceptable approaches to wildlife conservation. However, little research has been conducted on this topic. In this study, we investigate some aspects

of militarised conservation commonly practised in SSA such as rangers carrying and firing guns, monitoring people's movements, searching, and arresting people. We compare rural and urban perspectives from SSA, the UK and the US to better understand which forms of militarised conservation are socially acceptable, and to whom. Evidence of how different groups think about militarised conservation can inform decisions on wildlife conservation and protected area management in SSA.

Human - wildlife interaction around Selous Reserve in Tanzania.

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Abstract

Selous Game Reserve (SGR) including Nyerere National Park covering an area of 50,000 km² is one of the largest protected areas in the world and by far one of the global outstanding ecological entities. Its history is shaped by various forms of human-wildlife interactions. This paper highlights the genesis of wildlife conservation in the SGR and different forms in which wildlife interacts with adjacent local communities and possible solutions as way forward. The socio-economic status of the communities bordering the SGR, one of the major determinants of human-wildlife interaction

in Tanzania. Human-wildlife interaction have two scenarios. One being positive, in the sense that, interactions involves the use of wildlife for food, medicines, spiritual purposes etc. The other scenario is negative where interaction is defined by numerous costs associated with wildlife such as crop damage, livestock depredation, killing/injury to people and wildlife, diseases transmission, destruction of habitat and resources. This paper is framed around the following questions; (i) which are the different forms and how do humans interact with wildlife in SGR?; (ii) How do different

people perceive different forms of human-wildlife interaction (positive against negative) (iii) which are the different strategies/ solutions employed in addressing the negative forms of human-wildlife conflicts?; and (iv) what are the implications of these interactions on wildlife conservationist? I conclusion, paper recommends that, the policy makers and Protected Area Managers should address the needs of local people in order to minimize the prevailing conflicts resulting from negative interactions and promote harmonious coexistence between humans and wildlife. This will only be possible when attacks on people are mitigated through sound management practice.

Human-Lion Conflicts and role of wildlife veterinarians in mitigation in Tanzania

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Abstract

Human-wildlife conflicts (HWCs) have nowadays become not uncommon in villages surrounding protected areas in Tanzania. Among the driving forces include increase in human populations and associated anthropogenic activities around protected areas (PAs) including encroachment for agriculture, livestock grazing, poaching in PAs. On the other end, increased lion population and interactions with people and livestock in the human-wildlife interfaces aggravates situation. Since human share space and resources with wild animals within the landscape; events of injuries or deaths of people, livestock predation have recently been reported. Mitigation of HWCs in among critical issues to deal with for sustainable wildlife conservation and improved livelihood of the people around protected areas. And Tanzanians at large. In this case report, we present and discuss events of livestock depredation by lions and efforts done by wildlife veterinarians to search for, immobilize and translocate to safe areas. A total of 17 free-ranging lions that predated 158 livestock, injured two people and killed one person from 2021 to 2022, these cases were reported at various areas

including Serengeti, Bunda, Ngorongoro, Monduli, Manyara ranch and Kilwa district. In addition, 22 lions free-ranging lions were deployed with satellite collars to enable following up their spatial-temporal movements as an early warning system to timely mitigate HWCs in different places in Tanzania. These operations have not only improved survival and livelihoods of people in rural areas that strongly depend on land-based resources including fertile soil and water for agricultural production and livestock grazing but also saved the lions concerned from potential retaliatory killings by people. We highly recommend development and proper use of land use plans as a tool to minimize human encroachment of PAs for settlement and activities like cultivation, livestock grazing as well as urging communities surrounding PAs to observe good animal husbandry practices. The latter include proper housing, improved rangelands and wise use of water resource for smooth co-existence of people, livestock and wildlife.

Keywords: human-wildlife conflicts, lions, livestock depredation, translocation

Public perceptions of trophy hunting are pragmatic, not dogmatic

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Abstract

Fierce international debates rage over the social acceptability of trophy hunting (TH), especially when people from the Global North hunt iconic wild animals in sub-Saharan Africa (SSA). But what makes TH so divisive? We measured public perceptions of the acceptability of TH in SSA among people who live in urban areas of the USA, UK, and South Africa. Zebra hunts were more acceptable than elephant hunts, and hunts that would provide meat to local people were more acceptable than hunts in which meat would be left for wildlife. Hunts in which revenues would support wildlife conservation were more

acceptable than hunts in which revenues would support economic development or hunting enterprises. Acceptability was generally lower among participants from the UK and those who more strongly identified as animal protectionists, but higher among participants with more formal education, who more strongly identified as hunters, and who would more strongly prioritise people over wild animals. Overall, acceptability was higher when hunts would produce tangible benefits for local people, suggesting that public perceptions are more pragmatic than high-profile, polarised international debates.

Using mixed methods to measure topic sensitivity in conservation

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Abstract

Asking people about their behaviour can help design better conservation interventions and is becoming increasingly common. However, obtaining reliable information can be challenging, particularly if the research topic is considered sensitive. Topic sensitivity may raise methodological, ethical, political, and legal concerns which, if poorly addressed, can have significant

impacts on research participants, the research process, and data quality, as well as the success of conservation outcomes. While considerable effort has been invested in developing techniques for reducing bias when collecting data on sensitive topics, less attention has been focused on identifying if, and why, a topic is sensitive. Here, we present a mixed methods

approach to measure topic sensitivity. We develop a psychometric scale to measure topic sensitivity at the respondent level and conducted group exercises (free lists and pile sorts) to gain a deeper understanding of peoples' willingness to discuss different topics. Using data collected from people living around the Leuser Ecosystem in northern Sumatra, Indonesia (n=362) and the Ruaha-Rungwa Ecosystem in central southern Tanzania (n=345), we find participants' knowledge of rules, and their experiences of living alongside protected areas affect how sensitive they considered

topics to be. We highlight that mixed methods approaches can provide holistic and nuanced understanding of topic sensitivity. However, recognising that in-depth studies are not always feasible to implement, we demonstrate that tools, such as our Sensitivity Index, can easily be adapted for different contexts and deployed to rapidly obtain valuable insights on topic sensitivity, to help inform conservation research and practice.

Keywords: Compliance; protected areas; psychometric scale; free-listing; pile-sort

Copying strategies: Community engagement towards Human-wildlife coexistence

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Abstract

Human-wildlife conflict (HWC) is a major threat to both conservation and community residing adjacent protected areas. This threat is receiving attention especially in multiple-use landscapes where many wild animals still occur and the willingness of people to coexist with wildlife is indispensable. Like many other countries in Africa, Tanzania faces similar challenges with an increased HWC in almost all key ecosystems. Many protected areas are now increasingly becoming islands surrounded by farms, settlements and other anthropogenic activities. This results into increasing competition between people and wildlife in terms of sharing space and resources. Understanding this, Tanzania, made an effort in reducing HWC by developing its first five years National Human-Wildlife Conflict Management Strategy of 2020 – 2024. The strategy identified key hot spot areas and necessary best practices to enhance co-existence between people and wildlife were put in place. The strategy identify major species that cause massive damages, that include, elephant, lion, hippopotamus, crocodile, hyaena and other big carnivore. Among the most affected Ecosystems with higher rate

of incidences of Human-Elephant Conflicts (HEC) is Ruaha National Park and its surroundings. The papers shares some experience of working with communities in mitigating HEC around Ruaha NP in Mbarali, Iringa na Itigi Districts. Training of Trainers of Trainees was done on farm-based crop mitigation strategies, use of buffer and application of “HEC Mitigation tool Kit”. Unpalatable crops (chili papers, safflower “Katum”) had been reported to be adopted by farmers and were note raided by elephants, while beehive fencing though expensive proved to be effective in avoiding elephant entering farms. Both, buffer crops and beehive fencing were perceived as also an alternative income sources that increased food security as fund gained from selling of crops and bee products were used for buying food crops. We learnt that, involving communities in designing and implementing alternative livelihood opportunities may enhance coexistence.

Keywords: Co-existence, Human, elephant, mitigation measures, Training, wildlife.

Smallholder farming practices shape patterns of wildlife crop raiding; lessons from southern Tanzania

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Abstract

Crop-raiding poses a significant negative impact on farmers' livelihoods in Africa. However, the relationship between crop-raiding and characteristics of small-holder farming is not well-studied. We investigated how daily management of small-holder farms shapes wildlife crop raiding patterns using villages adjacent to Mikumi and Nyerere National Parks in southern Tanzania as a case study. Data was collected through structured questionnaire, Focus Group Discussion (FGDs) and Key Informants Interviews (KIIs) from seven villages. It was found that the extent of crop-raiding varied significantly ($p < 0.05$) and was spatially uncorrelated (Morans I -test = 0.00425, $p < 0.05$). Crop raiding increased with increasing crop

diversity ($p > 0.05$) and farm size ($p < 0.05$), but decreased with increasing distance ($p < 0.05$) and number of plots owned by the household ($p > 0.05$). Maize (*Zea mays*) and paddy (*Oryza sativa*) were the most raided crops, but still highly preferred by farmers. Farms under monocropping farming system were more raided compared to those under agroforestry. We conclude that characteristics of farm plots and farmers' management decisions are not mutually exclusive responses to wildlife crop-raiding, thus mitigation strategies that enhance co-existence between human and wildlife in rural areas should be promoted.

Keywords: Livelihood, food security, conflicts, poverty, policy, rural

Navigating the dilemma of human wildlife conflict in the Mbarang'andu Wildlife Management in the era of climate change

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Abstract

The Mbarang'andu Wildlife Management Area (WMA) is among areas with a significant human-wildlife conflict challenge. To understand the extent of the problem and explore strategies for mitigation, we conducted interviews using questionnaires, focus group discussions, and key informant interviews. Among the 389 individuals interviewed, 99%

reported that human-wildlife conflict has a profound impact on their livelihoods. The primarily crop raiding affecting 95 % of the respondents, followed by property damages, predation, and human injuries and fatalities. Savannah elephants were identified as the main culprits behind these conflicts, accounting for 78% of the reported incidents, while wild pigs, vervet monkeys,

and yellow baboons were also responsible in 77 % of cases. Hyenas led the list of predators mentioned, reported by 25% of the communities, followed by leopards. In exploring the reasons behind these conflicts, 45% of respondents admitted to not knowing the exact cause. On the other hand, 40% believed that animals were seeking food due to inadequate fencing and a lack of manpower to deter them from protected areas. Another 35% thought that wildlife populations had simply grown too abundant for the protected areas to accommodate. Regarding interventions, an overwhelming 89% of communities invested time in guarding their farms, and

many used noise-making as a deterrent against animals. Moreover, 40% reported using dogs to scare wildlife away, while only a few used chili-based deterrents and reported incidents to village leaders. The pressing question that remains unanswered is how to optimize conflict resolution between communities and wildlife. Given the nature of wildlife involved varying from elephant to velvet monkey and the time of crop raiding being night and day making it hard for the communities to navigate the challenge.

Keywords: Human wildlife conflict, Coexistence, Mbarang'andu, Crop raiding

Incentives for Biodiversity Conservation under Asymmetric Land Ownership

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Abstract

Wildlife corridors are key instruments for biodiversity conservation, but their effectiveness hinges on strategic placement to maintain and restore ecological corridors allowing flows of ecosystem goods and service between different protected areas. Conditional monetary incentives can encourage landowners to preserve valuable agricultural land for conservation. However, for conservation payments to effectively influence landscape connectivity it is crucial to leverage cooperation among land users in ecologically significant areas. Prior research suggests that fairness in the distribution of such payments can enhance overall conservation effectiveness. Although asymmetric distribution of access to and ownership of land can be a key determinant for the in equal distribution of benefits and cost in area-based conservation, this has not yet been systematically addressed in the experimental literature on payments

for ecosystem services. We address this knowledge gap based on a pre-registered and incentive-compatible lab-in-the-field experiment. Specifically, we explore how conservation incentives perform under alternative payment modalities and levels of equality in land ownership. The experiment was run with 384 Tanzanian farmers from two ecological corridors threatened by agricultural expansion. Two randomly selected groups of participants were endowed with either equal or unequal amounts of hypothetical farmland and subsequently exposed to two treatments, namely a fixed individual payment for each retired parcel and a fixed payment with an agglomeration bonus. Both payment modalities had positive effects on conservation, but we find no strong evidence for any impact of asymmetries in land on conservation decisions of farmers. Overall, our results suggest that conditional payments can be effective even when land

with high conservation value is unequally distributed in ecological corridors. We further discuss the potential welfare implications of our results.

Keywords: Agglomeration bonus, Ecological corridor, Framed field experiment, Landscape connectivity and Payments for Ecosystem Services.

Assessing the Basic Knowledge on Animal Behaviour, Habitats and Their Interaction with Human Beings Among the Young Generation from the Community Living Around Arusha National Park

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Abstract

The level of understanding on animal behaviors, habitats, and their interaction with human beings among the young generation contribute greatly to their involvement in conservation initiatives. Providing young people with wildlife education, increases their participation in conservation, by raising their compassion, and caring for wild animals. This study started with the concept that all over the world the majority of those reached with conservation education are adult aged groups, making them more aware on conservation needs and initiatives than the young people. Therefore, this study was designed to measure the basic knowledge on animal behaviour, habitats, and their interaction with human beings among the young generation and checking responses after imparting conservation education knowledge to them. We collected data from 5 primary schools located near Arusha National Park, by administering a structured questionnaire having both closed and open-ended questions to 40 students from each school who were randomly selected from each class to measure the basic knowledge they had on wildlife conservation. The theme of each question was analysed and recorded with respect to the percentage of

students responded. Upon analysis, average percentage of understanding on animal behaviors, habitats, and their interaction with human beings were found to be 45%, 35%, and 48% respectively however the analysis after providing the basic wildlife conservation education improved to 90%, 87% and 89% respectively. The study shows the importance of providing further education on animal behaviour, habitats, and their interactions with human beings among the young generation as this could be a great solution in reducing animal-human conflict, mostly for those communities that live near wildlife habitats. The long-term conservation of wildlife and their habitat depends on imparting knowledge to the young generation.

Keywords. Behavior, conservation education, young generation.



Human-Elephant Interactions; Exploring Conflicts and Drivers in Enduimet Wildlife Management Area, Tanzania

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Abstract

A globally rapid land use/land cover change (LULC) in human-transformed landscapes alters the interface of human-wildlife interactions due to shifting socio-ecological and environmental pressures. Understanding these shifts is crucial for mitigating repeated negative interactions that escalate conflict states between people and wildlife. This study aimed to understand LULC changes over 30 years (1989–2019), with more recent spatio-temporal patterns of high pressure at the human-elephant interface, and potentially underlying environmental and human-driven factors that affect elephant movement patterns. We analyzed a dataset of 923 human-elephant conflict occurrences, mainly crop foraging incidents, in the Enduimet Wildlife Management Area (EWMA) between the years 2016 and 2020 and combined these data with LULC for year 2019 to understand potential drivers of conflict and assess how agricultural land and settlement have increased over time. We further used GPS datasets of elephants collared between 2019 to 2020 to understand elephant movement patterns in changing land use types. Landsat image analysis revealed that 41% of the area had been converted into farmlands and settlements within the last three decades, which creates elephant-intolerant habitats and the potential to increase pressure at the human-elephant

interface. Collared elephants using EWMA moved through all land use types and did not avoid settlements, although they moved through these at higher speeds, reflecting perception of risk. Elephants travelled slightly more slowly in farmland, likely reflecting the availability of foraging opportunities. Our analysis shows that human-induced LULC changes and the encroachment into elephant habitats have resulted in spatially and temporally predictable increases in HEC in EWMA, driven by the proximity of farmlands and protected areas (PAs), so that incompatible land uses are the principal drivers of damage to human livelihoods and increased risks to Tanzanian (and Kenyan) natural capital. Communities in Enduimet urgently need support to increase the effective distance between their farming activities and the PAs. Village-level crop protection and small-scale land-use planning around PAs are important first steps to halt an escalating conflict situation but need to be supported with longer-range strategies that separate incompatible land-use types and encourage the cultivation of alternative crops and livelihood diversification.

Keywords: Conflicts, Elephant, Enduimet, People, Wildlife Management Area Human

Contributions of Wildlife-Based Tourism to Conservation and Livelihoods: A Case of Wildlife Management Areas in Northern Tanzania

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Abstract

The primary goal of Wildlife-based tourism (WBT) is to generate economic benefits for conservation agencies and local communities. The supposed benefits of this initiative include providing funds for conservation activities such as supporting anti-poaching patrols and creating job opportunities for the local communities living near wildlife areas. However, information on whether or not local communities perceive any benefits from WBT is scant. This knowledge gap has limited our understanding of how local communities, especially those living alongside wildlife areas, perceive the contribution of WBT to their livelihoods and conservation efforts. Understanding local perspectives is critical when making

decisions around contentious issues such as trophy hunting, which are subject to highly contentious international debates. Using wildlife management areas in northern Tanzania as a case study, this research uses interviews and questionnaire surveys to explore local perceptions of consumptive (i.e., trophy hunting) and non-consumptive (i.e., photographic) tourism to local livelihoods and conservation efforts. This research study will enable us to contribute information on local perspectives about wildlife-based tourism so policymakers can make informed decisions about wildlife conservation.

Keywords: Wildlife-Based Tourism; trophy hunting, Conservation, livelihoods

Reducing Vulnerability to Multiple Shocks Through Tourism Destinations Development in Gateway Communities of Northern Tanzania

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Abstract

There is a proposition that tourism diversify livelihood to residents and in turn, helps in reducing vulnerability. However, there is unclear understanding on extent of reduction in vulnerability to multiple shocks through the course of development of tourism destinations, especially to agro-pastoralists enduring low productivity due to semi-aridity and Savannah grass-lands of northern Tanzania. This study makes contribution to the body of knowledge by evaluating impacts of tourism development on households' wealth-trajectories capable to address livelihood vulnerability to shocks among residents in three gateway tourism

destination communities: Loliondo, lake Natron and Burunge. A cost-effective impact evaluation based on residents' definition of wealth was embedded in the participatory wealth-ranking as part of the multi-method approach involving in-depth interview, focus group discussions and survey among 416 tourism beneficiaries and 425 non-beneficiary households, to collect data on livelihood shocks, coping mechanisms and changes in household's wealth from year 2008/9 to 2018/19. It was found that, tourism has significantly raised the wealth status from normal to rich among tourism benefiting households than non-

benefiting, thus, enabled them to reduce vulnerability to drought, livestock diseases, rise in food prices and illness, by effective shock-coping activities. Recommendations for further reduction in vulnerability to multiple shocks is provided.

Keywords: Northern Tanzania, Multiple shocks, Tourism Development, Vulnerability, Wealth-trajectories

Agro-tourism: An alternative way of diversifying socio-economic development in Kilimanjaro Region.

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Abstract

Tourism is a fast-growing industry with great potentials for revamping economies particularly in developing countries. In Tanzania, despite impacts of COVID-19 still tourism contributes about 6% national GDP and employs not less than two million people. Kilimanjaro region is part of Tanzania's Northern Tourism Circuit, mostly known for its natural and cultural attractions. Agro tourism integrates agricultural and tourism activities facilitating pro poor tourism. For years coffee production has been a great source of income in Kilimanjaro Region. Agro tourism therefore provides a unique experience to visitors, allowing them to understand and being part of the process of coffee making. Despite its highest potentiality to the region's development little focus has been given to agro-tourism as an alternative form of tourism in Kilimanjaro region. Objectively,

this study aims at exploring best practices and approaches related to agro tourism worldwide and assessing the potentiality of establishing for the same in Kilimanjaro region. Methodologically, Different literatures were scrutinized and form bases for much of the study's discussions. By exploring successful approaches to Agro tourism from different regions, this study will offer valuable insight on how agro tourism (coffee tourism) has potentiality in contributing to the socio-economic development in Kilimanjaro region. The study will also provide a road map on the roles of the community and the government in promoting agro tourism and community based tourism initiatives in Kilimanjaro region.

Keywords: Agro tourism, Kilimanjaro region, socio-economic development

Plant species abundance and diversity in lake manyara-natron ecosystem, northern Tanzania

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Abstract

Human societies have for centuries impacted and altered the natural environments through different land use

practices. The study aimed to assess the importance of two protected areas (national park and game-controlled areas) on species

diversity and abundance in Lake Manyara – Natron ecosystem. The study employed nested plot techniques to collect the vegetation data. The results showed that a total of 177 plant species belonging to 39 families were recorded. The contribution of the vegetation life forms was classified as herbs (47.2%), grass (23.4%), shrubs (19.0%) and trees (10.4%). Mto wa Mbu Game Controlled Area (MTGCA) had slightly higher plant species diversity ($H'=2.94$) than Lake Manyara National Park (LMNP) ($H'=2.92$) as compared to Lake Natron Game Controlled Area (LNGCA) ($H'=2.68$). Furthermore, LMNP

had higher shrub species richness per plot ($n=19$) than the MTGCA ($n=16$) and LNGCA ($n=9$). Overall, the MTGCA had more trees ($n=13$) and herbs ($n=42$) species in terms of species richness than the other protected areas. Therefore, the study findings suggest and recommend for an urgent need to increase conservation efforts on decline of woody vegetation and spread of herbs.

Keywords: abundance, conservation, diversity, game-controlled area, national park

The status of biomass briquettes production and use in Tanzania: *baseline survey*

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Abstract

Promoting the use of biomass briquettes is believed to enhance the removal of invasive plant species and reduce dependence on forests for charcoal production. However, little is known about the state of the briquette sector in Tanzania.

It is within that context that the Ministry of Natural Resources and Tourism requested the Tanzania Wildlife Research Institute (TAWIRI) to conduct a country-wide baseline survey to determine the current status of the briquette sector and identify key challenges underpinning its slow adoption across the country.

This study was systematically conducted in 16 sampled regions of Tanzania's main land, namely: Arusha, Kilimanjaro, Dar es Salaam, Pwani, Lindi, Mtwara, Ruvuma, Iringa, Njombe, Singida, Shinyanga, Tabora, Mwanza, Geita, Kigoma and Kagera. The knowledge presented in this report was gained through focus group

discussions, key informant interviews, and field visits.

It was found that the briquette value chain in Tanzania involves diverse stakeholders with different levels of experience and capabilities. About 90% of the sector's contribution comes from smallholder producers, who are facing a multitude of challenges compared to the available opportunities. Notably, an unreliable market for briquettes, poor production technologies, the underdevelopment of clean energy sectors, and a lack of clear political support were the major constraints. Yet, plenty of opportunities to upscale the sector were observed. These include the existing high demand for domestic energy, the abundance and diversity of raw materials, the availability of labor, and the growing national interest in the use of renewable energy. Overall, our results underline the importance of a multi-sectoral approach in promoting the production and

use of briquette technology as the leading alternative source of domestic energy. We also emphasize the exploitation of biomass resources from protected areas, especially invasive plants and forest wastes, as it could improve the economic value of the forest products value chain. Finally, we highlight the importance of this baseline survey, as

it can either be the basis for future detailed studies or a powerful decision tool among conservation authorities, entrepreneurs, and donors.

Keywords: biodiversity, domestic energy, deforestation, community, charcoal

The flora resources of mikumi national park: an insight for strategic management of protected areas in Tanzania.

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Abstract

Mikumi National Park (MINAPA) offers wildlife experiences of significant historical and ecological importance. Nevertheless, the botanical and habitat composition of MINAPA has not been updated and therefore not well understood. It limits the implementation of feasible management techniques, research works and tourism options. We accomplished a review and compilation of vegetation resources mainly species records from previously unpublished surveys as well as the most recent in 2021. It provides updated plant names using the classification of the Angiosperm Phylogeny Group for the orders and families of flowering plants. We compiled a total of ca. 950 species records, which are within 504 genera and 124 families, of which 33 species were of conservation concern in the IUCN red list. Of all records, a total of ca. 777 species records were from the previous

surveys. Twelve (~1.5%) records were of conservation concern. The most recent survey conducted in 2021 has added new species records that were not previously listed for MINAPA, a total of 173 (22.3%) species, which were in 148 genera and 58 families. Of the new records, twenty one species (12%) are listed in the IUCN red list. Overall, this work draws concern for ensuring regular vegetation surveys to enhance knowledge, and awareness on the floral database of protected areas which are largely of the old Taxonomic nomenclature. It contributed to the improvement of management techniques and scientific research.

Keywords: Botanical surveys, floristic composition, habitat conservation, IUCN Red Listed plants, plant species records.

The contribution of plant nurseries to city biodiversity: a case study from dar es salaam city

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Abstract

Globally plant nurseries have been good contributors of city biodiversity conservation. Though this information is vital to biodiversity conservation globally but currently it's unavailable in Dar es Salaam city in Tanzania. Therefore, this study was conducted to assess the contribution of plant nurseries to species, genetic, and ecosystem diversity in the fast-growing commercial city of Dar es Salaam. Both qualitative and quantitative approaches were employed across 50 plant nurseries from 5 municipalities in Dar es Salaam. The study sample size was 121 respondents (Nursery Owners and Attendants) based on nursery ownership, age, gender, and education level. Data collection included field observations, structured and unstructured interviews, and questionnaires. The study used descriptive and inferential statistics for analysis and included ANOVA tests, while species diversity was measured using the Shannon-Weiner Index. Results showed that five types of nurseries exist in the study area, comprising those for fruits, vegetables, ornamentals, tree nurseries, and mixed nurseries. Species diversity

was as high as 4.91 for 166,100 trees, based on 77 species from 42 genera of 23 families. There was 1 IUCN's Critically Endangered Species (*Metroxylon vitiense* (CR) found in the sample, making this area important for Urban Biodiversity conservation. Key influencing factors for the distribution of plant nurseries in the city were environmental, economic, and socio-cultural. The environmental factors included suitable soils, access to sources of water, types, and sizes of nurseries, use of fertilizers, and plant boosters. The study found five different roles plant nurseries play in Dar-es-Salaam city. These roles included productive functions (food and shade, timber, and fuelwood energy), regulatory (mainly water, carbon, and oxygen cycles), ecological (habitat heterogeneity, connectivity), social-cultural (aesthetic, ornamental), also for education, and research, and negatively likely to increase the presence of invasive species that need to be avoided.

Keywords: City biodiversity; environmental; economical, socio-cultural factors



Liana proliferation threatens Chimpanzee (*Pan troglodytes schweinfurthii*) food trees abundance in Gombe National Park, Tanzania

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Abstract

Lianas infestation in tropical forests can significantly impact the basal area of removed trees, lianas compete with trees for resources and space, causing death of trees. Although lianas are essential to chimpanzees as food, lianas presence in chimpanzee habitats can negatively distress the availability and accessibility of tree food resources, can inhibit tree growth and fruiting capacity of a tree thus reduced food resource availability to chimpanzees. However, little is known on the impacts of lianas to chimpanzee food trees abundance in Gombe National Park. Chimpanzee food trees decline can influence changes in their long-term conservation. To investigate the impact of liana infestation on chimpanzee food trees in Gombe national park, we conducted a study using high-resolution satellite imagery to identify liana-infested areas. We established 50 random grids each with 1ha size: Kasekela = 30, Mitumba = 20 within liana range, collected data on affected, unaffected, and killed chimpanzee

food trees species, their names and DBH as well as their associated lianas in each plot. In both Kasekela and Mitumba, *Landolphia lucida* was the dominant killer liana species. Mitumba had a higher liana individuals/ha than Kasekela. Killed and affected chimpanzee food trees were generally larger in mean DBH than unaffected chimpanzee food trees. The regeneration potential of chimpanzee food trees was significantly lower than lianas. Liana infestation poses a significant threat to chimpanzee food trees in Gombe National Park. Our study suggest that larger chimpanzee food trees are prone to liana infestations and death. Targeted liana control or removal is necessary to preserve chimpanzee food trees that provide larger food patches for chimpanzees to ensure long term conservation.

Keywords: Chimpanzee food trees, Gombe national park, lianas, liana infestation, tree basal area

Identifying key drivers of sugarcane yield using a global dataset

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Abstract

The Sugar Board of Tanzania have set an annual production target of 760,000 tons of sugar by 2025 to end the national sugar deficit, and the Tanzanian sugar industry have set ambitious targets to reach these

targets. Kilombero Sugar Company, one sugar producers, aim to increase production from 127,000 tons to 271,000 tons per annum, and are constructing a new mill to increase crushing capacity.

Yet, competing land uses inhibit horizontal expansion of agriculture to increase output. Understanding the importance genotype, environmental factors, and management actions in determining yield, especially in a changing climate, will facilitate priority actions that promote increasing yields whilst safeguarding ecosystem health. We utilise a large dataset consisting of Tanzanian commercial data in the tropical savannah climate class, as well as global literature yield data to determine how sugarcane yield varies across bioclimate regions and the relative importance of soil, climate and management variables in predicting yield within each region. We found that tropical monsoon climates had a higher yield than arid desert, temperate dry winter and tropical savannah (Tanzanian) climates. In the global dataset, precipitation-related variables had a largest effect on yield relative to other soil and

climate predictors, however, the best model only accounted for 19% of yield variation. There was much greater uncertainty in the regional subset results, and the models did not fit well to the data. The large variation in yield for plots with similar climate and soil data indicates that the management variables are of greater importance relative to genotype and the environment. However, for the regional subsets that did include management variables, the models performed poorly. There is need to reproduce the analysis with a larger dataset that is more equally balanced among the bioclimate classes and considers a wider range of management variables than were available here.

Keywords: climate change, crop models, mixed-effects models, sugarcane, yield gaps

Livestock movements and rangeland conditions in the pastoral communities of the Amboseli-Kilimanjaro ecosystem

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Abstract

In northern Tanzania rangeland degradation is increasing, effective management strategies are crucial to maintain healthy pastureland for livestock and wildlife. Pastoral mobility promotes rangeland sustainability by distributing the grazing pressure throughout the landscape. However, reduced mobility through increasing anthropogenic pressure, land use changes and degraded pastures lead to increased pressure at local landscape level. Mapping livestock movements through GPS collars is still a relatively novel practice in Tanzania. This study aims at understanding the effect of livestock movements on vegetation cover together with the movement decision taken by

herders. From Nov 2019 – March 2020, seven cattle, five goats and four sheep were equipped with GPS-collars, with a GPS interval of 3min, to track their daily movements in the rangelands of Sinya ward in Enduimet Wildlife Management Area, Amboseli-Kilimanjaro Ecosystem, Tanzania. Furthermore, we assessed the vegetation in the different grazing categories in the study area in Feb 2020, sampling 5 (1m x 1m) plots along 3 (200m) long parallel transects. Google Earth Engine (GEE) was used to study the development of the Normalized Difference Vegetation Index (NDVI) over the same period of 5 months and to calculate the density of human settlements (bomas) in

the study area. Our preliminary results suggest that there is a strong correlation between: 1) daily walking distance and grass cover, 2) time spent by livestock in an area and rangeland conditions; 3) faster movements and earlier morning departures with increasing dryness and increased bare ground. Understanding the movement of livestock in relation to vegetation parameters are relevant for understanding

current rangeland management practices in this ecosystem and will help to develop usable decision-making tools for sustainable grazing practices by local communities.

Keywords: GPS livestock tracking, Maasai pastoralists, northern Tanzania, spatial rangeland utilization, vegetation assessment

Water quality assessment of lukosi river catchment using selected physico-chemical parameters as indicator. The case study of kilolo district in iringa, Tanzania.

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Abstract

Lukosi River Catchment is a freshwater river and among of major rivers contributing to the Great Ruaha River which is considered the most important river system of the country economy and ecological backbone. However, currently its health condition is unknown for the conservation benefits of species that depend on this catchment for their survival. The present study aimed to assess the health condition of Lukosi River Catchment by using selected water parameters as indicator. Three sampling sites namely, Mahenge, Mtandika "A" and Ruaha Mbuyuni were selected from different parts of the Lukosi River Catchment. Water samples were taken and placed in dark bottle, kept in ice box to prevent any change in chemical properties of samples prior to transportation to the laboratory for further analyses. One sample t test was used to analyze the laboratory results. The study indicated that the mean value of studied parameters were, pH; 8.67 ± 0.57 mgL⁻¹, Temperature; 24.803

± 1.361 , EC; 93.30 ± 3.34 mgL⁻¹, BOD; 9.667 ± 2.905 mgL⁻¹, TDS; 46.95 ± 1.55 mgL⁻¹, Hardness 27.53 ± 1.28 mgL⁻¹, DO; 9.22 ± 1.187 mgL⁻¹, Turbidity; 109.83 ± 40.99 mgL⁻¹, NO₂; 0.018 ± 0.018 mgL⁻¹, Cu; 0.733 ± 0.041 mgL⁻¹, Ca; 7.88 ± 0.356 mgL⁻¹, Ni; 0.0153 ± 0.0125 mgL⁻¹ and Zn; 0.143 ± 0.11 mgL⁻¹. Some of these parameters, such as pH, Turbidity, DO and BOD exceeded the allowable limits set by TBS and WHO for water quality. Additionally, heavy metal such as Ni, Ca, Zn, and Cu, were found to be higher than the standard values set by WHO. These findings indicate that water of the Lukosi River is polluted and necessitates continuous monitoring of its quality along with the implementation of protective measures to reduce pollution levels to meet those set in the aforementioned standards.

Keywords: Kilolo District, Lukosi river catchment, physico-chemical parameters, water quality assessment

Water resources and wetland conservation in Tanga, Tanzania

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Abstract

Water resources and wetland conservation are critical components of sustainable environmental management, particularly in regions like Tanga, Tanzania. This is due to the fact that these natural ecosystems and local communities heavily depend on these valuable resources. Tanga, located in the northeastern part of Tanzania, is endowed with a diverse range of water resources that play a crucial role in supporting various ecological processes and sustaining local livelihoods. Nonetheless, over the years, these resources have faced significant threats due to urbanization, industrialization, and agricultural expansion. Climate change-induced impacts, such as erratic rainfall patterns and rising temperatures, further aggravate the challenges faced by water resources and wetlands in the region. In recent years, there has been a growing recognition of the importance of preserving water resources and wetlands in Tanga for both ecological and socio-economic reasons. Wetlands, in particular, provide numerous ecosystem services, such as water purification and habitat for a diverse array of plant and animal species, including migratory birds. Additionally, they serve as a crucial source

of water for domestic, agricultural, and industrial purposes, supporting the region's development and economic activities. There are some initiatives that have been implemented to address the threats faced by water resource and wetlands. Such efforts include the establishment of protected areas, sustainable land-use planning, community-based conservation projects, and the integration of traditional knowledge with modern conservation strategies. Despite the progress made in conservation endeavors, challenges persist and the need for further research on the ecological dynamics of water resources and wetlands. Therefore, there should be an emphasize on the importance of continued commitment from all stakeholders to sustainably manage and protect these invaluable ecosystems for the benefit of current and future generations. By implementing robust conservation measures, it is possible to safeguard these vital ecosystems and ensure a harmonious coexistence between human activities and nature in the region.

Keywords; Conservation, Ecosystems, Sustainability, Water resource. Wetlands.

Grey crowned-crane (*balearica regulorum*) monitoring in kagera wetlands, Tanzania

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Abstract

Grey Crowned Cranes (*Balearica regulorum*) are threatened by habitat loss and fragmentation, the illegal removal of birds and eggs from the wild. In Tanzania,

the population and distribution ranges of the species are better known in protected areas other than in non-protected areas. So, in recognition of the necessity to understand

their population and distribution range, we conducted species monitoring in the Kagera wetlands in Northwestern Tanzania from June 2022 to May 2023. The monitoring work was largely done by the trained community conservation champions with technical support from Leonidas Momburi (Project Officer). Data were collected from ten sites in two districts (Karagwe and Kyerwa) of Kagera region where 23 nests were identified and coded in 12 different localities. The total number of dead chicks (29) was higher than the total number of

live chicks (21). The cranes face many threats at juvenile stage growth thus making the fatality rate to be higher. This is mainly caused by predation risks from raptors and carnivores, grazing disturbance that results in cattle stepping on chicks, flooding that draws away nests and chicks sometimes, collection of chicks by children, and too much cold weather.

Keywords: Grey crowned crane, habitat use, Kagera wetlands

Diversity and distribution of mammals and occurrence of illegal incursion of humans in protected areas: A case study of Burigi-Ibanda-Rumanyika National Parks

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Abstract

Understanding mammal's species present in a certain protected areas have both social, ecological and economic importance. Burigi-Chato (BCNP), Ibanda-Kyerwa (IKNP) and Rumanyika-Karagwe (RKNP) in North western Tanzania are newly National Parks. Information about mammal species present, diversity and distribution are lacking. Further, upgrading to national park is due to intention of reducing human incursion and poaching in the areas. Therefore, detailed information about magnitude of poaching in the area is necessary to be available for management purposes. This study aimed to document mammal species presents in the area, diversity, distribution and illegal incursion of humans. The study used 50 camera traps, totaling 2923 active trap nights deployed in the field from October 2021 to early February 2022. Dry season data ranged from October to December, while the wet season data ranged from December to early February. The study recorded a total of 37 mammal species where 34 were detected in BCNP, 12 in IKNP and 7 in RKNP. The mammal's diversity in three parks varied

significantly, and BCNP observed to have higher diversity than RKNP and IKNP, while IKNP observed to have significant higher diversity of mammals than RKNP. The abundance of mammals between these three parks did not vary, although IKNP had higher abundance than other parks, and RKNP had lowest mammal abundance. This study reveals presence of significant spatial and temporal variation of illegal human incursions between three protected areas investigated (ANOVA, $p < 0.05$). There is higher detection of illegal human incursions in the morning and evening hours in BCNP and RKNP, while in the IKNP illegal human incursion was high in the afternoon hours. This result dictates the need of using different hours of the day when performing anti-poaching activities between these three parks in order to increase chance of capturing poachers or reducing poaching incidences.

Keywords: mammals, diversity, abundance, distribution, illegal human incursions Scrutinized

Assessment of the abundance and distribution of ticks of the genus (amblyomma) in tortoise. “a case study of vilima vitatu village and Meserani snake park Arusha-Babati, Tanzania”

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Abstract

Ticks of the genus *Amblyomma* are known to act as ectoparasites and vectors for a variety of pathogenic diseases which results to severe health problems in their hosts worldwide. In Tanzania, there is insufficient information about the abundance and distribution of ticks of the genus *Amblyomma* in tortoises. This study aimed to assess the abundance and distribution of ticks of the genus *Amblyomma* in different species of tortoises found in Tanzania, hence samples were collected from Vilima Vitatu Village and Meserani Snake Park in Tanzania through active searching (scanning) and capture-mark-release method. Ticks collected from tortoise species were morphologically identified as *Amblyomma gemma* and *Amblyomma nuttalli*. The finding of this study reveals that ticks were more abundant

and more distributed in Leopard tortoises compared to other species such as Pancake tortoises and Hinge-back tortoises by the probability value of 0.0001 ($P=0.001$) and this was caused by factors such as large body size and wrinkles in the skin of Leopard tortoises. This study suggests that, tortoises-ticks relationship in the wild and in captivity areas should be intervened by the wildlife ecologist and curators as the tortoises are important in ecosystem functions such as seed dispersal and refuge in the form of burrows. This intervention will provide resource availability, improve reproduction, maintenance of the ecosystem, diseases control and improve visitor satisfaction.

Keywords: Abundance, amblyomma, distribution, ticks, tortoises.

Mapping Potential Areas for Avitourism in Ruaha National Park, Tanzania: Key Updates for Biodiversity Conservation and Tourism Diversification.

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Abstract

Avifauna form a significant component in terrestrial and aquatic ecosystems and they have socio-economic and conservation benefits. However, information to ascertain their importance in terms of diversity, richness and abundance for conservation and for avitourism in the park are scarce. This study therefore attempted to determine

the current species richness, diversity and abundance in different zones and habitats, also intends to describe the distribution of bird species of conservation importance especially the endemic, rare and threatened species and to map hotspot areas with key avifauna potential attractions for avitourism in the park. A total of 428 bird

species comprising of 45,194 individuals from 28 orders and 91 families were recorded. The southern zone had the highest species richness 394 (176.17 ± 34.41), abundance (1461.50 ± 625.80) and diversity ($H' = 4.44 \pm 0.19$), northern has the least abundance with 141 (58.00 ± 25.23) species. The species richness differed significantly across zones ($F = 5.38$, $df = 5$, $P = 0.0045$). Habitats-wise, shrubland had the highest mean number of species (112.0 ± 16.23) and diversity ($H' = 4.11 \pm 0.25$). However, the differences were not significantly across habitat types ($F = 0.628$, $df = 5$, $P = 0.7060$). The highest abundance was recorded in *Vachellia* woodland (933.0 ± 860.63) but the abundance differences did not differ across habitat types ($F = 0.49$, $df = 5$, $P = 0.807$).

The variety of habitats requirements in shrubland contributed to overall richness and diversity. Hotspot areas for avitourism were observed at central zone where there is good number of permanent roads. Therefore, future management plan should consider improving road network which will facilitate to access refuge habitats for continued survey of birds in Ruaha ecosystem. Further study is necessary in wet season in order to have comparison information that will assist in conservation of birds and avitourism planning in Ruaha National Park.

Keywords: Avifauna, Avitourism, Mapping, Ruaha National Park,

Spatio–Temporal Water Quality Determines Algal Bloom Occurrence and Possibly Lesser Flamingo (*Phoeniconaias minor*) Presence in Momella Lakes, Tanzania

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Abstract

Eutrophication and algal blooms have sparked worldwide concern because of their widespread effects on water-dependent species. Harmful algal blooms can cause fatal effects to lesser flamingos (*Phoeniconaias minor*), obligatory filter feeders and vital bio-indicators in soda lakes. Thus, early detection of algal blooms and potential indicators in water quality is critical, but general tools are lacking in eastern African soda lakes. We monitored algal biomass changes and related water physico–chemical variables for 12 consecutive months in the Big Momella and Rishatani lakes in northern Tanzania. We used chlorophyll-*a* to measure algal biomass and quantified water physico–

chemical variables that might influence algae growth. We also monitored lesser flamingo numbers to understand trends throughout the year and according to the occurrence of algal bloom. Algal biomass was strongly related to water nitrogen ($r = 0.867$; $p < 0.001$) and phosphorus ($r = 0.832$; $p < 0.001$). Monthly patterns showed significant differences in water quality and algal biomass ($F = 277$, $p < 0.001$) but not across sampling sites ($F = 0.029$, $p = 0.971$). Lesser flamingo numbers seemed to be related to algal biomass at Lake Big Momella ($r = 0.828$; $p < 0.001$) and shortly after algal biomass peaked high (i.e., March and April 2021), flamingo numbers declined. Lake Rishatani showed

similar patterns. Our findings can provide a basis towards understanding the factors contributing to temporal changes in lesser flamingo abundance due to spatio-temporal water quality variations, which is important

for optimising conservation efforts for the species in these unique Momella lakes.

Keywords: algal biomass; bio-indicators; eutrophication; nutrients; soda lakes;

Preliminary results on abundance, detectability and chicks mortality of the Endangered secretarybird (*Sagittarius serpentarius*) in the Serengeti National Park

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Abstract

The secretarybird is a raptor species widespread in savannas of Sub-Saharan Africa. Despite its conservation status, information about this bird in East Africa is poor. The 'Serengeti Secretarybird Project' aims to widen knowledge about its demography and ecology in Serengeti ecosystem. Serengeti National Park (SNP) has been selected as primary study area because it could be a source site for secretarybird across Tanzania. To count individuals and identify the factors affecting their detectability before the breeding season, we repeated twice 52 transects (length: $\bar{x}=15.3\pm 1.8$ km). Nests search was performed by covering all the roads nearby the transects with more observations. Each nest was monitored once a month. Preliminary results show that highest occurrences are recorded in southern (KI =0.13; 95%CI =0.07-0.18) and central SNP (KI =0.11; 95%CI =0.04-0.16) compared to north and west (KI =0.05; 95%CI =-0.01-0.11). Secretarybirds are more often detected during the morning, mainly in closed treed grasslands bordered by open woodlands, characterised by a low environmental heterogeneity. The probability to spot single individuals in

heterogeneous habitats is higher than pairs, which are more easily detected in wider plains, late in the morning and in the southern sector. Among the 20 nests identified, 16 are located in the central, 3 in the southern and 1 in the northern SNP. The tree species most used to build the nests are *Balanites aegyptiaca* ($n=11$, 55%) and *Vachellia tortilis* ($n=8$, 40%), ranging from 5 to 7 meters in height ($n=16$, 84.2%). The detected brood size is most often 1. From laying to hatching the entire brood was lost in 5% of cases, while in 45% during the first month of life. No mortality was recorded after the first month until fledging. These results provide the basis for an Action Plan specific to secretarybird in the Serengeti ecosystem.



Diversity of lizards in inhabited areas at Dodoma region Tanzania

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Abstract

Lizards are diverse group of reptile that are found in kingdom Animalia, phylum chordate, class reptile and order squamata, they are almost every part of the world including Dodoma region. Dodoma region is semi-arid and are growing city and have got different wildlife species including lizards. However the diversity and abundance of lizards in inhabited area of Dodoma region has less been studied. This study focus on understanding the diversity of lizards in inhabited areas at Dodoma region Tanzania. The study involve visual encounter survey under vigorous searching of 30 minutes, in three study site, namely UDOM, Makulu and Ng'ong'ona. There were 10 species of lizards which are; *Trachylepis varia*, *Agama lionotus*, *chondroda ctylus Bobronii*, *pendioplanis*

namaquens, *trachylepis planifrons*, *Hamidactylus mabouia*, *lygodactylus capensis*, *Agama armata*, *heliobolus spekis*, and *chameleon dilepis*. The common species was *Trachylepis varia* and *Agama lionotus*. While the rear species was, *pendioplanis namaquens*. Highest diversity was observed in Ng'ong'ona (Simpson index=0.69). While lowest diversity observed in UDOM (Simpson index=0.51). Regardless of Dodoma being a growing city yet it has potential for harbouring diverse species of Lizard. Conservation strategies for lizard should consider also the species which are found in inhabited areas.

Keywords: Lizards, Indicator species, Urban area, anthropogenic factors

Composition of dung beetle species in relation to habitat types and wild animal excreta in Msolwa sector area of Nyerere National Park, Tanzania

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Abstract

Knowledge of the composition of dung beetle species and their association with different habitat types and animal excreta is vital for understanding ecosystem functioning. Dung beetles play a significant -role in ecosystem processes, particularly in nutrient cycling. We surveyed dung beetle species in Nyerere National Park, Tanzania to determine how species composition varies across different habitat types and animal excreta. Traps and hand-picking methods were used to capture dung beetles from closed miombo woodland, open miombo woodland, riverine, and marshland habitat. Forty (40) baited plastic pitfall

traps of 2L were placed 50m apart on two linear transects. A total of 5534 individuals, representing 70 species of dung beetles belonging to 29 genera and 9 tribes were collected. Closed miombo woodland had the highest number of species (39), while the lowest number (22) were found in the Open Miombo Woodland. The high number of beetles recorded in closed miombo woodland is attributed to the prevalence of shade in closed miombo woodland which was higher compared to open woodland habitats during the dry season, as the area serves as a critical shelter for various animals, as opposed to their counterparts

in burnt open woodland habitats where the ground is notably exposed. Moreover, during the wet season closed Miombo woodland has a lower number of beetles because other habitats attract animals as influenced by openness and palatable grasses for feeding. In terms of animal excreta, an elephant has (42) species, buffalo (33), and hippopotamus (19). The study accomplishes that a diverse range of

habitats type and animal distribution play a significant role in determining dung beetle species composition, therefore it is critical to maintain habitat quality and animal population in order to ensure the long-term preservation and sustainable conservation of dung beetles in the ecosystem.

Keywords: Animal excreta, dung beetle, habitat type, species composition.

Assessment of density and spatial distribution of subterranean rodents in Kilimanjaro, Tanzania

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Abstract

Subterranean rodents are small mammals that live in burrows beneath the ground and play a vital role in maintaining ecosystem integrity although they are also potential pests in field crops. Despite their important role as ecosystem engineers, their *density and spatial distribution* are poorly documented. This study focused on the density and distribution of subterranean rodents and assessed the influence of environmental factors on their ecology in Kilimanjaro region, Tanzania. It included 156 sites that were divided into three ecological zones including highland (1100-1800 m.a.s.l), intermediate (900-1100 m.a.s.l), and lowland (below 900 m.a.s.l). Burrow systems were counted in 50m x 50m sampling plots, and their density calculated. The density of burrow systems between the habitat types, soil types and elevations was analyzed using a non-parametric test. A Generalized linear model was run to determine the influence of environmental factors, rainfall, temperature, soil types and elevation on the density of subterranean rodents. There was a significantly higher burrow system density in the highland than

lowland zone ($p < 0.05$). The burrow system density varied significantly ($p < 0.05$) between habitats where in cropland it was significantly higher than in woodland ($p < 0.0001$). However, there was no significant difference in burrow system density between woodland and natural forest ($p = 1.00$). Moreover, burrow system density varied significantly between different soil types ($p = 0.01$). The study found that, burrow system density was significantly and positively correlated with rainfall ($r = 0.45$, $p < 0.001$). However, there was a significant and negative correlation between burrow system density and temperature ($r = -0.28$, $p = 0.07$). Subterranean rodents were found to be distributed in all the ecological zones with the highest density in highland agro-ecosystems around the slopes of Mt. Kilimanjaro. Ecologically based management of subterranean rodents is recommended in highland agro-ecosystems.

Keywords: Density, distribution, Kilimanjaro, Subterranean-rodents

Diversity of large mammals as potential tourism attraction in the Nyerere National Park, Southern Tanzania

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Abstract

Protected areas in Tanzania are important sites for both biodiversity conservation and tourism development. Therefore, an understanding of large mammals' composition and distribution is important. This study aimed at establishing species richness, diversity and distribution of large mammals in Nyerere National Park (NNP). Purposive sampling techniques were deployed using vehicle and ground walking transects. Both direct and indirect observation methods were used. This paper hypothesized differences in observation methods; equal habitat preferences; and, mammal diversity is the same in the park. Results revealed 34 mammal species belonging to 8 orders and 17 families. Artiodactyl was the most recorded order (n = 18, 52.9%), followed by Carnivora (n = 8, 23.5%). Bovidae and Felidae were the most recorded families (n = 14, 41.2%) and (n = 3, 8.8%) respectively. Moreover, elephants (n = 252, 16.6%), buffalo (n = 161, 10.6%), giraffes (n = 157, 10.3%) and zebra (n = 150) were the

most frequently recorded species. A Few carnivore species (African lion, Leopard, black-backed jackal and Spotted hyena) were observed. Woodland was the most preferred habitat (86.8%). Most mammal species were observed in the northern zone (n = 940) than in the southern zone (n = 574). However, the southern zone had the highest species diversity $H' = 2.74$ than the northern zone $H' = 2.68$. The indirect method produced a significantly higher detection rate of species than the direct method, indicating that many species are missed by tourists during game viewing in vehicles. Overall, this study justifies that NNP supports a significant population of larger mammals that is useful in promoting nature-based tourism in the area. Therefore, we recommend the park management to ensure reliable road networks and other relevant infrastructure to meet tourist demand and satisfaction.

Keywords: forest trees; species richness; diversity; distribution; national park;

Correlates of breeding activity of *Lophuromys stanleyi* in Mabira Central Forest Reserve, Uganda

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Abstract

Lophuromys stanleyi is a dominant rodent specie in Mabira central forest reserve, and quickly adapts to changes in the habitat. The study aimed at investigating the factors associated with the breeding activity of *L. stanleyi* in Mabira central forest reserve, one of the largest disturbed tropical high forest Uganda. We followed a Capture-Mark-Release procedure from September, 2018 to August, 2020. Clustered bar graphs were used to analyze the monthly breeding activity based on sex and habitat. To further analyze the correlates of the breeding activity of *L. stanleyi*, the binary logistic regression was employed. We established that breeding activity of *L. stanleyi* takes place throughout the year with striking population peaks in both the long wet season (September-December) and short wet season (March-May). September-November, breeding is relatively very high, December-January, it starts dropping, February-March; breeding is at its lowest. Towards the end of March, it starts rising again, April-May shoots-up, in June, it drops, July-August, it is at its lowest, and from September to November, it increases. Such a trend was observed throughout the trapping years, and are linked to rainfall

patterns. In months when rainfall was low with a short wet season, the breeding activity was low compared to months with high rainfall and long wet season. Breeding activity based on rodent sex and habitat type showed similar patterns. Besides, further analysis revealed that the breeding activity of *L. stanleyi* is significantly more likely to occur in the regenerating forest habitat compared to the intact forest habitat ($OR = 10.665, P = 0.000$) ($OR = 10.665, P = 0.000$). On the other hand, it is more likely to occur in the depleted forest habitat compared to the intact forest habitat, though not significant ($OR = 1.559, P = 0.239$) ($OR = 1.559, P = 0.239$). Though not significant, breeding activity of *L. stanleyi* is more likely to occur in habitats with many nest holes and longer wet seasons compared to those without nest holes and experience long dry seasons, respectively. Thus, for proper management of opportunistic and adaptive rodent species, focus should be on restoration of disturbed forest habitats.

Keywords: Lophuromys, dominant specie, Binary regression, Mabira forest

Distribution and Diversity of Wildlife and Livestock in the Mara Landscape in relation to settlements

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Abstract

The Mara-Serengeti landscape is known for its distinct biodiversity, high species densities and the harmonious coexistence of its indigenous people with nature for ~ 3,000 years. This long timespan for interactions between people, livestock, and wildlife has enabled the development of evolutionary relationships that are less likely to be replicated in systems that have only had such interactions over short timeframes [4]. This study thus sought

to describe and understand the interplay between native wildlife, livestock and people in co-evolved systems with a long evolutionary history. Data collection was conducted in four landscapes in the Mara: within the Mara reserve, Mara reserve-group ranch boundary, and within areas of low and high pastoral settlement densities. The study was diurnal and was carried out in 2005 and 2006 during the wet and dry seasons. Distance sampling was used to

identify multiple species populations and their locations from the bomas. Spatial and multiple covariate distance sampling were used to calculate estimates of animal density on each 1-km segment of the 7-km long transects for all the 42 pre-identified transects. While livestock numbers reduced as the distance from the bomas increased, zebra and wildebeest numbers remained constant and elephant numbers steadily increased. The results suggest that

human settlements affect the concentration of wildlife and their numbers. An in-depth analysis of the detection functions is recommended to identify the key variables that impact wildlife distribution and the specific policy interventions needed for biodiversity conservation to be achieved landscape.

Keywords: Human settlements, wildlife distribution, Livestock

Using hair hormonal analysis to gain insights into lion stress and reproductive physiology in the Ngorongoro Conservation Area

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Abstract

To increase human-carnivore coexistence, we need an increased understanding of anthropogenic impacts on wildlife physiology. Our goal was to determine if African lion (*Panthera leo*) hair hormonal analysis can be used as a biomarker for stress and reproductive physiological changes in the Ngorongoro Conservation Area. Our objectives were to determine if there were hair hormone concentration differences between 1) lions living inside and outside of the wildlife-exclusive Ngorongoro Crater, 2) lions in poor body condition compared to healthy lions, and 3) lion hair collected beside carcasses of livestock or of native prey. We opportunistically collected hair samples from 2011 to 2022 (n=140) from free-ranging lions living in the Ngorongoro Conservation Area. We processed the hair samples at the Nelson Mandela African Institution of Science and Technology in Arusha. We extracted the hormones using methanol, and analyzed corticosterone ("CC", Arbor Assays #K014) as a biomarker of stress and testosterone ("T", males only, Arbor Assays #K032) as a biomarker of

male reproductive function. We did not find a relationship for CC between lions living inside and outside of the Crater (W=1075, P=0.93); however, males living inside the Crater (mean: 16.5±2.4 ng/g) tended to have higher T (W=774, P=0.054) than males outside the Crater (mean: 11.9±0.8 ng/g). We found that individuals who were in poor condition (mean: 31.0±5.3 ng/g) had higher (W=280, P=0.024) CC concentrations compared to those who were considered healthy (mean: 19.9±1.1 ng/g). Finally, hair CC concentrations (overall mean: 18.4±3.0 ng/g) were similar (W=11, P=1) whether they were collected from livestock or native carcasses. Our initial findings indicate that lion hair hormone concentrations can demonstrate physiological changes, particularly for chronic stressors like poor body condition. We continue to evaluate this new dataset to learn more about the relationships between lions and their environment.

Keywords: Carnivores, coexistence, endocrinology, noninvasive, physiology

Postfire effects on ground beetles composition on the slopes of mount Kilimanjaro

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Abstract

Globally fire is a key natural and anthropogenic factor in the ecosystem and an important conservation tool in protected areas. Fire outbreaks can be caused by natural causes such as lightning and human influence such as prescribed burning. Ground beetles are the most diverse and abundant group in the ecosystem with 40,000 known species worldwide. They are very sensitive to environmental changes that occur in the ecosystem and are good bioindicators. Mountains are key features of the earth's surface and biodiversity hotspots maintaining high diversity of plants and insects. Recently Mount Kilimanjaro have been faced fire outbreak in the year 2020 in Heather-moorland zone. Therefore, this ongoing study aims to assess ground beetles' composition in the fire has occurred on the slopes of the Mount

Kilimanjaro. The specific objective of this study is to assess ground beetles' abundance on burnt site and unburnt site on the three years of fire outbreak 2020. Pitfall traps will be deployed in each site to sample ground active invertebrates. The pitfall trap is the best method for the collection of ground-dwelling invertebrates, a cost-effective and efficient passive sampling method. In each site (burnt and unburnt) 16 pitfall grids (5m by 5m) will be established. Wet pitfall traps will be filled with water, salt and soap mixture to retain and kill captures during collection. Data collection will be done in after 5 days. Specimen capture will be preserved in 70% ethanol and taken to laboratory for subsequent proceedings. Preliminary results will be presented.

Keywords: Ground beetle, Fire, Mountain.

Avian Taxonomic and Functional Diversity in Contrasting Habitats: A Comparative Study of Urban and Remote Forests in Arusha, Tanzania

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Abstract

Urbanization has emerged as a prominent threat to biodiversity, with forested ecosystems being particularly susceptible to habitat loss and fragmentation. Understanding the impact of urban development on avian diversity and ecological functions is essential for effective conservation and management. In this study, we conducted a comparative analysis of avian taxonomic and functional diversity between an urban forest, Themis Forest, and a remote forest, Lake Duluti

Forest, both located in Arusha, Tanzania. Data collection was conducted using the point count method at selected sampling points. Functional traits of avian species were analysed to gain insights into their ecological roles within each habitat. Taxonomic diversity was evaluated using species richness, evenness, and Simpson's diversity index to assess the variety and distribution of avian species. Functional richness, evenness, and divergence were utilized to assess the ecological roles and

interactions of avian communities in the distinct habitats, allowing us to explore variations in the functional traits and ecological functions. Our findings indicated significant differences in both taxonomic and functional diversity between Themí Forest and Duluti Forest. Themí Forest, being an urban habitat, exhibited lower taxonomic diversity compared to the remote Duluti Forest, suggesting potential impacts of urbanization on avian species richness. In contrast, the remote forest displayed higher functional diversity, indicating a greater variety of ecological roles performed by avian communities. Further analysis identified key avian species and functional traits driving the dissimilarity between habitats. Urban areas harbored species with

urban and generalist traits, adapted to the human-altered environment. Themí Forest also supported forest-dependent species, highlighting its significance as potential refuges for certain species. These findings highlight the importance of strategic urban planning and conservation to protect avian biodiversity. Integrating green spaces and maintaining urban forests facilitate coexistence with native birds. Preserving remote forests, like Duluti Forest, sustains diverse avian species and ecosystem functions, ensuring a sustainable future for humans and wildlife.

Keywords: Avian, Diversity, Conservation, Forest, Urbanization

Assessment of the proposed important bird and biodiversity area – Makao Wildlife Management Area, Meatu district in Simiyu region, Tanzania

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Abstract

Tanzania has 20 years old with 80 Important Bird and Biodiversity Areas (IBAs) designated across its mainland and on the Zanzibar Islands. since 2002. Though the IBAs are present in Tanzania but the information of *birds poisoning* more specifically that of vultures in Makao WMA was lacking. We employed the timed species count method to collect the data in the area.. The results showed that a 159 species from 60 families were recorded during the study period. Among the recorded

species; two (2) are critically endangered, 3 are endangered, 1 is vulnerable, 1 is near-threatened, and 2 are endemic to Tanzania with potential stable populations in Makao WMA. Therefore, this study concludes that Makao area is qualifying to be upgraded to IBA. We recommend for upgrading the site to be the 81 Tanzania's IBAs for future birds conservation.

Keywords: Conservation, important bird and biodiversity area, Makao WMA

Distribution and abundance of migratory bird species and the status of illegal killing of birds in central Tanzania.

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Abstract

Illegal killings of birds (as a source of income and protein) have escalated across Africa, silently pushing some populations

toward extinction without our knowledge. In Central Tanzania, especially Kongwa and Mpwapwa Districts serve as habitats

for migratory bird species. White Stork, and Abdim's Stork are among many bird species that are being hunted, but information on the extent of IKB, its socio-economic drive, and its impact on the population of killed species remain unknown. This project aims to bridge these knowledge gaps and to provide baseline data on the current population status of Migratory bird species (including the White Stork, the flagship species) through population counts and distribution patterns, to provide new data to effectively address the conservation threats. These data will also contribute to updating the status and threats information of the migratory birds on the World Bird Database and possibly the IUCN Red List, including the White Stork as the flagship specie. The assessment study was conducted in Central Tanzania, specifically in Kongwa and Mpwapwa

Districts, observations at Kongwa and Mpwapwa districts confirmed that most killings are done using poisons and mist nets, unfortunately, target a wide range of birds, both migratory and residents bird species. Monitoring was conducted in 14 villages (7 villages in Mpwapwa), where a total count method was used in dams and open areas. Transects were also established near rivers and dams to collect the number of birds killed. During monitoring, 22 migratory bird species were observed, however, a total of 7,179 White Storks were observed in marshy areas, dams, protected areas, and cultivated land. The assessment indicates that a total of 1,000 birds are being killed per day (depending on the season). The assessment reveals that the main socio-economic drivers of IKB are the lack of alternative sources of income, lack of protein, and tradition.

Assessment of the abundance of Indian House Crows and other birds in Dodoma City

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Abstract

Indian House Crow (*Corvus splendens*) is a bird species native to the Indian subcontinent. It was introduced to Zanzibar in the 1880s to control organic wastes but a few decades later this exotic crow spread to mainland Tanzania, Kenya and many other parts of Africa causing major destruction of native fauna. Indian House Crows have now been recorded in fourteen Regions of mainland Tanzania, including Dodoma, but we lack systematic studies of their impact on native birds in the infested cities. Therefore, the current study was conducted to assess the correlation between the abundance of Indian House Crows and other birds in Dodoma City. Data were collected in May 2023 using the transect count method in which 12 transects each measuring 500m long and 40m wide were established in four wards namely, Makole,

Nkuhungu, Iyumbu and Ng'ong'ona. The number of Indian House Crows and other birds were recorded in the BirdLaser App while walking slowly (about 1km/hr) along the transect. R software was used to analyze the data by correlating the abundance of Indian House Crows and other birds. A total of 38 bird species were recorded, whereby the most abundant species were House Sparrows (20.38 birds per ha), Indian House Crows (8.559 birds per ha), Red-cheeked Cordonbleu (1.792 birds per ha) and Rock Pigeon (1.333 birds per ha). The results showed that there was an overall negative correlation between the abundance of Indian House Crows and the abundance of other birds, but House Sparrows had a positive correlation with Indian House Crows. Therefore, Indian House Crows have a negative effect on the

abundance of native birds in Dodoma city. We recommend controlling the population of Indian House Crows in Dodoma City in order to regain and maintain the ecological balance of the native bird population in the city.

Keywords: alien invasive species, Dodoma city, Indian House Crows, native birds, House Sparrow

Insect diversity in the wild flowering strips along arable fields.

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Abstract

Insects form an important component of the ecosystem due to the important roles they play and therefore their conservation is crucial. However, at present little is known about insect diversity in intensively managed agricultural landscapes. In this study, we aimed to assess insect diversity in flower strips along arable fields. These flower strips are expected to play an important role in pollination and biological control as they harbor different groups of insects including pollinators and natural enemies. In order to assess the diversity of different groups of insects supported by wildflower strips, combi traps were used as sampling methodology and optimal sampling protocols were suggested. The study was conducted in Belgium whereby two study sites with established wildflower strips were studied in Schriek and Hulshout. To assess the appropriateness of the sampling methodology used, traps were monitored for several weeks and at different

heights above the vegetation. To assess the optimal number of traps and optimal sampling period, rarefaction analyses were used. Univariate and multivariate analyses were used to assess the impact of trap height on insect diversity and community composition. Our results showed that wildflower strips harbored different groups of insects, including many beneficial insects such as pollinators, predators and parasitic wasps. Our results further showed that the observed number of insect families rapidly increased with an increasing number of traps, but this increase slowed down when >4 traps were used. Trap height also had a strong impact on the composition of insects observed. Overall, we conclude that flower strips harbor a wide diversity of insects and therefore represent an important tool to maintain or even increase insect diversity within intensively managed agricultural landscapes

Use of macroinvertebrates to assess the impacts of anthropogenic activities on Pinyinyi river around Lake Natron Ramsar site, Arusha Tanzania

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Abstract

Rivers are important for aquatic biodiversity such as bird and fish. However, anthropogenic activities such as agricultural activities and livestockkeeping degrade rivers and decrease their capacity to offer ecosystem services. This study used macroinvertebrates to assess the impact of anthropogenic activities on the Pinyinyi river during dry and wet season. Pinyinyi river pours its water into Lake Natron Ramsar Site. Abundance of macroinvertebrates, average score per taxon and Shannon Weiner Species Diversity Index was used to state the ecological status of Pinyinyi river. A macroinvertebrates hand net was used to collect the macroinvertebrates per sampling point. A total of 164 macroinvertebrates were collected. The most abundant taxa were mosquito larva, (41.07%) and aquatic caterpillar (23.21%) during dry season representing about 64.28% of the total macroinvertebrates whereas the least abundant taxa were dragon flies (19.64%) and pouch snail (16.07%) during dry season representing about 35.72% of the total macroinvertebrates. The

most abundant taxa collected during wet season were aquatic earthworm (19.44%), midges (17.59%), black flies (15.74%) and creeping water bugs (12.96%) whereas the least abundant were pigmy back swimmers (2.78%), snail (3.7%), predacious dividing beetle (4.63%) and coleopteran (4.63%). Average Score per taxon of Pinyinyi river during dry season was 5.25 and 3.6 during wet season. The Shannon Weiner Species Diversity Index was 1.318 during dry season and 2.138 during wet season. Based on the abundance, average score and diversity index indicate that Pinyinyi river is moderately polluted during dry season and seriously polluted during wet season. It was found that, agricultural activities, livestockkeeping, bathing and washing alter the quality of water. The study therefore, recommends that the source of pollutants should be controlled and the river regularly monitored by the relevant authorities.

Keywords: Anthropogenic activities, bioindicators, diversity, macroinvertebrates, s , wriver ater.

Women Participation in Forest and Wildlife Monitoring: The case of Village Forest Monitoring in Western Tanzania.

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Abstract

Community participation in forest and wildlife monitoring is increasingly recognized as an important aspect in natural resources management. However, women's participation in various community activities has been limited. The Jane Goodall Institute through USAID funding implemented a five-year project known as Landscape Conservation in Western Tanzania (LCWT). One of the Intermediate Results of the Project was Increasing Monitoring of chimpanzee and their habitat. This paper aims to share lessons

learned from engaging six female Village Forest Monitors (VFM) in monitoring of their own village forests and wildlife in Western Tanzania. The process involved sensitizing village councils for nominating the VFMs, then announcements were made in village centres and hamlets for villagers who wished to be VFMs to apply for the position. Applications were submitted to the Village Executive Officers and vetted by village councils. Then, three names per village were brought to the Village Assemblies for final nomination of best

candidates. The nominated candidates were offered opportunity to join Pasiansi Wildlife Training Institute in Mwanza for a three-months course then come back to their respective villages for beginning monitoring of their village forest reserves. Results: from December 2021 to June 2023, data contributed by the six nominated female VFMs include 8,214 data submissions to the ArcGIS Online server whereby effort GPS points count for 7,395 (90%), threats 584 (7.1%), chimp signs 12 (0.15%),

other wild animal signs 152 (0.2%), other information 71(0.86%). The contribution by female VFMs in monitoring of village forests, not only shows women are able to participate in forest monitoring, that they can contribute useful, relevant, up to date, and actionable data for informed decision making in NRM.

Keywords: Women, monitoring, forest, wildlife, chimpanzees

Avian species composition, distribution and abundance in selected habitat types in Lake Manyara National Park, Northern Tanzania

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Abstract

The habitat type and structural complexity are the major influences on avian species diversity and the inter-relationship between vegetation and avian population. Lake Manyara National Park comprises a large variety of habitats from the groundwater forest to acacia woodland as well as open savannah grassland which provides a home to an incredible array of over 380 bird life including pink Lesser flamingo (*Phoeniconaias minor*). However, little is known about the composition abundance and distribution of these birds' species in different habitat types of the LMNP. Here we report the findings from the study survey conducted twice during 2021 covering wet and dry seasons in aquatic, forest and woodland habitats of LMNP. The study aimed to document birds' species composition, distribution and abundance in selected habitat types. The point count method was employed to collect data. The results revealed a total of 171 identified birds' species belonging to 52 families and 17 orders. Species abundance of the

study area shows no significant difference between woodland and forest habitat ($z = 4.3182$, $p = 1.5729$) and between aquatic and woodland ($z = 5.8918$, $p = 3.8199$). However, there was a significant difference between aquatic and forest habitats ($z = 2.4254$, $p = 0.01529$). The majority of bird species were recorded in the woodland (61.05%) followed by forest (40.12%) and aquatic (22.09%). In the forest habitat, woodland and aquatic the most abundant species were the Silvery-cheeked hornbill (52), Green-backed Camaroptera (73) and Glossy Ibis (93) respectively. Based on the findings, it can be concluded that there is a highest abundance and diversity of avian species in woodland habitats followed by forest and least in aquatic habitats. More studies are required to establish a complete list of available bird species in the area.

Keywords: Birds, Habitat, Distribution, Diversity, Abundance, Lake Manyara National Park.

Impact of fires on foraging behaviors of chimpanzees in the Issa Valley, Tanzania: range and vegetation use

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Abstract

Chimpanzees (*Pan troglodytes*) that live in savanna habitats experience temporal and spatial habitat heterogeneity, including months of high aridity and extensive bushfires. Burning destroys vegetation, but also stimulates growth, catalyzes fruiting, and changes food properties. The impact of fires on chimpanzee feeding ecology is poorly understood however, limiting the effectiveness of conservation strategies in savanna areas, and models of early hominin behavior. Issa Valley is a savanna-mosaic habitat consisting of miombo woodland and riparian forests. During a six-month dry season (May-October) fires burn woodland vegetation. Issa chimpanzees forage more in woodland than forest vegetation during the dry season, but details of how they change their foraging behavior in response to fires are lacking. This study aims to better our understanding of the impact of fire on Issa chimpanzee foraging ecology by quantifying variation in vegetation use (during foraging) and food types over dry season months. We hypothesized that as the dry season progresses (and burnt areas

increase), Issa chimpanzees will increase (i) woodland foraging on re-growth after burning, and (ii) foraging area size, due to food sources being less restricted to riparian strips. Data were collected during half-day focal follows of adult individuals between June-October 2023. When an individual was observed feeding, food type, if the area was burnt, and GPS location were documented. We then created monthly foraging range maps to visualize range areas using QGIS, comparing these spatial outputs to frequency rates of foraging in burnt areas, food types consumed, and food availability. The results of this study will improve our understanding of the impact of fires on chimpanzee feeding ecology. This will give insights as to the importance of controlling fires in chimpanzee conservation strategic plans, as well as for models of the possible role of increased fire frequency in hominin evolution.

Keywords: chimpanzee, fire, foraging ecology, hominin evolution, savanna

The Impact of Composting Behavior Change Campaign for Saving Chimpanzees in Western Tanzania through the TACARE Model

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Abstract

Smallholder agriculture ranks as the prime threat to chimpanzees' habitat in Tanzania, followed by conversion of land to settlement and infrastructure, anthropogenic diseases, and many more other threats (CAP 2018-2023). In line to the prime threat, however, emerging debates on forest loss in Western

Tanzania are currently pivoted around rapid population growth exacerbated by high fertility rate (Kigoma with 17.2% and Katavi 34.4%) of teen pregnancy rate as compared to 22.7% of the national average (THDS 2022); and migration of people and livestock driven by climate

change. To respond to some of the threats affecting chimpanzees and their habitats in the Gombe Masito Ugalla Landscape, the Jane Goodall Institute, through the USAID-funded Landscape Conservation in Western Tanzania Project piloted a Social and Behavior Change Campaign, grounded on a composting program to support communities to improve soil fertility to boost food security and family incomes to help people understand the connection between the farm, soil and habitat conservation. Crucial to the success of agricultural projects under TACARE has been the participation of women, as they are the ones who care for the kids, farms, and households and are also seriously affected by the destruction of the environment (Kashula, 2022). The compost program is implemented using the Lake Tanganyika Catchment Reforestation and Education (TACARE) model to achieve its data-driven outcomes since 2020 to date. This paper explores how the Composting Social Behavior Change Campaign blended the TACARE approach (Engage, Listen, Understand, Facilitate and Step-back) to empower communities in Kigoma and Katavi regions to deepen their

knowledge and understanding of the JGI's community-led conservation approach to shape their perceptions and behaviors of sustainable use of land and forest resources to save the chimpanzees' communities. The father of TACARE admits that the TACARE approach intertwines LePSA methods of introducing project activities: Learner-centred (Le) training: Problem Solving (P); Self-discovery (S) and Action (A) (Strunden, 2022). The paper also pulls some interesting cases from individuals, power couples and communities positively impacted by the campaign to draw a learning curve of the behavioral change intervention for the conservation in Western Tanzania.

Keywords: Behavior, Change, Conservation, Chimpanzees, Composting



Assessment on the fire fighting skills of porters guides and rangers to wildfire suppression in Kilimanjaro national park

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Abstract

Wildfires have been a threat to the Protected areas and are also expected to be a serious threat in the future years as reported by the UNEP in the 2022 report that a global increase of extreme fires is expected to go up to 14% by 2030 and 30% by 2050. On the other side, Africa including Kilimanjaro National Park, community-based Fire Management has at least shown to be suitable for long term firefighting approach though still not working to the needed extent. This research got to assess the Fire Fighting Skills of the Major stakeholders used in KINAPA wildfire fighting.

Involving determining their awareness on KINAPA wildfire suppression, identifying the types of tools and equipment used and also the suppression tactics that they get to use. Data collection involved questionnaire and semi structured interview through Kobo tool box then analysed using SPSS and NVIVO windows software. The findings showed rangers to be the most aware group about wildfire suppression in KINAPA followed by Guides and lastly porters. The identified working tools mostly were Hoes, Pangas, Axes, Slashers and Flappers while for the identified safety

tools mostly were boots and firefighting clothes. Finally, the determined tactics used were, Fire line technique, Mopping up and water suppression technique. The research results show unmatching skills between Porters Guides and Rangers with respect to the awareness they have in

KINAPA wildfire suppression, tools and equipment used together with the Tactics applied. In future more efforts may be put towards improving the fire fighting skills of the KINAPA stakeholders especially for the porters who are know to be in large number in KINAPA and the least skilled.

New evidence of well digging in savanna chimpanzees (*Pan troglodytes schweinfurthii*): Kahensa, Tanzania

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Abstract

Surface water can be scarce in savannas during the dry season, posing a challenge to chimpanzees in these habitats. In a few study sites, chimpanzees have been reported to access drinking water by digging holes ('wells') in sandy riverbeds, and rarely near sources of running water, presumably to filter this liquid. Chimpanzee well-digging behaviour is most frequent during the dry season. In Semliki, Uganda, chimpanzees sometimes use leaf sponges made of vegetation to extract the water from the bottom of the wells. Here we report on new evidence of savanna chimpanzees digging wells to obtain water. These data come from Kahensa, a new study site in Ugalla, western Tanzania, one of the driest, most open and seasonal habitats. We inferred that chimpanzees were the excavators of the holes based on the indirect evidence

they left at the digging sites: knuckles, footprints and leaf sponges made of leaves associated with the holes. For each hole, we measured the maximum length, width and depth and recorded the presence of water inside the cavity and the number of associated leaf sponges. We found a total of 20 wells along one streambed. Eleven wells had at least one leaf sponge close to or inside the cavity. We found no evidence of tools used for digging the wells, except leaf sponges, inferred to have been used to extract the water from the wells. We discuss the implications that our finding has for understanding the adaptations of chimpanzees to savanna habitats.

Keywords Savanna chimpanzees. Surface water. Well digging. Leaf sponges. Kahensa.

Economic Loss to chickens' farmers caused by Indian house crow (*Corvus splendens*) Predation in Dodoma

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Abstract

Corvus splendens, sometimes known as the Indian house crow (IHC), is an invasive

species that was brought to Zanzibar from India. It is now widespread throughout

the nation, especially Dodoma Urban. Predation's broader effects on animals, including chickens, have, however, received less research. In Dodoma, Tanzania, Indian house crows (*Corvus splendens*) prey on chicks, which is a serious financial hardship for poultry owners. This study set out to look into the monetary losses brought on by crow predation over a range of chicken age groups and seasonal variations. A questionnaire survey was used to gather information from 150 farmers in the wards of Makulu, Makole, and Ndachi. Makulu and Makole were designated as the wards' urban and peri-urban areas, respectively. The farmers reported higher predation rates by Indian house crows on chicks and eggs compared to other age groups of chickens. Chicks and eggs were found to be more vulnerable and less capable of defending themselves against predation, resulting in

a substantially higher economic loss of 1,791,590 Tsh per year for the sampled people when compared to pullets and hens, which incurred a loss of 195,460 Tsh. Economic losses were further analyzed across the different seasons, revealing that the months of April to August experienced the highest predation rates, resulting in an economic loss of 831,518 Tsh per year. Overall, this study highlights the detrimental impact of Indian house crow predation on chicken populations and the significant economic losses incurred by poultry farmers in Dodoma. Understanding the dynamics of crow predation can help develop strategies to protect poultry and minimize economic losses in the region.

Keywords: Indian house crow, Economic loss, Huma wildlife Conflict, Livestock keeper

Land Use and Land Cover Change Trends and their Impacts on Structure and Function of Igando - Igawa Wildlife Corridor, in Southern Highlands Tanzania

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Abstract

Landscapes across the globe are increasingly being altered by humans, with the associated land use and land cover changes having considerable consequences for biodiversity growth. This study focused on detecting changes in land use and land cover within the Igando Igawa Wildlife Corridor over 30 years from 1990 to 2020. We conducted a comprehensive assessment of the corridor's existing land use and land cover patterns using remote sensing, GIS mapping, and on-ground surveys. This assessment provided a comprehensive understanding of the corridor's current state, including its vegetation types, water bodies, and potential threats. Multi-

temporal datasets from LANDSAT TM, ETM+ and OLI images for the years 1990, 2000, 2010, and 2020 were used to identify changes in land use and land cover through visual image interpretation techniques. The results revealed significant alterations in the landscape composition. Over three decades, notable changes in land use and land cover were evident in terms of square kilometres. Closed woodland areas decreased from 349.91 in 1990 to 59.54 in 2020. Open woodland communities, on the other hand, showed variations, starting at 259.34 in 1990, reaching a peak of 314.92 in 2000, and then declining to 187.07 in 2020. Riparian Vegetation

experienced fluctuations, hitting its lowest point at 34.70 in 2010 from 56.73 in 1990. Cultivated areas expanded from 50.59 in 1990 to 175.69 in 2020, while Built-Up areas exhibited consistent growth from 65.47 in 1990 to 108.97 in 2020. River/Water areas gradually increased from 24.94 in 1990 to 86.10 in 2020. Non-vegetated areas displayed fluctuations, beginning at 99.50 in 1990, dropping to 74.03 in 2000, and subsequently rising to 247.92 in 2020. The analysis of land use and land cover changes over the 30 years indicates that human activities have brought about significant transformations in the Igando Igawa Wildlife Corridor. These changes

are expected to have a notable impact on the corridor and a significant effect on the two connected protected areas and their future population viability. To address these changes, we recommend formulating conservation approaches and sustainable land utilization within the broader Ruaha-Mpanga-Kipengere ecosystem and reinstating the connectivity to restore wildlife movement in between.

Keywords: Wildlife habitat connectivity, Land Use and Cover Change, Igando-Igawa, Wildlife Corridor, GIS and Remote Sensing

Ranging pattern and reproductive successes of the African lion in the Serengeti plains

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Abstract

Estimates of reproductive success and ranging behavior have widely been used to guide planning processes and wildlife species conservation strategies globally. However, little is known with regard to how lion pride ranges, and reproductive successes change in relation to seasonal variability of prey abundances in the Serengeti Ecosystem. We measured the reproductive successes of known female African lion individuals in Serengeti National Park, Tanzania. We then compared the lion reproductive successes between the dry and wet seasons to measure the influence of seasonal large ungulate migration on lion population dynamics. We also compared lion pride ranges between wet and dry seasons for all the 20 monitored prides. We recorded significantly high female reproductive success and cub survival in the wet season than in the wet

season. All monitored prides had relatively wider pride ranges in the dry season than in the wet season. However, during the wet season, some lion prides moved towards large ungulate herds causing a sudden shift in pride ranges including areas not visited in the dry season. Our result supported the hypothesis that lion population persistency would strongly depend on the ability to adapt to a resource heterogenous landscape influenced by environmental stochasticity. Study results inform the management about the best practices to protect important migratory pathways and life-supporting systems to enable cyclic movement of large ungulates which in turn supports the life of lions and other sympatric carnivore species.

Keywords: Reproductive success, Savanna ecosystem, Ranging ecology, Serengeti

The Impact of Composting Behavior Change Campaign for Saving Chimpanzees in Western Tanzania through the TACARE Model

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Abstract

Smallholder agriculture ranks as the prime threat to chimpanzees' habitat in Tanzania, followed by conversion of land to settlement and infrastructure, anthropogenic diseases, and many more other threats (CAP 2018-2023). In line to the prime threat, however, emerging debates on forest loss in Western Tanzania are currently pivoted around rapid population growth acerbated by high fertility rate (Kigoma with 17.2% and Katavi 34.4%) of teen pregnancy rate as compared to 22.7% of the national average (THDS 2022); and migration of people and livestock driven by climate change. To respond to some of the threats affecting chimpanzees and their habitats in the Gombe Masito Ugalla Landscape, the Jane Goodall Institute, through the USAID-funded Landscape Conservation in Western Tanzania Project piloted a Social and Behavior Change Campaign, grounded on a composting program to support communities to improve soil fertility to boost food security and family incomes to help people understand the connection between the farm, soil and habitat conservation. Crucial to the success of agricultural projects under TACARE has been the participation of women, as they are the ones who care for the kids, farms, and households and are also seriously affected by the destruction

of the environment (Kashula, 2022). The compost program is implemented using the Lake Tanganyika Catchment Reforestation and Education (TACARE) model to achieve its data-driven outcomes since 2020 to date. This paper explores how the Composting Social Behavior Change Campaign blended the TACARE approach (Engage, Listen, Understand, Facilitate and Step-back) to empower communities in Kigoma and Katavi regions to deepen their knowledge and understanding of the JGI's community-led conservation approach to shape their perceptions and behaviors of sustainable use of land and forest resources to save the chimpanzees' communities. The father of TACARE admits that the TACARE approach intertwines LePSA methods of introducing project activities: Learner-centred (Le) training: Problem Solving (P); Self-discovery (S) and Action (A) (Strunden, 2022). The paper also pulls some interesting cases from individuals, power couples and communities positively impacted by the campaign to draw a learning curve of the behavioral change intervention for the conservation in Western Tanzania.

Keywords: Behavior, Change, Conservation, Chimpanzees, Composting

Factors affecting sustainability of wildlife corridors joining the Ngorongoro Conservation Area and adjacent landscapes in Northern Tanzania

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Abstract

This paper discusses observations on factors affecting the sustainability of wildlife corridors joining the Ngorongoro Conservation Area (NCA) and surrounding landscapes in northern Tanzania. Data were collected through site visits, interviews and document review. The study realised that despite having general information about the existence of the wildlife corridors, there is unclear information about the actual configuration and sizes of the corridors. It was also noted that some on-going land use practices and development projects in the corridors are incompatible with the conservation of wildlife corridors hence affecting the structural and functional attributes of the corridors. While some wildlife corridors and dispersal areas were observed to experience low level

disturbance, in other areas the corridors and dispersal areas are blocked by human settlements, farming and other incompatible land uses. Most of the corridor blockage has occurred at a fast rate in the last 20 years. The study also noted that there have been inadequate concerted efforts and genuine partnerships between state and non-state actors to protect and sustain wildlife corridors. To sustain the remaining wildlife populations and healthy protected areas in Northern Tanzania, some sites within the corridors require special conservation attention to secure key resources required by wildlife species for their survival.

Keywords: Ngorongoro, corridors, wildlife

Variation in Small mammals Fleas species (Siphonoptera) infestation load as the impact of habitats modification: A potential increase in zoonotic transmission in wildlife-human interfaces in Tanzania

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Abstract

Background: Host-parasite relationships in the community are determined by complex ecological interactions which influence parasites and host dynamics. Small mammals play an important role in variation and maintenance of ectoparasites vector populations. This study aims to investigate small mammals with their ectoparasitic fleas diversity, and assess factors which influence abundance, mean

intensity and prevalence of flea infestations.

Methods: The study were conducted in two wildlife-human interfaces in Tanzania; Iringa and Morogoro districts. A total of 358 small mammals were captured using Sherman® traps and anesthetized by diethyl-ether. The fleas from fur of respective animal were removed by using hard brush and preserved in 70% alcohol. Identification

of fleas were done morphologically at SUA Parasitology laboratory and confirmed through sequencing COX-1 gene. Negative binomial regression model was used to assess statistical variation in flea load among host species across different ecozone location, habitats type, seasons, animal sex and age classes.

Results: Eleven species of small mammals were identified. Cox-1 sequencing confirms presence of four flea species (*Xenopsylla cheopis*, *Xenopsylla brasiliensis*, *Echidnophaga gallinacea*, and *Ctenocephalides felis*). Overall prevalence of infestation was 18.6% (95% CI: 14.6 – 22.7) with higher prevalence in *Aethomys spp.* 73.33% (95% CI: 44.9 – 92.2). Generally, *Tatera spp.* showed higher mean intensity of infestation $2.62 \pm$

0.88 and *Elephantulus spp.* had lowest 2.0 ± 1.0 . The average flea load per individual was higher in the Iringa district than Morogoro district. Variation in flea load showed rainy season has high compared to dry season ($P = 0.00309$) and peridomestic habitat influence more flea infestation than other habitats ($p = 0.01447$).

Conclusion: Prevalence of flea species infestation was higher than that reported in some similar studies; influence of habitats modification by human activities, difference in ecozone of data collection regions and seasonaliy can explain as examined under this study.

Keywords: Arthropod-borne pathogens, COX-1 sequencing, Small mammals, Wildlife-human interface, Zoonosis,

Bee Pollinator composition in the three highest mountains in Tanzania

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Abstract

Pollinators play an important role in the pollination of a diversity of wild plants including those in the highest mountains. Weather conditions in the higher altitudes is unfavourable to most of animal species. However, insect pollinators strive to make sure wild plants in the mountains are still flourishing and surviving through the pollination services they provide. In this study, we assessed the diversity of different species of insect pollinators in the highest mountains in Tanzania. The study was conducted in Mountains Kilimanjaro, Meru and Hanang to assess diversity of bee pollinators present in these mountains. Different methodologies were used for data collection including use of yellow coloured pan traps, chain traps

and sweep nets. Different species of bee pollinators were collected from the three mountains and the results shows that the diversity of the pollinator species differed significantly within the three mountains and across the altitudinal gradients. Overall, we concluded that despite of the present weather changes including climate change the highest mountains still harbor a wide diversity of bee pollinators that are providing ecosystem services; therefore the study calls for conservation of insect pollinators to maintain or even increase insect diversity in the highest mountains.

Keywords: Insects, pollination, high mountains, diversity, ecosystem services.



PRENARY PRESENTATION PAPER 3

Human-wildlife coexistence: biodiversity as the basis for a sustainable future

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Abstract

Biodiversity is crucial for healthy ecosystems and the foundation for a sustainable society. Global initiatives aim to bend the curve of biodiversity loss and increasing the size and number of our protected areas. Tanzania is doing incredibly well in terms of biodiversity conservation and areas set aside for this. The of this conservation success is an increase in human-wildlife conflict. In this

talk, I will discuss trends in human-wildlife conflict - temporal and spatial -, including human-plant conflict. I will discuss some of the drivers and identify opportunities to move forward, both in terms of possible solutions as well as approaches.

Keywords: Biodiversity, Conflicts, Co-existence Human, Wildlife

PARALLEL SESSION PRESENTATIONS

SUB-THEME: Human-Wildlife Interactions

Comparative Species Compositions and Human Interactions Across a Bushmeat Supply Network in Cross River State, Nigeria

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Abstract

Spillover of infectious diseases from animals to humans is increasing, and wildlife hunting and consumption represents an important transmission route. Species encounters, and the frequency and nature of those interactions, have zoonotic risk implications for both pathogen exposure likelihood and dose. In Nigeria, wildmeat is important in both rural and urban locations, but there is limited information on how this meat moves from the forest to urban markets. This gap limits our

understanding of how meat is transported across the landscape, and who is exposed as it is procured, preserved, and processed. Mapping how different people interact with different species in trade networks is vital for understanding exposure risks across geographic and socioeconomic gradients. This present and on-going study aims to map local wildlife trade networks, identify actors within wild meat commodity chains, and uncover differences in species compositions and demographic

characteristics. We are interviewing ~150 bushmeat traders in three locations (village, road transect, city) for an entire year. Each month, four Nigerian research assistants and two local liaisons survey all bushmeat interactions per subject over the prior seven days. Six months into data collection, we have recorded 1200 wildmeat interactions spanning 39 species. Traders in the urban centre interacted with significantly higher numbers of animal specimens of similar diversity to the other locations. Nonetheless, traders in the urban city were significantly more likely to interact with

rodent specimens than those on the road or in the village. In contrast, traders on the road or in the village were more likely to interact with primate specimens. Some taxonomic groups, such as birds and bats, occur in greater numbers in the village than other locations. Continued work on this project will incorporate participants' knowledge, awareness, and preventative behaviors surrounding zoonotic disease to assess opportunities for risk mitigation.

Keywords: West Africa, wildmeat, Zoonotic disease

Understanding the links between poverty and the perceived costs and benefits of living near protected areas

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Abstract

Protected areas form the cornerstone of national and international conservation strategies and play a vital role in the long-term protection of global biodiversity and ecosystems. Protected areas can generate substantial benefits through mechanisms such as tourism, and the protection of ecosystem services. However, they can also impose significant costs, particularly on those living near their boundaries, and questions concerning the socially just distribution of costs and benefits remain. In this study, we draw on social psychology to develop a novel psychometric tool to measure levels of perceived costs and benefits of living next to protected areas. Further, to investigate whether the costs of protected areas are disproportionately felt by poorer people, we draw on development studies and investigate relationships

between individuals' multidimensional poverty status and their cost and benefit scores. Collecting data from people living around the Ruaha-Rungwa ecosystem, our results revealed higher levels of poverty are associated with lower perceived benefits of protected areas, and that MBOMIPA wildlife management area was perceived as more beneficial than other protected area types. Our study highlights the potential of multidisciplinary social science methods for measuring the perceived impacts that conservation policies have on people, and also if these impacts are evenly distributed and thus socially just.

Keywords: MBOMIPA, novel psychometric tool, perceived benefits poverty Ruaha-Rungwa

Transfrontier conservation areas as a viable landscape approach to biodiversity conservation and sustainable development: A case study of Zimbabwe

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Abstract

Transfrontier Conservation Areas (TFCAs) are established to collaboratively manage shared natural and cultural resources across international boundaries for improved biodiversity conservation and rural development. Zimbabwe is pursuing six TFCAs namely the Kavango Zambezi (KAZA TFCAs), Great Limpopo (GLTFCAs), Greater Mapungubwe (GMTFCAs), Chimanimani (Chimanimani TFCAs), Lower Zambezi Mana Pools (LOZAMAP TFCAs) and Zimbabwe Mozambique Zambia (ZIMOZA TFCAs). This study analyzed the progress and impact brought about on conservation and rural development since the establishment of the first TFCAs in 2002. Data were collected through a mixed method approach including documentary reviews, interviews, and focus group discussions. TFCAs as special purpose vehicles of conservation and development has brought about diverse opportunities in the six (6) TFCAs Zimbabwe is involved in for the governments and stakeholders, including development partners and local communities, to engage, negotiate and collaboratively plan and implement joint projects related to among others, wildlife management, tourism development, socio-

economic development, harmonization of legislation and resource mobilization. Despite the different stages of the TFCAs development trajectories of the TFCAs Zimbabwe is involved in, the results showed that significant progress has been recorded in terms of the cross-border collaborative wildlife management including wildlife dispersal areas and habitats, research and monitoring, integrated planning, law enforcement, disease surveillance and capacity building. Further, notable rural development has been recorded associated with improvements in the livelihoods of the local communities, diversified tourism products, human-wildlife conflict management strategies and enhanced synergies in project implementation. For TFCAs to realize their full potential, the following is recommended, i.e., robust participatory planning and engagement, periodic programme reviews, targeted capacity building of actors and adaptive management to allow for socio-economic resilience given the changing environment.

Keywords: biodiversity conservation, collaboration, resilience, socio-economic, transboundary, wildlife management

The Impacts of Covid-19 on Local Small-Scale Tourism-Based Enterprises near Lake Manyara and Tarangire National Parks, Northern Tanzania.

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Abstract

Tourism is one of the largest financial sectors in Tanzania and it has always ranked high in the country's development

strategy. The Covid-19 global pandemic that started in 2020 not only caused serious life-threatening damage to people's

physical health, but it also caused an economic rippling effect that negatively impacted the entire world, and countries that were more dependent on tourism suffered severe financial losses. Current research on the impacts of the Covid-19 pandemic is more focused on the Tanzanian macroeconomic level and the research on how the pandemic has impacted the tourism sector on the microeconomic level is extremely limited. This study aimed to fill this knowledge gap by understanding the impact of the Covid-19 pandemic on the microeconomic level particularly on local small-scale tourism-based enterprises near Tarangire and Lake Manyara National Parks in northern Tanzania, these are souvenir shops, street sales businesses and cultural tourism businesses. Primary data was collected from 112 key informants through interviews using semi-structured questionnaires, and this study found that the pandemic has negatively impacted the

tourist trend in the study areas and 80.54% of local enterprises were extremely negatively impacted, which has led people to generate lower revenues or to completely stop engaging in their respective enterprises during the pandemic. The study also found that majority of local people engaged in these enterprises adapted the following strategies: 58.33% by depending on the land and natural resources, 14.81% switched to non-tourism-based employments, 26.86% used other strategies such as change type of local businesses, changed targeted clients, used their savings and sold their properties to generate income during the pandemic. The results were reflective of the national tourism sector trends and recommended that people should diversify their livelihoods and lean into non-tourism-based businesses.

Keywords: Adaptations, Covid-19, Impacts, Small-scale Enterprises, Tourism

Trophy hunting and the associated perspectives from local communities: A Case study of Rungwa Game Reserve, Tanzania.

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Abstract

Trophy hunting plays an important role in wildlife conservation as well as economic and community development in Tanzania, however, it is also facing antagonism from anti-trophy hunting people in relation to trophy hunting supporters. Research on local community perceptions, as well as benefits and costs incurred due to trophy hunting to local communities in Tanzania are not well known. This study aims to fill the research gap by evaluating local communities' perception towards trophy hunting, evaluating costs and benefits generated from trophy hunting and assessing the trend of trophy hunting. Rungwa Game Reserve (RGR) in Tanzania

have been conducting trophy hunting for many decades. The study used the mixed methods approach to gather all the data required through household interviews and key informants. The study found 92% (n = 110) of local communities are aware of existing hunting operations. The study found positive attitude from local communities toward trophy hunting, only if they receive benefits from hunting operations. The findings revealed that there were significantly higher benefits than costs imposed by trophy hunting activities on local communities living adjacent to RGR (t-test, $p < 0.001$). However, cost-benefits analysis showed variation with

demographic variables. The study found that the number of tourists who conducted trophy hunting activities in and around RGR decreased significantly over the past five years (GLM, Poisson, $p=0.002$). Our findings suggest that local communities in Tanzania are aware and acknowledge the contribution of trophy hunting to the society, however, communities accept this if benefits of trophy hunting exceed the costs incurred by wildlife in the area and demographic variables play important

role to understand variation of perceptions among individuals. In conclusion, trophy hunting is important to local communities living adjacent to protected areas and banning them may have a significant impact in their livelihood and wildlife conservation.

Keywords: Trophy hunting, local communities, costs and benefits, perceptions, Rungwa Game Reserve.

Efficacy of various elephant deterrents in the Kilombero valley, Tanzania

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Abstract

Human-elephant conflict (HEC) poses a threat to the welfare and livelihoods of communities adjacent to protected areas and elephant conservation efforts. In the Kilombero valley, Tanzania, one source of HEC is elephant crop use. Previous work indicates that protecting crops from elephant damage may be more effective when farmers have access to multiple appropriate deterrents that can be combined or rotated, but more research is needed on how different methods can be combined to enhance efficacy. We trialed the efficacy of solar-powered strobe lights fencing (2km), the combination of beehives and metal strips fencing, and the combination of beehives and solar lights fencing with local farmers. Fences were linear in configuration and were located between protected area boundaries and farms. The beehive-metal strips fence trial had a 300m test section with beehives and metal strips, and an 850m control section comprising beehives only. The beehive-solar lights trial had a 750m test section with beehives and solar-powered strobe lights and a 1150m control section comprising beehives only.

We used ground surveys and camera traps to collect data on elephant responses to the mitigation fences. Elephants encountering solar lights fencing when heading to farmland crossed the fence on 29% of occasions and avoided the fence on 69% of approaches ($n=147$ approaches) over a 36-month period. Elephants encountering beehives-metal strips fencing when heading to farmland crossed the fence on 44% of approaches at test sections and 92% of approaches at control sections over 12 months ($n=22$ approaches). Elephants encountering beehives-solar lights fencing when heading to farmland crossed the fence on 50% of approaches at test sections and 92% of approaches at control sections over 12 months ($n=17$ approaches). Elephants were more vigilant at test than at control sections. We provide initial evidence that adding additional deterrents to beehive fences may enhance their efficacy.

Keywords: Beehive combination fences, elephant deterrents, human-elephant coexistence, Kilombero Valley, Tanzania

Characterizing Elephant Use of Human dominated Landscapes in the Greater Serengeti Ecosystem

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Abstract

Human elephant conflict is one of the most challenging conservation issues facing protected areas in Tanzania. In the Greater Serengeti Ecosystem, conflict between communities and wildlife, particularly elephants, is prevalent. In order to create opportunities for co-existence between elephants and people, a clear understanding of how elephants utilize human dominated landscapes is required, and this knowledge can aid in identifying where conflict is likely to occur. We investigated how elephants select resources within and adjacent to protected areas across dry and wet seasons by analyzing GPS locations of 35 adult elephants monitored via satellite collars between 2018-2022 in the Greater Serengeti Ecosystem. Taking advantage of large gradients in anthropogenic and environmental variables, third order resource selection functions (RSF's) were used to investigate elephant use in response to land cover type, distance from the

protected area, slope, distance to buildings, roads, and rivers, and forage quality. We fit RSFs for each individual-season-year in order to examine variability in strategies across individuals, seasons, and years. Our results indicate that elephants demonstrate significant individual-level variability in response to environmental and human dominated features, and individual animals demonstrate high levels of behavioural plasticity by employing varying strategies over time. However, certain features, primarily rivers, roads, forage quality, and the timing of use within human dominated areas elicit consistent responses. We discuss our results and how our findings can be used to prevent human-elephant conflict and promote coexistence in the Greater Serengeti Ecosystem.

Keywords: Human wildlife conflict, Coexistence, Elephant, Resource selection, Habitat use

Cultural dimensions for the conservation of the Southern Ground Hornbill at Mswakini Chini.

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Abstract

Birds, especially hornbills, have held symbolic and supernatural significance in cultures worldwide. The Southern ground hornbill, in particular, has played various roles in cultural practices within the Asian and African continents due to its distinct features. However, the species faces a decline in population, primarily

attributed to habitat destruction, the live specimen trade, and its use in traditional medicine and beliefs. This research sought to identify cultural beliefs and practices associated with the Southern ground hornbill and assess their influence on the bird's conservation. Data was collected from 83 households through

questionnaires in Mswakini chini, with the Maasai ethnic group being dominant among respondents. Interestingly, by majority (79.5%) had no cultural beliefs associated with the hornbill, suggesting that such beliefs may not be significant for its conservation ($p < 0.05$). Only 20.5% of respondents held beliefs related to the bird, and *Bucorvus leadbeatri* (the scientific name for the Southern ground hornbill) was not used in any cultural practices by 98.2% of participants. Certain beliefs, such as the hornbill being a signifier of death, seemed to negatively impact conservation efforts, as they induced fear and potentially harmed the bird. On the other hand, beliefs portraying the hornbill as a signifier of seasonal change, eater of destructive insects, or a bird of God, were associated

with conservation efforts, encouraging locals to protect the species to manifest their beliefs. The study successfully identified cultural beliefs linked to the Southern ground hornbill and shed light on the influence of specific beliefs on conservation efforts. This newfound knowledge could be instrumental in designing effective conservation initiatives. By promoting beliefs that positively influence species conservation and discouraging those that do not, efforts to conserve the Southern ground hornbill can be better directed and strengthened.

Keywords: Birds, Cultural beliefs, Southern ground hornbill, Conservation, Traditional practices

The efficacy of electric fencing on addressing human-wildlife conflict in western Serengeti

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Abstract

The Tanzanian Wildlife Policy emphasizes free-roaming wildlife, however, due to severe levels of Human-Wildlife Conflict (HWC), the newly developed National HWC Management Strategy acknowledges the use of electric fencing as a mitigation tool, especially around protected areas with hard boundaries. Research which shows the efficacy of electric fences and their effects on the management of land outside protected areas is poorly understood. We investigate whether an electric fence set up in 2020 along the boundary of Ikorongo Game Reserve in western Serengeti succeeds in reducing human-wildlife conflict. We used systematic spatial interviews, satellite data and ground-based research, and analysing land use/land cover gradients in the village lands. We found that

households adjacent to the core section of the fence did not report experiencing crop losses to elephants, whereas those within proximity to the endpoints still experienced crop damage by elephant. Households adjacent to the unfenced sites experiences higher crop losses than even those found at the endpoints of the fence. Livestock losses to carnivores did not vary between fenced and unfenced sites. About 97% of people interviewed believe that fence can reduce crop damage, while 91% perceive that fence can reduce livestock attacks from carnivores if the existing fence will be designed in a different style or modified. We found no significant difference in overall percentage cover of cropland, fallow land, and grass vegetation between villages found in fenced and unfenced sites

(ANOVA, $p > 0.05$). However, farmers preferred to cultivate crops that are less palatable to elephants (mostly sunflower) at unfenced sites, while in the fenced sites farmers cultivated crops that are palatable to elephants like maize, millet, sorghum, and cassava, which suggests reduction of crop raiding in fenced sites. Our study

highlights the potential benefits of electric fences in reducing human-wildlife conflict near protected areas experiencing high anthropogenic pressures.

Keywords: electric fence, human-wildlife conflict, western Serengeti, land-use

Heterogeneity of the mountain, heterogeneity of nature's values, and demands for Nature's Contributions to People by local communities

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Abstract

Mountain ecosystems are considered critical ecosystems for the provision of multiple nature's contributions to people (NCP) that benefit the quality of life of local people. Previous research has considered local people as a homogenous stakeholder group when researching demands for NCP and nature's values. However, the intrinsic heterogeneity of local people based on their socio-cultural characteristics and geographical variables might play a key role in determining people's values and demands for NCP for their land management. We applied a socio-cultural valuation approach to investigate how geographical and socio-cultural variables affect demands for NCP and nature's values among villagers. We conducted a household questionnaire to survey 364 villagers on the southern slopes of Mount Kilimanjaro, Tanzania. We conducted two redundancy analyses (RDA) to explore the effect of socio-cultural and geographical variables on NCP demands and nature's values, respectively. We found that villagers demanded most material NCP, followed by regulating NCP. Overall, those NCP that were highly demanded and perceived with decreasing

supply trends by villagers -i.e., critical NCP- were *food, feed, and regulation of freshwater quality*. In addition, villagers overall expressed high agreement with the statements representing values of nature: intrinsic value, followed by relational and instrumental values. When looking at individual statements, the pattern slightly varied. Villagers mostly agreed upon the intrinsic value statement that represents the worthiness of conserving nature and the instrumental value statement that represents the idea of nature as a provider of basic needs. We found that both the demands for NCP and nature's values varied along the altitudinal-latitude gradient and according to various socio-cultural variables, such as level of formal education, age, generations numbers living in Kilimanjaro region, and conservation activities engagement. Findings can be used as a baseline by decision-makers for policy formulation through the understanding of how people demand NCP and value nature.

Keywords: Ecosystem services; local communities; nature's contributions to people; plural valuation; values of nature.

Bat species and their interaction with humans: Risk identification for Marburgvirus disease Outbreak in Kagera region, Tanzania

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Abstract

Marburgvirus disease (MVD) was a central issue in emerging and re-emerging zoonotic viral disease in Tanzania, in 2023. It is the first outbreak of viral hemorrhagic fever in the country and had a case fatality of 67%. The disease is caused by Marburgvirus (MARV) belonging to the Filoviridae family of viruses. Ebolavirus and Marburgvirus, which are Filoviruses, pose significant threats to public health and species conservation by causing hemorrhagic fever outbreaks with high mortality rates. As a zoonotic disease, the MVD is transmitted to humans through saliva, feces, and contaminated fruits from mainly bats (primary reservoirs), and African green monkeys and pigs (potential amplifier hosts). In identifying the potential risk factors for the MVD outbreak, the ecological study for MARV was conducted. The objective of the present study was to identify and document the potential animal species that serve as hosts or reservoirs for MARV in the Kagera region. Face-to-face interviews, inspection of the trees, buildings, and other structures like caves, and netting methods were used. In 17

surveyed sites, Egyptian fruit bats, Hairy slit-faced bats, Noack's roundleaf bats, and African sheath-tailed bats were identified in 8, 1, 1 and 7 sites respectively. The bats interacted with humans in the living houses, caves, rocky crevices, and abandoned mineshafts whereby manure collection (88%), mining (12%), and tourism (6%) were the main interaction causes. The intrusion of bat habitats by human activities has caused bats to shift to other new areas, a scenario that increases the chance of new bat-human interaction. The manure from bats has been collected for home farming purposes and selling. It is the risk factor that predisposes many people from collection to field application. Therefore, knowledge and safety practices during collection and sterility during handling and application are important factors that need to be taken into consideration.

Keywords: Bukoba, Multidisciplinary response, Organic farming, *Rousettus aegyptiacus*, zoonoses

Reducing Vulnerability to Multiple Shocks Through Tourism Destinations Development in Gateway Communities of Northern Tanzania

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Abstract

There is a proposition that tourism diversify livelihood to residents and in turn, helps in reducing vulnerability. However, there is unclear understanding on extent of reduction in vulnerability to multiple shocks through the course of development of tourism destinations, especially to agro-pastoralists enduring low productivity due to semi-aridity and Savannah grass-lands of northern Tanzania. This study makes contribution to the body of knowledge by evaluating impacts of tourism development on households' wealth-trajectories capable to address livelihood vulnerability to shocks among residents in three gateway tourism destination communities: Loliondo, lake Natron and Burunge. A cost-effective impact evaluation based on residents' definition of wealth was embedded in the participatory wealth-ranking as part of the multi-method approach involving in-depth

interview, focus group discussions and survey among 416 tourism beneficiaries and 425 non-beneficiary households, to collect data on livelihood shocks, coping mechanisms and changes in household's wealth from year 2008/9 to 2018/19. It was found that, tourism has significantly raised the wealth status from normal to rich among tourism benefiting households than non-benefiting, thus, enabled them to reduce vulnerability to drought, livestock diseases, rise in food prices and illness, by effective shock-coping activities. Recommendations for further reduction in vulnerability to multiple shocks is provided.

Keywords: Northern Tanzania, Multiple shocks, Tourism Development, Vulnerability, Wealth-trajectories

SUB-THEME: Wildlife Ecology and Ecological Interactions

Variation in avian species and feeding guild diversity between habitat types of land use and elevation zones in the Tarangire-Manyara Ecosystem, Tanzania.

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Abstract

Avian feeding guilds can often determine where birds live, what habitats they prefer, what elevation levels they are found to be and the level of disturbance they tolerate. This, in turn, can affect how well ecosystems function. Considering the diverse species of avifauna found in Tanzania, we conducted a study in the Great Rift Valley of Tanzania to evaluate

avian species and feeding guild diversity at different elevations, land use intensity, and habitat types. A point count was done at nine different locations to sample birds in the Tarangire-Manyara Ecosystem. From the sampled birds, we determined Jacob's Habitat Selection index and variation in avian species diversity and feeding guild diversity between elevation, land use

type and habitat types using R Statistical Program. A total of 2,058 birds representing eight feeding guilds were recorded. While species diversity varied significantly between elevation zones ($F_{2,771} = 20.73$, $p = 0.001$), variation in feeding guild diversity between elevation zones was not significant. Similarly, while findings revealed a significant variation in species diversity between land use intensity levels ($F_{2,771} = 11.81$, p -value=0.001), the study did not register a significant variation in feeding guilds diversity between land uses. Findings also showed variation in feeding guilds' habitat preferences, cropland followed by wooded grassland had the highest positive Jacob's Index Score of 0.73

and 0.63 and the two habitats were mostly selected by frugivores and herbivores, respectively. In contrast, findings revealed that cropland (-1) and wooded grassland (-0.9) were mostly avoided by herbivores and frugivores, respectively. Our study shows that factors affecting avian species diversity may not necessarily affect avian guilds' diversity in the same way and that, even habitats with high human influence such as croplands may be critical for the conservation of some avian feeding guilds.

Keywords: Species diversity, feeding habits, land use intensity, habitat selection, elevation gradient, insectivore

Habitat use and Diet composition of the Common Eland (*Tragelaphus oryx*) in Ngorongoro Conservation Area, Tanzania

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Abstract

Ngorongoro Conservation Area (NCA) is renowned worldwide for its multiple land use concept where pastoralists and wildlife co-exist; hence, the ecosystem must meet a delicate balance of competing needs between wildlife and livestock. This study, therefore, investigated the factors influencing habitat use and diet composition of the common eland (*Tragelaphus oryx*) in the Ngorongoro Conservation Area. Data were collected along 82 pre-established transects early in the morning (06:00 to 11:30 am) and late evening (5:00 to 6:30 pm), both in wet and dry seasons, in 2020 and 2021, using direct field observation. Eland habitat use was computed and mapped using ArcGIS Software Version 10.3, while the diet composition was modelled using Generalised Linear Mode (GLM) in R statistical software version

4.1. The results indicate that the grassland habitat was mainly used by elands (> 85 % in both dry and wet seasons) while other habitats were least used (< 15%). Eland diet composition varied significantly between plant species, with the animals most frequently feeding on *Themeda triandra* but rarely on *Vachellia tortilis* and *Hibiscus aponeurus*. The study concludes with recommendations for enhancement of grassland habitat management and reduced anthropogenic activities which are significance for eland conservation in Ngorongoro Conservation Area.

Keywords: *Tragelaphus oryx*, habitat use, diet composition, Ngorongoro Conservation Area

Best Practice Guidelines for Responsible Images of Non-Human Primates A Publication of The IUCN Primate Specialist Group Section for Human-Primate Interactions

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Abstract

In many countries, primates are illegally caught from the wild and used as photo-props for tourism and other entertainment purposes. The use of non-human primate imagery (photos or videos) can draw the attention of millions of people to non-human primate conservation and welfare. However, if the context of the images is inappropriate or unclear, people may draw mistaken conclusions about the content. Images of people holding or physically very close to primates give the false impression that touching primates is not physically dangerous, poses no risk to health of human or primate and that primates make appropriate pets. These may induce public perception that primates are merely sources of entertainment, and thereby underestimate their biodiversity value and threatened status, which can then undermine conservation efforts especially in range countries. The IUCN Primate Specialist Group Section on Human-Primate Interactions is a group of an interdisciplinary experts collaborating to improve understanding of human-primate interactions. We used a mixture of techniques including desk top reviews and internet communication within the group to collect information on the impact of taking primate images very close to human, and to collect

ideas on developing a document detailing appropriate imagery to be shared of non-human primates, and describing direct and indirect consequences of publishing images of ourselves close to a primate. It was observed that images of primates very close to people in popular media decrease appropriate public perceptions of primates, and increase inappropriate interactions with primates. All these can decrease welfare and rehabilitation efforts, and decreases primate conservation efforts in all contexts. In that regard, the group produced six bullet points as the best practice guidelines available in 24 languages worldwide to reduce the potential costs of primate images to primates, their welfare and conservation in and ex situ.

Keywords: Entertainment animals, Primate photo-props, Primate Pet, Primate welfare.



Importance of Urban Green Spaces in Avian Conservation: the status of understory birds at the University of Dar es Salaam thickets, Dar es Salaam, Tanzania, has not significantly changed after 30 years

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Abstract

Between 1986 and 1990, 77 species of birds were mist netted and ringed at the University of Dar es Salaam main campus thickets, in an urban landscape in Dar es Salaam, Tanzania. Thirty years later, due to various developments at the campus resulting into decline in the overall cover of the campus vegetation, we hypothesized that the current avian community to have changed. Between 2016 and 2021 we conducted a similar mist netting study to assess whether there have been changes in bird species composition and abundance at the campus. We mist netted 65 species of which 44 were also mist netted between 1986 and 1990, and seven species were new records for the campus. Species similarity index between the species we mist netted and those mist netted 30 years ago was 61% suggesting a moderately high similarity in species composition

between the two periods. About 80% of the total species did not show any significant differences in probability of occurrence between 1986-1990 and 2016-2021. Our assessment revealed that despite the various developments at the University of Dar es Salaam campus, the remaining thickets have continued to provide a habitat for a number of bird species including forest-dependent ones. However, given the ongoing loss of original habitats and urban sprawl in Dar es Salaam, the continued protection of these thickets is recommended as are any other thickets in urban and sub-urban environments in the country.

Keywords: Coastal forest thickets, Forest dependence, University campus, Urban green space

The influence of food availability, rainfall, and temperature on yellow baboon ranging patterns in the Issa valley, western Tanzania

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Abstract

Primate ranging patterns vary with environmental conditions, with distance, direction, and duration influenced by local weather patterns, predation pressure, and fruit availability/distribution among others. When food availability is low, animals may range further to find preferred foods, or fallback on less nutritious, but more

abundant foods, and range less. Range increases are energetically expensive and can place individuals at increased risk, especially along the periphery of their territory where they may encounter members of rival groups and end up the recipient of extra-group aggression. We used ranging data over 8-years (84-months)

from a troop of yellow baboons (*Papio cynocephalus*) in the Issa valley (Katavi region, western Tanzania) to assess how changes in rainfall, temperature, and food availability may influence daily path length and annual ranging behaviour. Our preliminary results suggest that overall ranging behaviour is unchanged across seasons, but daily path length is significantly longer during the dry season, when fruit is more available, but patchily distributed. In the wet season, baboons exploited locally abundant grasses and mushrooms that contributed to reduced ranging distance.

We contextualize our findings with those from other baboon troops across Africa to assess whether our findings are typical for *Papio* and also whether there are inter-specific similarities with sympatric red-tailed monkeys (*Cercopithecus ascanius*) and chimpanzees (*Pan troglodytes*). Finally, we discuss the implications of a baboon ranging in a changing East African climate.

Keywords: *Papio*, movement, environmental influences, Miombo woodland

Evaluation of the Non-invasive Genetic Sampling for estimating lions' population size in Ngorongoro Conservation Area (NCA)

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Abstract

Estimating the population sizes is crucial for effective wildlife management and conservation, particularly for endangered species where even small population fluctuations may be critical. Nevertheless, the assessment of carnivore population size has encountered numerous methodological challenges, with index-based counts revealing significant flaws that undermine the effectiveness of carnivore management decisions. Finding alternative methods to accurately estimate the size and trends of the remaining low-density populations is increasingly urgent. In this study, we assessed the feasibility of estimating the population size of lions using non-invasive genetic sampling (using hair and faecal samples) in NCA. For a start, we evaluated the quality of non-invasively collected samples compared to higher-quality tissue samples. We then tested a new non-invasive genetic sampling protocol for reliable population size estimation using Capture-Mark-Recapture in *Capwire* using Single Nucleotide Polymorphism (SNP) genotyping. Noninvasively collected samples matched tissue samples by an average of 99%, showing that they were of good enough quality for

individual identification and population size estimation. By using the R package *allelematch*, we identified 179 unique individuals from 284 samples collected during a 10-year period. We used a subset of 38 samples collected in the crater in 2014-2015 to estimate the population size. We estimated a population size of 100 lions in the Crater. This was higher than the population based on the minimum total count and our long-term monitoring based on the individual identification of 75 lions. An essential difference between our estimate and the minimum total count is the few re-sampling cases needed for the Capture-Mark-Recapture assessment. While population assessment, in this case, was restricted, it holds the future for population size estimations. We recommend short periods of multiple sampling sessions to meet the closure assumption of the Capture-Mark-Recapture. We further propose using scat-detecting dogs to maximise the capture rates and reduce sampling bias.

Keywords: Amplification success, Capture-Mark-Recapture, Sampling intensity, SNP Genotyping.

Does variation in plant diversity and abundance influence browsing intensity in Black Rhinos?

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Abstract

Variations in forage availability, selection and preferences can lead to intense foraging competition and depletion of food consequently lowering diet quality and population performance of black rhino species. This study investigated seasonal variations in rhino diet, foraging, preference and browsing intensity and how this is influenced by plant diversity and availability in Mkomazi National Park (MKONAPA). 58 square-grids were randomly selected in each season and plots were laid for vegetation assessment during wet and dry seasons in the sanctuary. Browsed species by rhinos were compared with rhino feeding data from fourteen rhino range areas within Africa savannah. More than 85% of species edible in MKONAPA were similar to those in rhino range areas. *Acalypha ornata*, *Grewia similis*, and *Commiphora africana* were highly utilised

specie in both seasons. Diversity and abundance of consumed browses decreased towards the dry season while browsing intensity increased with forage preference in both seasons and was prominent when browse availability was low in dry seasons. Our study established seasonal variation in dietary composition, browsing intensity and preferences for black rhinos. We suggest establishing nutritional composition of preferred forages, assessing density of competitor browsers in the sanctuary, translocating excess rhinos to restock safe areas within their former ranges in Tanzania or expanding the sanctuary to meet the recommended ecological carrying capacity.

Keywords: *Diceros bicornis*, forage availability, forage preference, Mkomazi Rhino Sanctuary

Ecological correlates of population abundance of a pest small mammal species (*Mastomys natalensis*) inhabiting a protected area-farmland landscape in western Serengeti, Tanzania

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Abstract

Population abundance of pest mammal species in most rural landscapes across Africa is less well documented, posing increased risks of food insecurity and the human health. We aimed to assess abundance and associated environmental

and habitat characteristics of a rodent pest species *Mastomyis natalensis*, to generate data for management of the species potential negative impacts. Field data were collected using Capture-Mark Release method in rural farmland and protected areas in

Western Serengeti over a 12-month period between April, 2020 and March, 2021 and analysed with the Minimum Number Known Alive and Generalised Linear Modelling methods. Rodent density ranged from $5.5 \pm 1.6/\text{ha}$ to $20.56 \pm 3.6/\text{ha}$, was significantly higher during the dry season and in active farmlands than in the wet season and protected areas ($\chi^2 = 79.393$, $df = 2$, $p < 0.001$). Further, rodent density was strongly positively associated with active farmlands (Mean = 0.249, $Z = 2.268$, $p =$

0.023) and sandy-clay-loam soils (Mean = 0.280, $Z = 2.709$, $p = 0.007$) but negatively correlated with the plant richness (Mean = -0.038, $Z = -4.180$, $p < 0.0001$). These results are useful for developing the potential strategies to reducing impacts associated with this rodent species in the rural landscapes elsewhere in Africa.

Keywords: Minimum number known alive, population abundance, rodents, Serengeti, soil texture

Advances in aerial survey methods: oblique camera counts, AI and counting from space

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Abstract

Standard methods for aerial surveys of large mammals were invented in Tanzania in the 1970s and are used to this day in dozens of countries around the world, and regularly in around 300,000 km² of survey areas in Tanzania. Methods have not changed much in the past 50 years, with the human eye still the primary means of counting, though studies indicate that digital images allow for more consistent rates of detection. At the Conservation Information Monitoring Section at the Tanzania Wildlife Research Institute (TAWIRI), we are trialing the use of automated cameras and automated target

detection in oblique images, though at present human counters still must process the majority of images collected. Moving to automated cameras and detection may allow for better data and more regular surveys, and some studies show promising results in counts from satellite imagery. Here we review the state of the field and the potential for updating and improving our methods in long-term monitoring.

Keywords: aerial survey, conservation, mammals, monitoring, remote sensing.

Metapopulation genetics of hyrax

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Abstract

Most species do not occur in a single continuous population but are instead structured into spatially delimited local populations that differ in size and degree of isolation. This fact has led to the development of the notion of the metapopulation, a concept that views

populations as consisting of discrete local subpopulations that interact via migration and gene flow. The metapopulation concept has gained a lot of attention, in part because most endangered species occur in metapopulations, but also because many fundamental ecological and genetic

processes act differently in metapopulations than in a large population of the same total size. We have been studying the demography of a metapopulation of rock and bush hyrax in Serengeti National Park since 1971. Because their life history is similar to many much larger mammals, hyrax provides an opportunity to gain insights into conservation-relevant metapopulation processes. We show that the two hyrax species in Serengeti differ substantially in their metapopulation dynamics, even though they inhabit the same kopjes. Furthermore, comparing

genetic data collected over a period of 20 years, we show that there is remarkably high genetic turnover. Intriguingly, hyrax populations are now genetically more similar than 20 years ago, suggesting increased dispersal among kopjes. Our recent genetic work combined with the long-term demographic study is yielding unique insights into the genetic dynamics of a natural metapopulation.

Keywords: genetics, hyrax, kopje, metapopulation, Serengeti National Park

Maximizing efforts and accuracy in rapid demographic assessments of African elephants

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Abstract

Age and sex are important demographic indicators of population structures as they influence population dynamics and signal extinction risk. With the ongoing declines in global elephant populations, monitoring is central to the identification of population trends. However, elephant monitoring programs across many African ecosystems are often constrained by financial and logistical practicalities as abundance monitoring is expensive so infrequently done. In addition, surveys typically do not collect age and sex data, which makes it difficult to predict how population will perform in the near future. Despite this, the appropriate sample size required to infer the age and sex of the African elephants in varying population sizes is poorly understood. We used simulations of age and sex data based on elephant surveys within Tanzanian ecosystems to evaluate how precision of estimates (i.e. Root Mean Square Error) varied in response to the number of elephants sampled. Contrary to

previous findings, the sample size required to stabilize precision depended on the number of age categories used, the age and sex structure and the population size, but sample sizes between 70 and 429 (3% - 10%) unique individuals are sufficient to infer the population. Overall, we provide evidence sampling efforts should vary depending on population size with smaller populations needing much effort than larger populations. These results will inform the planning and execution of rapid demographic studies in the context of limited resources in the management of wildlife populations. When used in combination with occasional abundance monitoring, demographic surveys can improve predictions of population change during years between abundance surveys.

Keywords: African elephant, demographic, Monte Carlo simulation, Root Mean Square Error, sample size.

Comparative analysis of bird diversity, richness and evenness in three protected areas with different protection status

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Abstract

Highly Protected areas and lower protected areas play a crucial role in safeguarding and promoting ecological balance of bird diversity, which varies basing on the level of protection they receive. This study presents a comparative analysis of bird diversity, richness, and evenness in three protected areas, Lake Manyara National Park (LMNP), Lake Natron Game Controlled Area (LNGCA), and Mto wa Mbu Game Controlled Area (MGCA). Standardized methods including point count which were established within the several randomly established transects were used to collect data on species composition, abundances and distribution in each protected area during wet and dry season. The results of this study revealed surprising trends in bird diversity across the three protected areas contrary to our expectations. During wet

season, LNGCA displayed high diversity of bird species ($H' = 4.859$, $n = 233$) followed by MGCA ($H' = 4.253$, $n = 137$) and lastly was LMNP ($H' = 3.695$, $n = 125$), contrary to dry season where MGCA was observed to have high diversity of bird species ($H' = 4.353$) followed by LMNP and LNGCA ($H' = 4.145$), ($H' = 3.541$) respectively. Overall this study recommends that, to enhance conservation of avian species areas with lower protection statuses such as MGCA and LNGCA, should receive additional conservation attention and strictly regulations. Furthermore, continuous monitoring and researches are essential to assess the long term impacts of different protection statuses on bird populations.

Keywords: Bird diversity, Evenness and Protected areas.

Distribution of wildlife water points in Mikumi National Park, Tanzania: What are the possible socio-ecological implications?

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Abstract

Artificial water points can offer year-round water availability to wildlife in protected areas. However, the socio-ecological implications of its establishment for the park ecosystem and neighboring communities have been less investigated in Tanzania. The study was conducted to evaluate the consequences of establishing artificial water points in a wildlife ecosystem, using Mikumi National Park as a case study. It

was found that MINAPA has established 20 artificial water points, of which 80% are located within the core tourism circuit, the Mkata Plain. Moreover, 95% of dams were established too close to game-drive roads and highways, a decision that could intensify disturbances to animals and elevate wildlife road kills. Dams located far from the park boundary might lessen human-wildlife conflicts in transboundary

villages. Furthermore, topography and hydrology in rugged landscapes might limit the establishment of water points due to difficulties in developing access roads and high risks of siltation. The study predicts that there is a possibility of establishing 11 water points with uniform distribution and minimum socio-ecological threats within the park and adjacent villages. In conclusion, the application of a multi-criteria evaluation process provides a strong

base for informed decisions when planning the development of artificial water points. We recommend the application of other knowledge disciplines in order to increase the accuracy of predicted water points in MINAPA.

Keywords: dams, game-drive roads, wildlife, ecosystems, adjacent communities, risks

Monitoring carrying capacity can inform on the status of wild mammal populations: Lessons from spotted hyenas in Ngorongoro Crater

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Abstract

To be successful, wildlife conservation strategies require accurate information about the environmental conditions experienced by an animal population. Current conservation strategies strongly rely on estimating trends in population size to assess environmental conditions. This approach has significant limitations because changes in population size can result from changes in the environment or from processes unrelated to environmental conditions such as demographic stochasticity or density dependence. Thus, changes in population size are possible under improving, static, or even declining environmental conditions. We propose to use carrying capacity as an additional metric in conservation monitoring because it encapsulates all environmental factors potentially influencing a population and therefore accurately reflects environmental conditions. We apply our approach to a wild population of spotted hyenas (*Crocuta crocuta*) in Ngorongoro Crater, Tanzania. To simulate the properties of

this population and estimate its carrying capacity, we created an individual-based model using 25 years of empirical data (1997 - 2021). To quantify changing environmental conditions in conjunction with changes in population size, we allowed carrying capacity to vary over time. We found that the population overall grew during the monitoring period but that its carrying capacity did not increase nor decrease substantially, indicating that environmental conditions have remained relatively stable over time. The observed discrepancy between trends in population size and carrying capacity suggests that the observed population growth in Crater hyenas likely resulted from past environmental improvements and conservation efforts rather than recent ones. We discuss why such a discrepancy is likely to be common in long-lived species and how our approach can be applied to other wildlife populations. If applied in combination with classical monitoring of population size, our proposed approach

can substantially improve evidence-based conservation: it can help assess whether and what type of conservation intervention is needed.

Keywords: conservation monitoring, individual-based model, population dynamics, spotted hyena, time-varying carrying capacity

Phylogeographic patterns of Greater cane rat (*Thryonomys swinderianus*) populations from eastern, western and southern Africa and implications for wildlife conservation

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Abstract

The African Greater Cane rat (AGC) populations are widely distributed in eastern, western and southern Africa. It is uncertain whether they have a single ancestral origin. To date, information is lacking on the genetic differentiation of these populations due to long-time geographical isolation, and environmental and anthropogenic pressures in each region. This information gap limits our ability to understand the potential speciation processes of AGC and how this could be useful to enhance the conservation of the species and others with similar life-history and ecological needs in the forest and savannah biomes in Africa. We analyzed genetic markers of the African greater cane rat, *Thryonomys swinderianus* samples from three geographic regions: parts of eastern, western and southern Africa to characterize the phylogeographical patterns of the populations based on a single mitochondrial region (D-loop). Mitochondrial D-loop sequences for samples collected from two Eastern Arc Mountains in Tanzania, three agro-ecological zones in Ghana and four sites in South Africa. Overall, AGC populations from Tanzania revealed higher haplotype diversity than those from

the other countries. AMOVA revealed a considerably higher genetic variation within than between populations in all geographic regions. Demographic history analysis revealed a negative and significant Tajima's D for the populations from southern Africa. The Fu's Fs was negative and significant for all populations across the three regions indicating population increases. **Conclusion:** This is the first study to compare maternal lineages of AGC populations from eastern, western and southern Africa and provides a basis for future genetic studies of *T. swinderianus*. Populations from three geographical regions revealed both negative and positive Fu's Fs values indicating that other populations are undergoing either recent population expansion or genetic hitchhiking or population bottleneck. Hence indicating the areas where the government should concentrate more energy in conservation however the status of *T. swinderianus* is the least concern.

Keywords: African Greater Cane rats, demographic history, conservation genomics, evolutionary history, mt-DNA, maternal origin.

New record on capture and consumption of two juvenile red-legged sun squirrels (species) by a female chimpanzee in Mahale Mountains National Park, Tanzania

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Abstract

In many chimpanzee study sites, females and immature chimpanzee individuals have been less observed in hunting than male chimpanzees. However, solitary and silent hunting attempts by such individuals may have been missed. Chimpanzees hunt, kill and consume a variety of prey though there are differences in the frequency of hunting between savanna and forest sites. They hunt primate species, ungulates, rodents, birds, lizards and frogs. Nevertheless, they show a clear focus on mammalian prey. Hunting techniques employed in hunting may vary between chimpanzee populations and depending on the type or age of prey. While there are records of tool aided squirrel predation by the Mahale chimpanzees, there has been no records of chimpanzees hunting and capture squirrels bare-handed before. The use of tools in squirrel hunting by chimpanzees has been

argued as material to rouse the hiding squirrel from a tree hole and to reduce the risk of being bitten by the squirrel's powerful incisor teeth during "bare-handed" exploration in the hole. Unlike in the previous records where chimpanzees used tools to hunt and kill squirrels, here we report, a solitary female chimpanzee who conducted a bare-handed explorative search in the hole of a tree, and succeeded in capturing two juvenile squirrels hiding in the hole and consumed almost all both of them, alone. This observation suggests that hunting techniques in chimpanzees can be more diverse than reported to date. Further, we explore, compare and discuss the behavior exhibited.

Keywords: Chimpanzees, predation, prey, prey-capture styles, bare-hand exploration

Medium and large-sized mammal survey in the Northern Highland Forest within Ngorongoro Conservation Area Authority in Tanzania

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Abstract

Northern Highland Forest is one of the main habitats found within the Ngorongoro Conservation Area Authority (NCAA). Apart from being the water tower for the communities living in Karatu District, it is also a crucial habitat for various forest

mammal species. However, little is known about the status of forest mammals within the area compared to other habitats found within NCAA. To address this gap, we conducted camera trap surveys from November to December 2018 of which a

total of 9 camera traps were set covering mostly the western side of the forest at a density of 2.5 km² per camera. Each camera trap was set for a minimum of 34 days and yielded a total of 8050 images. We used Wild ID software which has built-in IUCN Red list of mammals for identification and R program for analyses. We derived for each photographed species the number of camera-trapping events as the number of images filtered by 1 hour. We also considered the Relative Abundance Index (RAI) as a proxy for abundance. Our results showed that a total of 24 species were found in the area with Dik dik (*Madoqua kirkii*) being the most abundant species (RAI=23.6) followed by bush duiker (*Sylviscapra grimmia* (RAI=11.65)) and African buffalo

(*Syncerus caffer*; (RAI = 11.36)). In addition, the African elephant (*Loxodonta africana*, (RAI = 7.10)), Marsh mongoose (*Atilax mongoose*, (RAI = 7.67)), common genet (*Genetta genetta*, (RAI = 7.39)) and Leopard (*Panthera pardus*, (RAI = 7.10)) were among other abundant species. Our findings show the importance of the Forest habitat for the conservation of endangered species such as the African elephant. Reinforcement of conservation measures is still critical in managing important mammals' habitats.

Keywords: Forest mammals, endangered species, relative abundance index, abundance and camera traps

Resource partitioning among savanna herbivores: key determinants of forage quality variation

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Abstract

African savanna ecosystems host a diverse community of mammalian herbivores, from small dik-diks to gigantic elephants. Their coexistence is enabled through the partitioning of plant resources of different quality and quantity. The drivers of such resource variation across spatial scales are still poorly understood, especially the role of plant species turnover (interspecific) vs. plasticity within species (intraspecific). To investigate the relative importance of these factors, we determined plant species composition in nine study sites selected along a rainfall and fire frequency gradient (680-1000 mm/yr) in Serengeti National Park, Tanzania. In total, 121 leaf samples of 50 common plant species were collected from those sites and measured for nitrogen, phosphorus and sodium contents. Of those, samples of the same 13 plant species were collected at multiple sites (≥ 3), allowing

nutrient comparison within species across sites. We found that nitrogen contents showed large inherent differences between plant species but little variation within species along the environmental gradient. In contrast, intraspecific phosphorus contents significantly decreased with increasing rainfall and fire frequency. The combination of species and site determined the most variation in sodium contents. We suggest that at high rainfall and fire frequency, soil nutrients are more easily lost through run-off of ash and/or combusted after fire, leading to potentially lower quality forage resources. However, nitrogen is more easily replenished through nitrogen-fixing plants taking up atmospheric nitrogen, thus making species-specific nitrogen less affected by landscape gradients. Instead, sodium seems related to specific drought adaptations of particular

species on particular sites. To meet their food quality requirements, herbivores need to select the right plant species and foraging locations, which is likely only possible in larger protected areas with extensive environmental gradients.

Keywords: dietary niche partitioning, herbivore coexistence, plant nutrients, spatial heterogeneity

Unveiling the Enigmatic *Rungwecebus Kipunji*: The Untold story behind its conservation setbacks.

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Abstract:

The kipunji (*Rungwecebus kipunji*), a critically endangered primate species, is confined to the Southern Highlands of Tanzania, specifically the Rungwe-Livingstone Forest. This species faces severe endangerment due to habitat loss resulting from the expansion of agriculture and human settlements. A comprehensive study was conducted using structured questionnaires, focus group discussions, and consultations to investigate the factors contributing to the kipunji's decline. The study revealed three key factors placing the kipunji at risk. Firstly, 62 % reported that kipunji is notorious for raiding crops, although it primarily targets non-agricultural crops. The absence of effective strategies to mitigate crop raiding exacerbates the conflict between the species and local communities. Secondly, 35 % reported that the kipunji is hunted for consumption as a delicacy, providing a source of income for some communities. However, this threat is often overlooked and underreported. Lastly, limited manpower and resources are allocated to protect the species, as it does not receive special attention from relevant organizations. To ensure the survival of the kipunji, immediate actions are required. Firstly, the development of

non-lethal methods should be prioritized to mitigate crop raiding by the kipunji. Implementing strategies such as deterrents, barrier methods, or alternative food sources can reduce conflicts between the species and local communities. Secondly, there is a pressing need to enhance anti-poaching activities to protect the kipunji population effectively. This includes increasing patrolling efforts, strengthening law enforcement, and raising awareness about the importance of conserving this critically endangered species.

Key-words: *Rungwecebus kipunji*, human wildlife conflict, coexistence, Rungwe



Vultures population surveys and monitoring in makao wildlife management area, Meatu district in Simiyu region

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Abstract:

The drastic decline of all species of vultures during recent decades in Africa is a well-known fact. Poisoning, habitat destruction, and traditional uses have been considered among the major factors behind the vulture population crisis. However, limited information is available on their population status and distribution range around the world. For effective conservation activity, regular updates to monitored data and population estimates are inevitable. The project aimed to establish baseline data on the current population status through population counts and distribution patterns, with the objective of identifying vulture species and their diversity at Makao WMA. The study was conducted in Makao WMA in two seasons: wildebeest migration (December–April) and non-wildebeest migration (May–November). The road count method was used for the survey within 9 developed transects. Four different species of vultures, named the White-backed Vulture (150), Ruppell's

Vulture (37), Lappet-faced Vulture (22) and Palm-nut Vulture (4), were seen during wildebeest migration. The findings show that Transect 7 was more diverse ($H = 0.84$) compared to Transect 8 (0.07). On the other hand, for non-wildebeest migration, only Ruppell's Vulture (1) and Lappet-faced Vulture (2) were observed in transects 3 and 8, respectively. The findings show that Transect 3 was more diverse ($H = 0.37$) compared to Transect 8 (0.27). As we targeted surveying in the two seasons during wildebeest migration and non-wildebeest migration seasons. The numbers and diversity of vultures after wildebeest migration look smaller compared to those during wildebeest migration. The results imply that the movement of wildebeests has significant influence on the movement and distribution of vultures in Makao.

Key-words: Conservation, Distribution, Vulture, Wildebeest migration.

Factors influencing the density of udzungwa red colobus monkey (*procolobus gordonorum*) in magombera forest reserve, Tanzania

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Abstract

The vulnerable Udzungwa Red Colobus Monkey (*Procolobus gordonorum*) population has been declining due to habitat degradation. This study was conducted to understand the population

status of *P. gordonorum* in Magombera Forest Reserve (MFR) after its annexation to a nature forest reserve. The Line transect distance sampling technique method was used to assess the population density

of *P. gordonorum*. Primate census was conducted in three different habitat types including semi-evergreen forest, semi-deciduous forest and wooded grassland. In each habitat type, important variables including tree species richness, tree DBH, tree height, fire and human disturbances were recorded. Above-ground biomass was computed using the allometric model. Tree species richness was obtained by counting the number of tree species in each transect. Tree species diversity was computed using the Shannon-weiner diversity index. Food treespecies density was obtained by dividing the total number of individual edible tree species per hectare. A Generalized Linear Model with a Gaussian error function was run to determine the influence of predictor variables on the density of *P. gordonorum*. The Kruskal-Wallis test was used to test for any significant differences in predictor variables among the three habitats. There was a significant difference in the density

of *P. gordonorum* among habitat types ($p < 0.05$). The estimated density of *P. gordonorum* was the highest in the semi-evergreen forest (44 individuals per km²) and the lowest in wooded grassland (1 individual per km²). Vegetation structure and human disturbances influenced the density of *P. gordonorum*. Tree species richness, above-ground biomass and fire had an explained deviance of 78.4%, 76.3% and 44.1% respectively. Furthermore, there was a significant difference in tree species richness, above-ground biomass and *P. gordonorum* among the three habitat types ($p < 0.05$). Findings from this study are essential in the conservation and management of *P. gordonorum* on a large scale.

Keywords: Red colobus monkey, population density, vegetation, anthropogenic activities, Magombera Forest Reserve

Ashy red colobus (*Piliocolobus tephrosceles*) current potential suitable habitat distribution in western Tanzania

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Abstract

Primates are currently confronting habitat loss, placing many of them as endangered. Nevertheless, the challenges posed by climate change worth dedicated and active conservation actions targeted specifically at preserving primates in their natural habitats. The Ashy red colobus in Tanzania, for instance, inhabits solely the western regions. However, with climate change introducing additional pressures, their habitat distribution has become increasingly scarce. Surprisingly, no

study has yet explored the implications of present climate change on the potential suitable habitat distribution of Ashy red colobus in western Tanzania, essential to update the existing conservation plan. We applied Maxent, a machine learning platform, current climate variables, land cover data for 2020 and Ashy red colobus presence data collected from 2014-2015 in the Greater Mahale Ecosystem and Ufipa plateaus, Gombe (2020-2022) and Burigi-Chato (2020-2022) National Parks

to predict current potential suitable habitat distribution of Ashy red colobus in western Tanzania. Greater Mahale Ecosystem, Gombe and Burigi Chato national parks were predicted as current potential habitats coherently to presence records. Other new areas (north and south) were predicted as current potential suitable habitats. The existence of potentially suitable patches east and south of Gombe, the entire Mahale National Park, and west and northeast of the Ufipa plateau suggest a patchy distribution of Ashy red colobus. At least Mahale Mountains National Park provide

connected distribution with Greater Mahale Ecosystem populations. Our findings predicted coherently the areas surveyed for presence records of Ashy red colobus important habitats. Newly predicted areas worthy of additional surveys. These results are important for updating Ashy red colobus's current conservation action plan under climate change and population monitoring in western Tanzania.

Keywords: Ashy red colobus, climate change, potential suitable habitat, western Tanzania

Movement patterns of rodents associated with spatial-temporal and habitat heterogeneity in rural landscapes, Eastern Tanzania

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Abstract

Crop losses and disease transmission caused by wild and domestic rats is influenced by their foraging behavior; however, there remains lack of knowledge concerning the movement patterns of these rodent pests in rural landscapes. We investigated movement patterns of *Mastomys natalensis* and *Rattus rattus* between domestic, peri-domestic, and crop fields near homesteads in Kilombero using Rhodamine B as a tracking method. We hypothesized that rodents movement pattern is significantly associated with temporal-spatial and heterogeneity of habitats, seasons and cropping calendar. A total of 370 individuals, for *Mastomys* (84.32% and *Rattus* (14.32%) had consumed Rhodamine-B bait that was distributed across their home ranges to detect their movement for four months. We found movement patterns significantly varied between the rodent species, across seasons

and habitats. *M. natalensis* exhibited longer travel distances when the bait was placed outside near water pumps and decreased movement in houses. In contrast, *R. rattus* showed limited movement, mostly remaining close to the baiting point. During rainy seasons, *M. natalensis* exhibited high movement (250m) but moderate (150m) in dry season. In contrast, *R. rattus* showed minimal (35m-50m) movement during both seasons. These movements closely followed the cropping season cycle. Furthermore, across the periurban -rural gradient, *M. natalensis* displayed diverse movement patterns across different habitat types from the Rhodamine B station, with RB-positive individuals showing longer movements near watertaps (>200m) and in crop fields (>150m), while movement decreased significantly in houses located approximately 280m away, as well as in peridomestic areas. In contrast, *R. rattus*

did not exhibit distinct movement patterns, and a higher proportion of RB-positive individuals were found confined within houses. These findings provide valuable insights into the ecological dynamics of rodent species and can inform pest

management strategies and rodent control efforts in the study area.

Keywords: Habitats, Rhodamine B, rodent control, rodent movement patterns, seasons

Investigating the daily activity, morphometrics and diet of the Pancake Tortoise *Malacochersus tornieri* in Tanzania

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Abstract

Pancake-shaped tortoise East African endemic *Malacochersus tornieri* is classified as severely endangered, with habitat degradation and excessive collecting for the pet trade being the main causes. However, the species only live in a few numbers of kopjes, rock outcrops, and rocky slopes due to its severe ecological needs. These microhabitats are sadly extremely fragmented and surrounded by huge areas of unsuitable habitat, which limits interpopulation genetic exchanges and migration. In this study, pancake tortoise populations at Vilima Vitatu, Tarangire National Park, and Chemba district will be examined for their morphometrics, sexual dimorphism, and population demography. Additionally, poor connectivity may cause

reduced gene flow between subpopulations and a loss of genetic diversity within populations, which could eventually result in inbreeding. In planned locations, observations of the morphometrics of wild pancake tortoises (*Malacochersus tornieri*) will be made in August 2023. The ranges of carapace length for several pancake tortoises will be measured separately for both sexes. Additional measurements will include carapace width, height, body weight, and plastron length. Carapace length and breadth relationships will be evaluated and compared across various sites. Furthermore, it is anticipated that a comprehension of how human activities and other connected hazards affect Pancake Tortoise well-being across several research sites will be developed. The information collected from this study will be useful in assisting the management of Tanzania's rare Testudinidae species and other African locations where they are found.

Keywords: Testudinidae, Carapace, vilima vitatu



Diversity and Richness of Butterfly Among Various Habitat of Msolwa, Nyerere National Park

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Abstract

The study was focused on butterfly diversity and richness among various habitats within four areas namely; Kasungura, Manane, K5, River Ruaha, and River Kilombero located in Msolwa area, Nyerere National Park. A survey was conducted between November 2022 to March 2023 by using the following techniques sweep nets, banana-baited traps, and visual observations. GIS mapping and reconnaissance surveys were done before habitat selection. A stratified sampling technique was employed in the selection of habitats for butterfly sampling in the study area. A traditional transect (pollard walk) of 1km was established in each habitat, walking transects were done at a constant rate of 20 minutes per plot. A total of 10 plots with 5 meters side by side within the transect were established systematically with an interpoint distance of 100 meters between 0700 hours to 1100 hours. The results showed that a

total of 1037 butterflies from 95 species belonging to 5 families were recorded. Butterfly species richness was highest in the riverine(68) habitat of Ruaha and Kilombero, and lowest(16) in Marsh vegetation (Kasungura). A mean number of individual butterflies was highest in forest compared to riverine, woodland, and marsh habitats. The findings from this study concluded that climatic change, habitat transformation, seasonal burning, and the absence of floral resources affect the richness and diversity of butterfly species. Furthermore, the study recommends that more conservation efforts should be employed so as to reduce the likelihood of butterfly species extinction.

Keywords: Butterfly, diversity, evenness, richness, habitat, Msolwa area, Nyerere National Park

Habitat suitability modeling for sustainable conservation of the endangered red colobus in lower Tana River Delta, Kenya

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Abstract

Tana River red colobus (*Piliocolobus rufomitratu*s) is an endangered primate species endemic in 34 patches of fragmented forest that stretches 60 km from Kipende to Mitipani in the lower Tana River delta in Kenya. Despite various conservation efforts and measures on these fragments, red colobus still face

diverse anthropogenic threats, yet a new group of red colobus that was discovered in a communally owned land 70km away from their already known range is thriving well. This study sought to determine if the area between the newly identified group and the known range is suitable for red colobus and come up with ways of

promoting contiguous suitable habitat for the red colobus meta-populations in Tana delta. Data were collected by mapping biogeophysical features using GIS techniques and recording red colobus movement via ground tracking. Biogeophysical maps were prepared in ILWIS software and habitat suitability map determined using Logistic regression models. Results showed that red colobus prefers habitats in forests, near surface water, far away from settlements and roads. Most of the area between the newly identified group and the known range is not suitable for the red colobus. The factors contributing to the degradation of the red colobus habitat in this area include: harvesting of trees, charcoal production, fire, abstracting river water for agriculture,

infrastructure development and changing river course. The following strategies have been identified for improving the habitat suitability: reforestation of indigenous trees; zonation for different land uses and establishing alternative livelihood projects. If the government and non-governmental conservation bodies work together with local communities on these intervention strategies, there is great possibility of creating a contiguous suitable habitat for all red colobus groups in Tana River delta and thus boost their population and avoid extinction of this species.

Keywords: Endangered Primates; Habitat Suitability Modeling; Logistic Regression; Tana River Delta; Tana River Red Colobus;

MIXED SUB-THEME:

Rangeland degradation – the threat of invasive species infestation in northern Tanzania

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Abstract

The rangelands of northern Tanzania are at high risk of degradation due to increasing anthropogenic pressure and climate change. One of the identified degradation parameters and most serious threats to biodiversity, eroding rangeland productivity, is invasive plants. Although the majority of invasive species found in Tanzania are exotic, some native species, favored by poor rangeland conditions became invasive, such as *Solanum incanum* and *Dichrostachys cinerea*. Climate change and poor grazing management will likely favor the expansion of the presence of invasive, non-palatable plants both in rangelands and in protected areas. For local pastoral communities, who are entirely dependent on the health of their rangelands, invasive species create a major threat to livelihoods and, consequently,

food security. The presence of new species is often ignored until they widely invade grazing areas and affected available fodder resources for livestock. The first step for proper invasive plants management is their correct identification and distribution. Through vegetation sampling and distribution mapping conducted for circa 8 years we were able to identify the most common invasive plants and their distribution, and train 510 people in 21 villages on their correct management. The vegetation sampling includes assessing vegetation height, ground cover, density and species occurrence using four 25m transects from a central point, recording data every 5 meters, in 1 m² plots. The information collected regarding invasive plants was translated into posters which

were distributed in 21 villages and 19 schools, helping communities to identify invasive plants and learn about the most appropriate and cost-effective management.

Keywords: rangeland health, grazing areas, vegetation assessment, rangeland restoration

Challenges of domestic tourists on visitation to Tanzanian national parks

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Abstract

Domestic tourism has been regarded as a key driver of tourism sector globally, accounting for 73% of total tourism travel and spending in 2017. However, in Africa, particularly Tanzania, domestic tourism has been largely disregarded and undervalued contributing little to the economies of the tourism-dependent nations. This review article sets out to present the challenges faced by domestic visitors on visitation to Tanzanian national parks. The study employed an integrative conceptual review approach whereby various published and unpublished documents on domestic tourism in Tanzanian protected areas were

summarized and evaluated. The findings of the review revealed several challenges that face domestic visitors, especially those who desire to visit Tanzania's national parks - including economic challenges that leave them with little or no disposable income. In conclusion, the paper underscores the gravity of the problem and its implications for tourism sustainability in Tanzania and offers some recommendations for improving the situation.

Keywords: Challenge, domestic tourists, visitation, Tanzania, National Parks

Current situation of human-elephant conflict in western Tanzania

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Abstract

Human-elephant conflict (HEC) is an increasing problem that poses serious challenges to wildlife conservation authorities, local communities as well as the elephants themselves. The study was intended to provide insights in the current situation of human elephant conflicts in agricultural community adjacent to protected areas and its policy implications. In order to understand the magnitude of HEC in western Tanzania, Western Wildlife Research Centre (WWRC) conducted a study in Kigoma, Tabora, and Katavi and Rukwa regions. The study used Focus Group Discussion (FGD) and Household

(HH) Interview data Collection Techniques using a list of guiding questions and a semi-structured questionnaire. Results showed that majority of respondents were not indigenous to the villages adjacent to the protected areas. They migrated to these villages in search of land for cultivation that resulted in population density increase surpassing threshold for elephants to tolerate interaction with humans in the study area. Crop raiding was reported to be the main HEC in the study area with maize crop being mostly affected. This was attributed to low use of HEC mitigation measures as less than 50% of respondents

were aware of local ineffective mitigation measures this study found that overall majority of farmers cultivated 1 to 5 acres and incurred loss of 0 to 20 bags of maize due to elephants. Our findings show that currently, farmers are not acquainted with effective HEC mitigation techniques. This makes agriculture production in villages to be rather difficult and discouraging due to crop raiding problems caused by elephants. It is recommended that it will be beneficial

and more cost effective to provide education on awareness and set up experimental plots to test various mitigation strategies so as to develop specific mitigation strategies. In the HEC hotspots, research on elephant movement patterns is very important to predict future elephant crop raiding events and to assist with land use plan decisions.

Keywords: HEC, local communities, western Tanzania, wildlife conservation

Effect of Urbanisation on Avian Community in Tanga Metropolitan Areas, Tanzania

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Abstract

Urbanisation has had profound impacts on wildlife including birds. Tanga, being the second largest city along the coast of Tanzania, is also subjected to high rate of urbanisation. We conducted a study to assess the impact of urbanisation on the avian communities in Tanga metropolitan areas. Study area was stratified into three zones with different levels of urbanisation; central business district (CBD), semi-urban (SU), and peri-urban (PU). Birds were sampled using point count method. We also estimated the following environmental variables (urbanisation indices) at each census point: percentage cover of buildings, pavements, bare land, and vegetation, and number of parked vehicles and pedestrians. A total of 1358 individual birds from 28 families and 8 orders were recorded. Parked vehicles, buildings, pedestrians, pavements increased towards the CBD whereas bare land and vegetation cover increased towards the PU ($\chi^2 = 2313.808$, $df = 10$, $P < 0.05$). Avian species diversity decreased with the increase in urbanisation (with significant levels, $P < 0.05$) among zones:

CBD *versus* SU, CBD *versus* PU, and SU *versus* PU. However, in the CBD there was high abundance of alien bird species; House Crow and House Sparrow. The first two axes of the canonical correspondence analysis scatter plot explained 62.72% and 37.28% of the variance in the species, whereby vegetation and bare land had significant influence in distribution of birds than pavement, buildings, parked vehicles and pedestrian. Because urban sprawl is increasingly affecting avian communities, it is worth considering some strategies to increase green spaces and managing urban gardens by planting native trees. Moreover, the dominance of alien bird species may as well outcompete and threaten native avifauna; we therefore recommend their population control. For House Crow, long-term trapping and garbage management could work well.

Keywords: Alien bird species, Avian community, Environmental variables, Urbanization.

The Ban on Trade in Live Wild Animals: Emerging Coping Strategies amongst Butterfly Farmers in Amani Nature Reserve in Tanzania

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Abstract

In 2016, the government of Tanzania banned the export of live wild animals for three years, partly because illegal permits were causing a massive loss of government income and resources. The ban on trade has triggered changes in coping strategies among the butterfly farmers in the study area. Yet, little is known about these changes and dynamics and their effectiveness in ensuring secure livelihoods. The study aimed at investigating the coping strategies developed after the 2016 ban on live wildlife trade among butterfly farmers and the effectiveness of the strategies. Specifically, we selected 143 sample households using the Exponential Non-Discriminative Snowball Sampling Technique (ENSST). A Likert scale was used to identify the perception of the local community regarding the impact of banning the wild live animal trade on the local economy and conservation. Kendall's coefficient of concordance and Friedman's test were used to test the level of agreement and significance of the mean ranks of the best copying strategy identified among

butterfly farmers. The findings showed that agriculture farming, and causal labour were highly ranked as the main coping strategies. However, the strategy was rated as less effective (83%), not only causing many environmental challenges in the area but also causing substantial deterioration in the living standards of the butterfly farmers. Before the ban, farmers were motivated to participate effectively in the conservation of ANR as this was the main source of breeding stock for butterfly farming. The ban has reduced the motivation of local communities to participate in the conservation of ANR. A thorough revisiting of the ban is recommended. As such, we further recommend lifting the ban on the butterfly trade, as its benefits substantially outweigh its costs, especially in terms of securing livelihoods and conserving the ANR.

Keywords: Butterfly trade, Trade bans, Forest conservation, Livelihoods, Amani Nature Reserve

Human migration into rufiji delta wetlands as climate change adaptation strategy: Effects and mitigation measures

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Abstract

The Rufiji Delta Wetlands has the largest single remains of mangrove forest in Eastern Africa, with higher biodiversity. However, the health of the delta mangroves is threatened by the immigration of people.

This study, therefore, aimed at assessing the effects of human migration to the delta's wetlands and mitigation measures. Specifically, we assessed human migration patterns into the delta, their socioeconomic

activities and land cover changes. Qualitative data were collected from Focus Group Discussions and Key Informants Interviews, while land cover changes were obtained through Satellite images using Remote Sensing. While qualitative data were analyzed using the ethnographic content analysis technique, ArcGIS Pro's Change Detection Wizard assessed the land cover changes. Four migration patterns were found, including Inter-village, inter-district, and inter-region migration to the Rufiji Delta wetlands. Deforestation for rice farming and cattle grazing was the major socioeconomic activity that negatively affected the wetlands ecosystem. About 4500 farmers farming in the delta wetlands

contributed to the loss of 7000 ha of mangroves from 1991 to 2016. A total of 123 pastoralists with 24,967 cattle were reportedly taken to the delta wetlands, owned by pastoralists from Western and Northern parts of Tanzania, more than 800 km from the delta. Farmers and pastoralists continued invading the delta despite awareness-raising and alternative livelihood support from Government and non-government organizations. Therefore, more mitigation measures are needed to sustain the conservation of the Rufiji Delta wetlands in the Rufiji Delta.

Keywords: biodiversity, cover change, migration patterns, socioeconomic

Linking biodiversity conservation and community livelihoods in rural Tanzania: a comparative analysis of parks and Wildlife Management Areas

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Abstract

Communities surrounding Protected Areas (PAs) are key to biodiversity conservation and the integrity of respective protected areas. Biodiversity conservation has an important direct positive benefit on rural livelihoods. Another aspect to consider is the costs of human-wildlife conflict in conservation areas through incidences of crop and livestock loss as well as raiding animals and risk to life (Kimario et al., 2020). In poverty-stricken communities, this cost is disproportionately high (ibid). Conservationists aim to offset these costs and build support for PAs by “making informed and fair trade-offs between social, economic and ecological costs and benefits in a way that is relevant to most involved parties. Over time, different conservation approaches have been deployed to engage local communities into biodiversity conservation objective while ensuring that they benefit from such resources in or adjacent to their land. However, the effectiveness of these approaches in Tanzania is not yet clear. This study used the Social-Ecological

Systems Framework (SESF) to examine the link between biodiversity conservation and livelihoods and its outcome on sustainable local development and conservation objectives. To reach this aim, the study: mapped the flow of benefits from parks and WMAs to local livelihoods; assessed the benefits accrued and values attached to natural ecosystems and their implications on sustainability as perceived by locals; and established whether the dynamics of community needs have altered the character of biodiversity conservation and their livelihoods. The study was conducted in the Tarangire – Manyara Ecosystem and involved 2 National Parks (Tarangire and Lake Manyara) and 2 WMAs (Burunge and Randilen). 8 villages were chosen from this study area based on proximity to a national park or WMA. The study adopted both qualitative and quantitative research approach.

Keywords: biodiversity conservation, community, livelihoods, parks, Wildlife Management Areas

Using survival analysis from telemetry and transects to assess short-term population trends in vultures

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Abstract

Determining short-term (<10 years) population trends in vultures is critical for their conservation, both to understand threats and ecology of the population but also to evaluate conservation interventions. Telemetry studies can be used to estimate survival rates, and has become a common tool for assessing population trends, but cost can limit sample size. Transects can be useful for assessing changes across multiple species, but can be affected by variation in survey conditions and large confidence intervals due to natural variation in vulture numbers.

We used two methods to assess population trends in three protected areas in southern Tanzania over 6-8 years: satellite telemetry data primarily from White-backed vultures to estimate survival rates, with corresponding population trajectories based on population models, and transect counts for seven scavenging raptors. We incorporated carcass presence into transect models to account for aggregations of

vultures that can occur when these are along transect routes. Both methods suggest declines for White-backed vultures in Ruaha and Nyerere National Parks, while only telemetry estimates suggested significant declines in Katavi National Park. With 25% annual mortality rates, the telemetry work shows that poisoning is prevalent while highlighting the challenges of determining cause of death when working across large, rugged landscapes. Despite these declines, southern Tanzania remains an important stronghold for African vultures with higher current encounter rates than elsewhere in East Africa. However, preventing further declines will heavily depend on the ability to mitigate the threat of poisoning. This study demonstrates the value of using multiple techniques when attempting to understand population trends in vultures over short time periods.

Keywords: Decline, mortality, poison, White-backed vultures

Mapping Potential Areas for Avitourism in Ruaha National Park, Tanzania: Key Updates for Biodiversity Conservation and Tourism Diversification.

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Abstract

Avifauna form a significant component in terrestrial and aquatic ecosystems and they have socio-economic and conservation benefits. However, information to ascertain

their importance in terms of diversity, richness and abundance for conservation and for avitourism in the park are scarce. This study therefore attempted to determine

the current species richness, diversity and abundance in different zones and habitats, also intends to describe the distribution of bird species of conservation importance especially the endemic, rare and threatened species and to map hotspot areas with key avifauna potential attractions for avitourism in the park. A total of 428 bird species comprising of 45,194 individuals from 28 orders and 91 families were recorded. The southern zone had the highest species richness 394 (176.17 ± 34.41), abundance (1461.50 ± 625.80) and diversity ($H' = 4.44 \pm 0.19$), northern has the least abundance with 141 (58.00 ± 25.23) species. The species richness differed significantly across zones ($F = 5.38$, $df = 5$, $P = 0.0045$). Habitats-wise, shrubland had the highest mean number of species (112.0 ± 16.23) and diversity ($H' = 4.11 \pm 0.25$). However, the differences were not significantly across habitat types ($F = 0.628$, $df = 5$, $P = 0.7060$).

The highest abundance was recorded in Vachellia woodland (933.0 ± 860.63) but the abundance differences did not differ across habitat types ($F = 0.49$, $df = 5$, $P = 0.807$). The variety of habitats requirements in shrubland contributed to overall richness and diversity. Hotspot areas for avitourism were observed at central zone where there is good number of permanent roads. Therefore, future management plan should consider improving road network which will facilitate to access refuge habitats for continued survey of birds in Ruaha ecosystem. Further study is necessary in wet season in order to have comparison information that will assist in conservation of birds and avitourism planning in Ruaha National Park.

Keywords: Avifauna, Avitourism, Mapping, Ruaha National Park,

Harnessing the Power of social media: Promoting Wildlife-Based Tourism in Tanzania

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Abstract

Social media has emerged as a powerful tool for promoting wildlife-based tourism in Tanzania, significantly impacting the growth of the tourism industry. This systematic review delves into the influence of social media on local wildlife tourism, focusing on popular platforms, advertisement formats, and user engagement. The study gathers information through a comprehensive literature review and social media site analysis from various databases and tourism organizations. WhatsApp, Facebook, Instagram, Twitter, YouTube, and TripAdvisor are widely used by the wildlife tourism industry to reach both local and international audiences. Wildlife tourism advertisements on social media encompass diverse formats, from

captivating images and videos showcasing Tanzania's natural beauty, wildlife, and unique experiences, to engaging storytelling campaigns featuring wildlife encounters and conservation efforts. Influencers and user-generated content have become prevalent, fostering authentic connections and higher user engagement. User engagement, as demonstrated by likes, comments, shares, and hashtags, reveals the effectiveness of social media in creating a community of passionate travellers and potential visitors interested in Tanzania's wildlife. Social media platforms facilitate interactive spaces where tourists share experiences, seek information on conservation, and exchange recommendations, fostering a virtual wildlife tourism community.

In conclusion, this systematic review highlights the significant role of social media in promoting wildlife-based tourism in Tanzania. By strategically utilizing popular platforms, creative advertisement formats, and high user engagement, Tanzania enhances its visibility as a premier wildlife travel destination. As

social media evolves, stakeholders should adapt marketing strategies to fully utilize its potential in driving sustainable wildlife tourism growth and fostering positive destination experiences.

Keywords: Social media; Tanzania; Tourism advertisements; User engagement

Community-Based Wildlife Management Area as a tool for conflict resolution between Conservation Practices and Livelihood needs in Loliondo Game Reserve, Tanzania

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Abstract

The theme of the conference is reflected in the Human-Wildlife Co-existence for wildlife conservation and socio-economic development facing Tanzania and other regions of the globe. This article investigates how changing perceptions of wildlife management have resulted in conflicts between conservation practices and the livelihoods of local communities near protected areas. This study focuses on people who reside in and are relocated from protected areas. It examines the various adaptations around protected areas over the past two decades, including changes in population structure, social, economic, and cultural norms, and recommendations

for future anthropological study directions. This study investigates protected areas to observe, comprehend, and create a healthy natural environment and society (culture) and manage and control their relationship at Loliondo Game Reserve. I argue that the absence of Community-Based Wildlife Management Areas (WMA) encompassing Loliondo Game Reserve as a tool for resolving conflicts between local communities and management authorities regarding wildlife conservation has negatively impacted livelihoods. This article analyses the inadequacies of current methods for resolving human-human conflicts and propose the establishment of a WMA that addresses the fundamental social, cultural, and ecological challenges affecting humans and biodiversity in the vicinity of protected areas. Interviews, focus group discussions, direct observation, and secondary sources were used to acquire information.

Keywords: Conflict resolution, Human-Wildlife Co-existence, Livelihoods challenges, Protected areas, Wildlife Management Areas



Women leading rangeland restoration in Northern Tanzania

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Abstract

Rangeland degradation and invasive species infestations in northern Tanzania threaten the survival security of pastoralist communities and wildlife habitats, with women bearing the greatest burden. Despite their unequal vulnerability, women hold the potential to drive positive changes in their communities by addressing climate change and rangeland degradation. So far, more than 400 female Rangeland Guardians have been trained to effectively manage and restore degraded rangelands focusing on co-identified degraded areas within village grazing areas to improve pastures, livelihoods, and wildlife corridors. To this point, 418 hectares of land have been restored. Through their diligent efforts in addressing issues such as bare ground, bush encroachment, soil erosion, and invasive plants, Rangeland Guardians rejuvenate degraded landscapes and enable the potential recovery of these rangelands through proper grazing management. The assessment of rangeland conditions combines field vegetation surveys to evaluate indicators of degradation, including vegetation cover, soil erosion, and invasive plant species occurrence, utilizing satellite imagery to track changes in vegetation patterns over time. It is expected to find invasive plant species reduction and biodiversity and ecosystem health improvement in the restoration area. Successful restoration relies on women's commitment, rainfall, and zero grazing, which allows for necessary resting time. Yet, enforcing zero grazing

in resource-scarce communities proves challenging due to weak governance and influential members violating agreements and grazing on limited grass resources in restoration plots. The community-led monitoring of rangeland's health informs landscape-scale degradation distribution and promotes a more evidence-driven natural resource management of village grazing committees and authorities, while active restoration counteracts the spreading of invasive plant species in the Tarangire-Manyara-Kilimanjaro ecosystem. Women are broadly identified as catalyst of positive environmental change, by targeting vulnerable pastoralist and agropastoral women from disadvantaged rural communities, we aim at increasing resilience of families and communities at large.

Keywords: grazing land, invasive species infestation, rangeland degradation, sustainable rangeland management, women empowerment



Alleviation of *calotropis procera* infestation in Ruaha National Park, Tanzania

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Abstract

Calotropis procera (Calotrope) is a soft-wooded perennial shrub with high ability to survive harsh environment condition. It is disputed for forming dense thickets especially in alluvial soil that reduce the grazing area and value of pasture land. Calotrope is estimated cover more than 500 ha in Ruaha national park that threatens availability of feed resources for grazing herbivores. This compelled the Ruaha national park administration to seek for feasible control of the species. An intact plants trial was established at Msembe site on 5th December 2022 using a Randomized Complete Block Design. The site had an estimate of 370 ha infested with *C. procera*. The site was portioned by establishing square sampling plots of 35m x 35m dimension randomly distributed within site. The trial incorporated seven herbicide treatments that included 5% glyphosate, 12.5% glyphosate, 50% glyphosate, 100% glyphosate, 5% mixture of 1:1 glyphosate and 2,4-Dichlorophenoxyacetic

acid, 10% mixture of 1:1, glyphosate and 2,4-Dichlorophenoxyacetic acid and 100% mixture of 1:1 glyphosate and 2,4-Dichlorophenoxyacetic acid (2, 4 D). Results indicate that the percentage of Calotrope mortality caused by herbicide treatments and period of herbicide application varied significantly ($p < 0.001$). A significant ($p < 0.001$) interaction was observed between herbicide application period and treatments. High content of glyphosate (50 – 100%) killed more than 75% of Calotrope when applied before noon while lower content (<50%) was effective when applied in the afternoon killing about 50% of Calotrope. Mixing of glyphosate and 2,4-D herbicides resulted in relatively lower Calotrope mortality than glyphosate treatments alone. The effectiveness of mixed herbicide decreased with increase in mixed herbicide content.

Keywords: Calotrope, grazing herbivores, feed resources, herbicide, mortality, treatments.







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