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Heritage Science News

Quarterly Newsletter of the Directorate of National Repository & Research, National Museums of Kenya
Issue 2: July-September, 2019

In this issue

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Ekembo: Kenya's Fossil Ape

A brief analysis by Prof. Kieran McNulty Department of Anthropology University of Minnesota

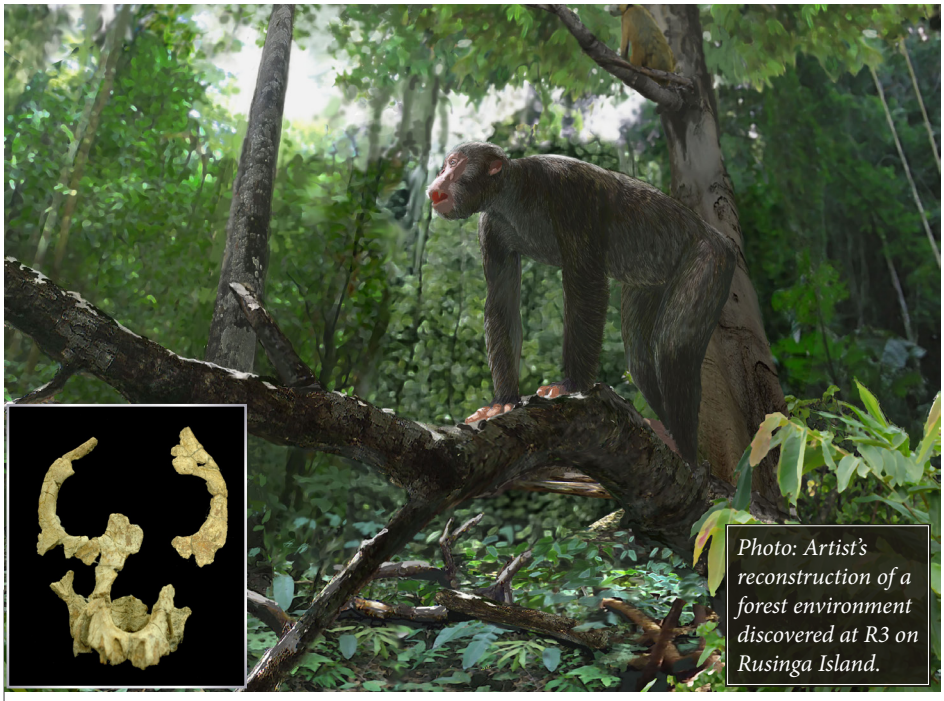

Photo: Artist's reconstruction of a forest environment discovered at R3 on Rusinga Island.

Ekembo is a genus of medium- to large-bodied ape found primarily on Rusinga and Mfangano Islands– fossil sites associated with the Kisingiri Volcano in Western Kenya. Although not the first fossil ape discovered in East Africa, it is certainly the best known of Kenya's Miocene hominoids, with fossil representation for virtually every element of its skeleton. That, combined with the variety and quality of biological remains preserved at these fossil sites, has made Ekembo an important signpost for interpreting the early evolution of the hominoid clade.

What we now call Ekembo was, for many years, referred instead to the genus Proconsul – an ape first discovered at the Kenyan locality of Koru, and best known from other deposits in that area (*Songhor, Chamtwara, Meswa Bridge*) and from Napak in Uganda. Ekembo and Proconsul look similar in many respects: both preserve a rather primitive catarrhine body plan, lacking most of the orthograde and suspensory traits that characterize later ape species and especially modern apes. This explains in part why the two groups were long considered to represent a single genus. Interestingly, however, when Rusinga's fossil

Editorial Note

Once again, I am pleased to present to you the second edition of Heritage Science News, the quarterly newsletter of the Directorate of National Repository & Research. In our current feature, we look at the fossil deposits in Rusinga and Mfangano Islands that have opened new doors into research on the evolution of apes in East Africa. Our scientists and collaborators have made significant steps in piecing together the impacts of recent findings in Lake Victoria basin. With such growing paleontological interest, the possible expansion of the Western Kenya tourism circuit and a boost on the local socio-economy is not in doubt. In keeping with the digital world, research at NMK is not left behind. In this volume, we highlight the use of a Mobile App in crowd sourcing of distribution data for birds in Kenya. The "Birdlaser" offers a revolutionary approach and an unprecedented appeal for users and many volunteers to get involved in biodiversity data collection. Adopting this kind of technology not only enhances public participation in research but also ensures rapid accumulation of data for timely conservation action. Food security has remained a topical agenda for Kenya as envisioned in the current government development framework – the Big Four. One of NMK's flagship projects contributing to this agenda is on documentation, nutritional analysis and market value chain of Indigenous Leafy Vegetables (ILVs). In addition, we also pay keen attention to ecosystems and habitats by taking a critical look at human-induced threats in wetlands. Finally, we engage our readers on an innovative approach on crop pest management using locally available and environmental friendly solutions. For these stories and more, read on…

Prof. Mary Gikungu
DIRECTOR, DNRR

apes were first presented to the public, it was suggested that they represented a more advanced species than Proconsul.

My colleagues and I reached a similar conclusion when we studied all of the relevant fossil material in detail (*https://www.sciencedirect.com/science/article/abs/pii/S0047248415000767)*. Specimens from Rusinga and Mfangano had several characteristics that made them more advanced than specimens from Koru, Songhor, and Napak. These include traits like: check teeth with expanded, bunodont cusps and wide crests; reduced molar cingulum; increased similarity between P3 and P4. Likewise, specimens of Proconsul share several features that fossils from Rusinga and Mfangano do not have: upper and lower canines with a distinctive, "blade-like" tip; mandibular symphysis with a robust, internally projecting shelf. We also found important statistical differences between dental measurements in the two groups. Based on this combined evidence, we determined that the large apes from Rusinga and Mfangano are distinctive enough to be placed within a new genus. We chose the name Ekembo, which means "ape or monkey" in the Suba language, to honor the people who historically settled the Rusinga area.

Photo: Remnants of the Kisingiri volcano viewed from Mfangano Island. The once-giant volcano has collapsed and faulted leaving behind a series of fractured hills rising out of Lake Victoria.

Ekembo is currently only well-known from Rusinga and Mfangano, with a single tooth from Uyoma also placed in this genus. A medium-sized ape from the fossil localities near Karungu may also belong in this group, but specimens are too poorly preserved for an accurate diagnosis. Two species (Ekembo nyanzae and Ekembo heseloni) are recognized, and both are highly sexually dimorphic with males estimated to be about 1.3 times larger than females. Although the species have traditionally been distinguished based on body size, with E. heseloni thought to range from 10-20 Kg and E. nyanzae from 28-40 Kg (nyu-staging.pure.elsevier.com), a revised alpha-taxonomy currently underway suggests that there is much more overlap in species sizes.

Like most early Miocene catarrhines, Ekembo is thought to have been primarily frugivorous but practicing some folivory. There is no evidence known for niche partitioning between species despite the fact that they almost certainly were sympatric.

In locomotion, Ekembo would have more closely resembled a large monkey than a living ape – walking quadrupedally above branches rather than hanging below them. However, some features of the forelimb suggest Ekembo may have included clambering and climbing components in its locomotor repertoire. The brain size of Ekembo, only roughly estimated from a single specimen (KNM-RU 7290), has been characterized as more encephalized compared to cercopithecoids, but this is disputed. Likewise, analyses of dental microstructures in E. heseloni found that the timing of tooth development in this species was slower than in monkeys, but not nearly as slow as in apes.

Habitat reconstructions for Rusinga and Mfangano Islands have varied widely. The most comprehensive study was able to place E. heseloni directly within a multi-storied, closed-canopied forest (*https://www.nature.com/articles/ ncomms4236?origin=ppub*). However, that was based on only one small slice of time in the long occupation of Ekembo in East Africa. Ongoing studies suggest that environments in this region varied considerably over time, with Ekembo occupying more open and dry habitats as well as warmer, wetter ones.

The age of the Kisingiri deposits has been of considerable importance in interpreting variation within Rusinga and Mfangano, and in comparison with other localities. Older Potassium/Argon dates were interpreted to indicate that deposits on Rusinga and Mfangano accumulated rather quickly – hundreds of meters of sediment in less than 500 thousand years – with the most fossiliferous horizons dated between 17.8-17.9 Ma. Our recent analyses combining Argon-Argon and paleomagnetic dating have greatly refined these dates, however, and we now know that the fossil deposits accumulated over a longer period: from ca. 20-17 Ma. Future studies will focus on how the Kisingiri fauna, including apes like Ekembo, changed over that timeframe.

As a scientist, it is humbling to work with this amazing collection of fossils – but more so to realize how little we know about these enigmatic ancestors. One learns quickly in paleontology that each question answered by a new discovery is matched by three or more unanswered questions the discovery brings into focus. With so many spectacular fossils from Rusinga and Mfangano, we are only just starting to see the scope of questions we might be able to answer through rigorous, long-term field and museum research. I anticipate that in 5 or 10 years – with hard work and a little luck – we will be able to provide many new details about the life and livelihood of Ekembo, Kenya's best-known fossil ape ■

Citizen Science and Mobile Technology Helping Study Birds

Photo: Long-crested Eagle at Mount Mtelo - *Photo by* S. Shema

By: Dr. Peter Njoroge
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Citizen science or the involvement of people who are not professional scientists in gathering data or contributing to research is not a new phenomenon but its potential is only now being realised in Africa. With a range of constraints that hamper the speedy collection and availing of critical biodiversity data to policy makers, citizen science is invaluable. At the Ornithology Section, we appreciate the usefulness of citizen science in accumulating large amounts of data and bridging information gaps such as the timing of key life stages/events in birds. It is therefore not surprising that only one out of 1100 bird species that occur in Kenya is listed as Data Deficient unlike other vertebrates. We have had a long history of using citizen scientists to collect useful data. For example, since 1991, we have used citizen scientists to count water birds annually in the Rift Valley soda lakes. These datasets have been used in supporting

designation of some of these lakes as Ramsar Sites under the Ramsar Convention and/or World Heritage sites by UNESCO.

In 2013, we launched an ambitious project to map all the 1100 bird species known in Kenya to update their distribution and conservation status. The obvious approach was to mobilise our huge base of citizen scientists.

Since the last Kenyan bird distribution map was published over 30 years ago, many invasive bird species have upset the natural balance, some native species populations have severely dwindled; besides growing concerns on the impacts of climate change. A freely accessible interactive online bird database with a user protocol was set-up. It later emerged that the protocol was a bit cumbersome for many citizen scientists and was subsequently replaced by a mobile app ('Birdlaser'). The app is more appealing to young users and is inspiring a new generation of ornithologists.

The 'BirdLaser' automates the entire mapping protocol - the user simply logs in all the birds heard and seen and their abundance. The app captures the exact location (geo coordinates), timing and validates the data. This simplifies an otherwise complex data collection protocol, secures the data instantly, eliminates the need for papers and pens in field, enhances accuracy in data collection and most importantly, offers internal validation system once data is submitted.

The data is captured in an online database- http://kenyamap.adu.org.za/, where it is freely accessible. For the field user, the mobile app comes in handy because the data can be sent direct via email to the coordinating office in a spreadsheet format!

Photo: Volunteers During Bird mapping in Kora National Reserve - S. Shema

So far we have registered over 1000 citizen scientists out of which only a third are active, covered 16% of the country and received over 250,000 observation records. There is still a long way to go but matching forward, the achievements of the project cannot be overlooked. Data from the platform has recently been used for EIAs. For instance, the data was used to develop bird sensitivity maps for the wind energy project, a national red list for birds and control of the invasive Indian House Crows. Besides, there is growing demand by national planners, policymakers and environmental managers to provide a support system for the complex reporting requirements of various MEAs such as the Convention on the Conservation of Migratory Species of Wild Animals. Tour companies have also found it a useful tool for the planning of their bird tourism itineraries.

Through IT experts and statisticians, we are using two web-based collaboration platforms, Github (https://github.com/) steered by software developers and Slack (https://slack.com/intl/en-ke/), led by a range of professionals and businesses to develop data analysis tools for the bird map. For the enthusiatic citizen scientists, they get the satisfaction of having done something for the conservation of nature while indulging in their favourite adventures!

The Kenya Bird Map is a collaborative project between the National Museums of Kenya, Tropical Biology Association and Arocha Kenya. The funding partners include the EU's Marie Skdowska-Curie actions programme and the Natural History Museum of Denmark, Swiss Embassy in Kenya, Minara Foundation, Imarisha Naivasha and National Research Fund ■

Indigenous leafy vegetables: 30 years of research and promotion work in Kenya

By: Patrick Maundu
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The giant African nightshade (Solanum scabrum or Managu)

Each of the 60 communities in Kenya has a set of vegetables that it regards as traditional. Cumulatively, the country has a huge diversity of edible leafy vegetables. A database of traditional leafy vegetables at the Kenya Resource Centre for Indigenous Knowledge (KENRIK) in the National Museums of Kenya (NMK) has up to 210 species. Ninety percent of these are picked solely from the wild.

Research on traditional vegetables at the NMK began in earnest in 1989 with the start of the Indigenous Food Plants Programme (IFPP; 1989 – 1992). IFPP, which would later evolve to become KENRIK, laid the foundation for the current research on traditional foods at NMK.

By early 1990s, this huge diversity of vegetables and the knowledge that is associated with it including indigenous recipes, had come under great threat. Eating traditional vegetables had been stigmatized, often being associated with poverty and 'not modern' - a vestige of the colonial and post-colonial legacy, where many Kenyans had a poor attitude towards their traditions. The diversity of leafy vegetables in diet had been narrowed considerably, typically to three vegetables –cabbage (Brassica oleracea var. capitata), kale (B. oleracea var. acephala) locally known as sukuma wiki and Swiss chard (Beta vulgaris subsp. vulgaris, Cicla-Group) locally called spinach.

Phase I

The efforts to bring back African leafy vegetables (ALV) to the Kenyan menu started in 1995; mainly through a consortium of about eleven institutions. In the forefront was the National Museums of Kenya and Bioversity International (then IPGRI). The latter played the role of coordination. The first phase, 1995-1999, saw the documentation of local production systems, associated indigenous knowledge and local use of the ALVs. This phase not only laid a baseline for future work but also selected 24 priority vegetables for further research and promotion.

Phase II

In a meeting convened in Nairobi by International Plant Genetic Resources Institute (IPGRI) in September 1998 at the end of the first phase, key areas of follow-up were identified including: to change peoples' perceptions by increasing awareness of the nutritional and health benefits of the vegetables; collecting germplasm of priority leafy vegetables and improvement through selection; improving seed systems; developing protocols for cultivation; linking farmers to markets; documenting recipes and nutritional analysis. This guided the preparation of the second phase which was launched in 2001. In this phase, partners were expanded to include the relevant government ministries, national research institutions, NGOs, CBOs and universities.

Traditional vegetables had made a come-back by 2003 with most supermarkets stocking them

The data generated revealed the untapped potential of the benefits of ALGs. Most of these vegetables are highly nutritious, a fact that proved helpful during promotional campaigns. Over the next 6 years (2001-2006), the project gathered germplasm and improved it using facilities at the World Vegetable Centre in Arusha. Improved seeds were distributed to farmers and seed companies. Farmers around Nairobi city got agronomic support and were also linked to formal markets, initially Uchumi supermarkets. Promotion was done through series of field days and cooking demonstrations, media programmes and street campaigns. By 2003, a wind of change was noticeable. Traditional vegetables had started to flood both formal and informal markets.

By 2006, consumption of ALVs had increased creating an unprecedented demand. Most supermarkets were now selling the vegetables. Attitudes had changed from that of stigma to pride and the once neglected traditional vegetables were a centre of interest for development workers and researchers. Production and marketing slowly moved from city suburbs into rural areas and soon the traditional vegetables could be seen in even the smallest of markets in rural areas.

Up to 17 traditional vegetable species were now regularly sold in local markets. Restaurants started to include the vegetables in their menu. An impact assessment conducted in 2006 and 2007 positively attributed increased activity to the work of the consortium (*see Gotor, E.; Irungu, C. (2010)*. Weekly gross value of traded vegetables in 2006 was US$1.1 million.

Later years

The following years saw many organizations including NGOs and Universities come to the scene and implement projects on ALVs. From 2008-2011, Bioversity International in partnership with NMK and other local organizations initiated a similar research and promotion approach in Kitui County.

One area (Mwingi South) was chosen as the control site and Kitui Central chosen as the intervention site. A baseline situation was established before intervention. After a year of promotion work in Kitui Central, a marked different was noticeable. Attitudes in Kitui Central had changed. More traditional vegetables were being cultivated in Kitui Central. Other factors like dietary diversity and diversity of marketed species had also been influenced. Vegetables like managu (Solanum spp.), amaranth and spiderplant, previously looked down upon, became mainstream traditional vegetables.

The outcome from this project is a clear demonstration that with the right approach - a multi-disciplinary research and development team, awareness and promotion - neglected and underutilized species can become part of local diets, contributing to nutrition, health and incomes particularly among women and the youth.

Several outputs and outcomes have been realized from the project. Currently, KENRIK maintains a garden for seed multiplication and basic research on traditional vegetables.

The centre also maintains a database of all the 210 species of vegetables and also a recipe database with over 1000 entries. Information on where to get seeds and how to grow and prepare the vegetables is also available. In addition, various publications on ALGs are available at NMK including books (e.g. Mboga za watu wa Pwani, Traditional food plants of Kenya, How to grow and use traditional leafy vegetables) and comprehensive reference databases ■

Human-induced threats and mitigation strategies in Ewaso Narok wetland in Laikipia, Kenya.

By: Walter Nyamolo
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Wetland riparian Crop cultivation in Mathira village, Thome

Ewaso Narok wetland serves poor rural communities, mainly squatters whose livelihoods mostly revolve around subsistence farming, wage labour and extracting various wetland products for sale. Anthropogenic threats to the wetland include cultivation, settlements, and livestock grazing, among other socio-economic activities.

These activities are intensifying pressure on the wetland and its natural resources. High dependence and over exploitation of natural resources of the wetland could subsequently lead to negative impacts on biodiversity, environmental sustainability and ultimately the poor livelihoods of people.

This research assessed impacts of such activities on the wetland ecosystem by identifying socio-cultural user profiles, socio-economic activities, determined impacts of such activities, and established conservation challenges and mitigation measures. Combinations of interview schedules, ground transects, focus group discussions and water sample analysis were used for primary data collection. This was complemented with secondary data review.

The survey design covered 220 households representing 10.1% of total households in the study area. Activities with high degradation potential included; burning of the wetland vegetation, overgrazing, over-exploitation of macrophytes and other wetland vegetation. Some of the negative

impacts included; reduced water supply, low water quality, increased soil erosion, increased siltation and flooding, wetland conversion to farmlands, pollution from agro-chemicals and

Logging for charcoal production in Sosian

increased pest challenges. The growing human population also led to increased sanitary and solid wastes disposal constraints, and disease outbreaks. Uncontrolled land conversion for settlement and cultivation also resulted in human-wildlife and human-human conflicts due to loss of vegetation diversity and cover, grazing habitats and wildlife dispersal areas.

The results confirmed on-going anthropogenic degradation in the ecosystem and revealed strong relationships between the pressures and wetland degradation. Our analysis revealed that agriculture had the most significant impact on water availability, vegetation cover, food production and soil fertility. Very low species diversity and richness was documented, while water quality tests yielded results below recommended health thresholds based on WHO standards.

From the results, it is considered that human activities significantly contributed to the degraded state of the wetland. To address the pressures leading to prevailing unsustainable utilization and poor management of the wetland, community participation in restoration and landuse planning is recommended. Besides, enforcement and implementation of relevant national wetland and biodiversity management regulations and policies and well as international conventions and protocols are necessary to achieve long-term conservation and management. Some of the community-based mitigation habitat restoration activities could include tree planting, bamboo zoning, water retention pans, canals and rehabilitation of earth roads.

Overall, management interventions aimed at reversing rampant degradation and pollution trends are needed to ensure sustainable utilization. This will enhance optimum ecosystem structure and function to support high productivity while ensuring sound ecological balance. Considering that Ewaso Narok wetland is outside protected area network, community participation in restoration efforts is key in the successful implementation of Ewaso Narok wetland restoration programme ■

Assessing Pesticidal Activity of Pawpaw Leaves and Seeds Against Maize Weevils

By Nancy Kwamboka
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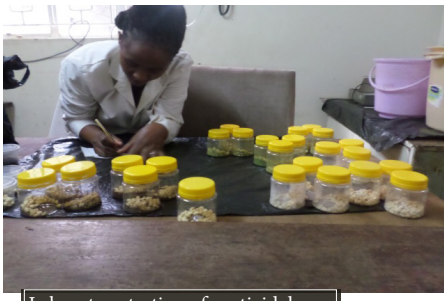
Logging for charcoal production in Sosian

Agricultural sector is the backbone of Kenyan economy, contributing 35% of the GDP and constitutes 40% of the export earnings. However, this sector is facing serious threats such as pest invasion and diseases which significantly reduce crop production leading to low yields. Studies have estimated annual yield losses of about 50% - i.e. 35% and 14% in the field and storage respectively. As a result, half of the Kenyan population is considered food-deficient. This has led to high prevalence of hunger, malnourishment and poverty in many counties in Kenya, particularly in arid and semi-arid areas. The most common practice to control pests and disease carriers involves use of pesticides.

Conventional pesticides, mostly synthetic, are a mixture of chemical substances. These are used in agriculture as insecticides, herbicides, rodenticides, bactericides, fungicides and larvicides to control insects, weeds, rodents, bacteria, fungi and larvae respectively. Unfortunately, synthetic pesticides are generally more expensive, non-environmental friendly and some and potentially cause deadly diseases such cancer and respiratory conditions.

This project evaluated pesticidal activity of crude extracts of leaves and seeds of Carica papaya (Pawpaw) as an alternative approach for control of maize weevil. Traditionally, natural pesticidal plants have widely been used prior to the introduction of synthetic pesticides. These naturally derived pesticides have little to no chemical alteration whereas synthetic pesticides involve chemical alteration.



Laboratory testing of pesticidal activity of paw paw leaves and fruits

This study involved application of indigenous knowledge to complement modern science to seek local solution for control of the weevil which can cause huge damages to farmers and grain handlers. This is because farmers use pesticides to: protect crops from insect pests, weeds and fungal diseases in the field and contamination while in storage in order to safeguard human health. Pesticidal activity of crude leaves and seeds extracts of pawpaw and synthetic pesticides in the control of maize weevils was compared. Paw paw leaves and seeds were separately dried and ground into powder which was used to dust infected grains at varied application rates in various experimental treatments.

Treatments were monitored against controls for several weeks to establish the plant's pesticidal activity on the maize weevils and data collected for analysis. Findings confirmed pesticidal activity of pawpaw leaves and seeds on maize weevils. The phyto-chemical composition of the leaves and fruits was therefore tested. The leaves yieled saponins, tannins, phenols, alkaloids and sterols while the seeds had alkaloids and sterols. These compounds worked best by inhibiting the weevils from affecting the maize.

The plant extracts showed significant antifeedant activity whereas the other compounds acted as natural grain protectants by suppressing reproduction in weevils throughout the experiment. Based on these results, pawpaw leaves and seeds are recommended as alternative for control of maize weevils, with leaves more preferable to the seeds. They are naturally abundant, cheap, healthy and environmental friendly.

Staff Updates

- Mr Dominic Kimani, Assistant Research Scientist at the Ornithology Section has left the position to take up a similar role at Kipeto Wind Energy Ltd
- Dr. Henry Ndithia, completed his PhD in animal eco-immunology at the University of Groningen, the Netherlands.
- Dr. Henry Ndithia was nominated to represent the National Museums of Kenya in the Multi-institutional stakeholder Advisory Committee on Partnering with Business for the Restoration of Mt. Kenya Ecosystem Services in August 2019

Recent Events

18th -19th July 2019: Wildlife Hazard Management Symposium. Kisumu Kenya

23rd July 2019: Meeting of the Technical Working Group on the Development of a National Program for Payment for Ecosystem Services in Kenya" held at the Kenya Water Towers Agency, Ministry of Environment and Forestry.

24th - 25th July 2019: Use of DNA barcoding to combat wildlife crime. Workshop held at the Natural Science Seminar Room

24th -26th July 2019: 1st Meeting of the AEWA Grey Crowned-Crane International Working Group. Entebbe, Uganda

5th-8th August, 2019: BHL Africa training workshop held at Nairobi National Museum on use of Metadata Collection and Workflow (Macaw) system and standards for digitizing biodiversity heritage literature and making them freely available online. Twenty trainees from National Museums of Kenya (NMK), South African National Biodiversity Institute (SANBI), International Centre of Insect Physiology and Ecology (ICIPE), Kenya Wildlife Service (KWS), University of Nairobi (UoN), African Conservation Centre (ACC) and Kenya Marine & Fisheries Research Institute (KEMFRI) completed the course. Trainers included Lidia Swart (University of Pretoria, South Africa) and Technical Director BHL Africa Lawrence Monda (NMK).

8th August 2019: First meeting of the advisory committee on the partnering with business for the restoration of Mt Kenya Ecosystem Services. Norfolk Hotel, Nairobi

29th - 30th August, 2019: Kenya Climate Smart Agriculture Project (KCSAP) Proposal development Workshop.. Jumuia Hotel, Nakuru

29th August - 4th September 2019: Workshop on International Inventories Program (IIP), in Frankfurt & Cologne, Germany – Lydia Nafula & Juma Ondeng', represented NMK

2nd - 5th September 2019: Workshop to develop Draft Natural Resources Atlas organized by FAO/National Land Commission in Machakos

3rd – 6th September 2019: Workshop on Cultural Heritage For Inclusive Growth In Kenya, at Mount Kenya University.

19th September 2019: Stakeholders Workshop on the National Art Gallery at the NMK, Old Board Room 4th October 2019: The USA Ambassador to Kenya visited the National Museums of Kenya He had rescued and brought an injured immature Black Kite to the Ornithology Section. The bird is in stable condition and being attended to by staff before delivery to a Vet for treatment. He was warmly welcomed into the Ornithology Section by Dr. Oliver Nasirwa and Mr. Titus Imboma.

August, 2019:[confirm date] Staff from Research directorate attended meeting convened by DNRR to discuss and develop multi institutional proposals for KCSAP call 2019, a number of the proposals have been awarded.

19th – 22nd August, 2019: 'Documentation, Digitization & Standardization of Museums' Research Collection and Database Workshop' held at NMK, Nairobi

6th – 20th September 2019: 'International Symposium on Tropical Mycology Parakou (Benin) and Meeting at Parakou University, attended by Dr. Jefwa

5th July 2019: Botany departmental seminar, 'Climate Change adaptations in Wajir County', presented by Dr. Ahmed Abdi, Ford Hall, NMK

23th – 27th September 2019:, 'Heritage Studies workshop', held at NMK Old Boardroom, NMK

7th October 2019: PEER plants project -Senior Management Data Communication Workshop, Serena Hotel, Nairobi, Kenya

Recent Research Publications

Ndithia,H., Versteegh, A.M., Muchai, M. and Tieleman, I.B. 2019. No downregulation of immune function during breeding in two year-round breeding bird species in an equatorial East African environment' Journal of Avian Biology. https://doi.org/10.1111/jav.02151

Spawls S, Wasonga D V and Drewes R C, 2019. The Amphibians of Kenya. Norwich City College Print Shop, Norwich.

John H. Boyle, Dino Martins, Paul M. Musili, Naomi E. Pierce (2019) Population Genomics and Demographic Sampling of the Ant-Plant Vachellia drepanolobium and Its Symbiotic Ants From Sites Across Its Range in East Africa. Frontiers in Ecology and Evolution. Doi: 10.3389/fevo.2019.00206

Solomon Kipkoech, David Kimutai Melly, Benjamin Watuma Mwema, Geoffrey Mwachala, Paul Mutuku Musili, Guangwan Hu, Qingfeng Wang (2019) Conservation priorities and distribution patterns of vascular plant species along environmental gradients in Aberdares ranges forest.

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Kirika, P.M., Divakar, P.K., Crespo, A. and Lumbsch, T. (2019) Molecular and phenotypical studies on species diversity of Hypotrachyna (Parmeliaceae, Ascomycota) in Kenya, East Africa. The Bryologist, 122(1): 140-150; https://doi.org/10.1639/0007-2745-122.1.140

Mbuni YM, Zhou Y, Wang S, Ngumbau VM, Musili PM, Mutie FM, Njoroge B, Kirika PM, Mwachala G, Vivian K, Rono PC, Hu G, Wang Q (2019) An annotated checklist of vascular plants of Cherangani hills, Western Kenya. PhytoKeys 120: 1–90.

Watuma, B.M., Wei, N., Melly, D.K., Kipkoech, S., Kirika, P.M., Hu, G-H & Wang, Q-F (2019). Zehneria tuberifera (Cucurbitaceae), a new species from Taita Hills, Kenya. Phytotaxa 411 (3): 215–22

Muchane Nyawira Muchane (2019) Population Status, Distribution Patterns and Conservation Needs of Endangered Croton alienus Pax in Kenya. International Journal of Natural Resource Ecology and Management. Vol. 4, No. 5,, pp. 120-128. doi: 10.11648/j.ijnrem.20190405.1

Ke-Wang Xu, Cheng-Wei Chen, Peris Kamau , Wen-Bo Liao, & Li-Bing Zhang (2019). Four new species of the fern genus Hymenasplenium (Aspleniaceae) from Africa and Asia. Phytotaxa 416 (1): 034–042 https://doi.org/10.11646/phytotaxa.416.1.4

Otieno, N.E., 2019. Economic impact of predatory piscivorous birds on small-scale aquaculture farms in Kenya. Aquaculture Reports, 15, p.100220.

Otieno, N.E., Pryke, J.S., Butler, M. and Jacobs, S.M., 2019. Top-down suppression of arthropod herbivory in intercropped maize and organic farms evidenced from δ 13 C and δ 15 N stable isotope analyses. Agronomy for Sustainable Development, 39(4), p.39.

Up-Coming Events

- 22-25 October 2019: The 2nd workshop of Citizen Science for Conservation in Africa (CISCA) programme will be held at the National Museums of Kenya. Theme "Making an impact with citizen science projects"

- October 2019: Launch of online platform of digitized collections and stories, as part of Google Arts & Culture Project

- 29th November 2019: Launch of Invisible Inventories Project, funded by Goethe-Institut Nairobi & Kulturstiftung des Bundes

- November, 2019: Regional Training in the Use of DNA technology in Combating Illegal Wildlife Trafficking in Selected Countries in Eastern and Southern Africa,

Awards/Grants

Dr Esther N. Kioko, National Museums of Kenya won a Marsh Award for Ecologists in Africa: Provided by the Marsh Christian Trust and administered by the BES, this is awarded for an outstanding current research record, largely completed in Africa, which is having a significant impact on the development of the science of ecology or its application.

Enhancing the Conservation of Cultural sites in Northern Kenya to Safeguard the Integrity of Cultural and Natural Heritage in Isiolo and Marsabit Counties, Funded by Christensen Fund through the Silicon Valley Foundation, Contact: Dr Peris Kariuki, pkariuki@museums.or.ke

Kenya Afromontane Seed Conservation Project, Funded by the Royal Botanic Gardens-Kew, 2017-2019, lead Dr. Musili

Developing a Freshwater Biodiversity Information System for the Tana River Basin, Kenya, for Improved Ecosystem Management and Development Planning, JRS Biodiversity Foundation, 2018-2021, Dr. Masinde and Dr. Kamau

Flora of Kenya, Sino Africa Joint Research Centre, funded by Chinese Academy of Sciences-CAS, 2016-2020, lead, Dr. Mwachala

Cancer care project, funded by NRF-Kenya, 2018-2021, lead Dr. P. Musili

Sustainable management of Arbuscular Mycorrhiza fungi in Kenyan Agro-ecosystems, 2016-2019, lead Dr. Muchane

Inventory and monitoring of fungi diversity using Citizen Science programs and open data kit, funding by National Geographic, 2018-2019, lead Dr. Nyawira

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