Sacred Kaya forest Ecosystem Biodiversity management project

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Joint Conference and Workshops
The Role of Falconers and Local Communities in Conservation and Sustainability

24th – 26th June 2023
Cape Town South Africa

IUCN CEM
ECOSYSTEM RESTORATION THEMATIC GROUP

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NATIONAL MUSEUMS OF KENYA
WHERE HERITAGE LIVES ON

OUTLINE

- Historical Perspectives of the Kayas
- The Biodiversity of Kaya Kauma
- Threats to Kaya Forests
- Culture and Biodiversity Research
- Conservation and Management Interventions

Coastal Kenya Region

Diverse ecosystems encompassing both marine and terrestrial environments

Coastal region modern urban cities

Ancient Cities now **ruins**

12th Centuary city and 45 acres Gede, Mnarani and Jumba Ruins

Biodiversity Hotspots

- The East African Coastal forests are global Biodiversity hotspots
- In Kenya, the sacred Mijikenda kaya forests are unique fragments preserved by cultural beliefs
- The forest sites spread over some 200 km along the coast containing the remains of fortified villages,
- The kayas, created in the 16th century were abandoned by the 1940s
- Approximately 52 out of which are nine primary Kayas forests
- They are maintained by councils of elders (UNESCO, 2020).
- Among them are eight UNESCO Heritage sites


THIS IS A UNESCO WORLD HERITAGE SITE
KAYA KAUMA
NATIONAL MONUMENT

Sacred Forests cultural landscape

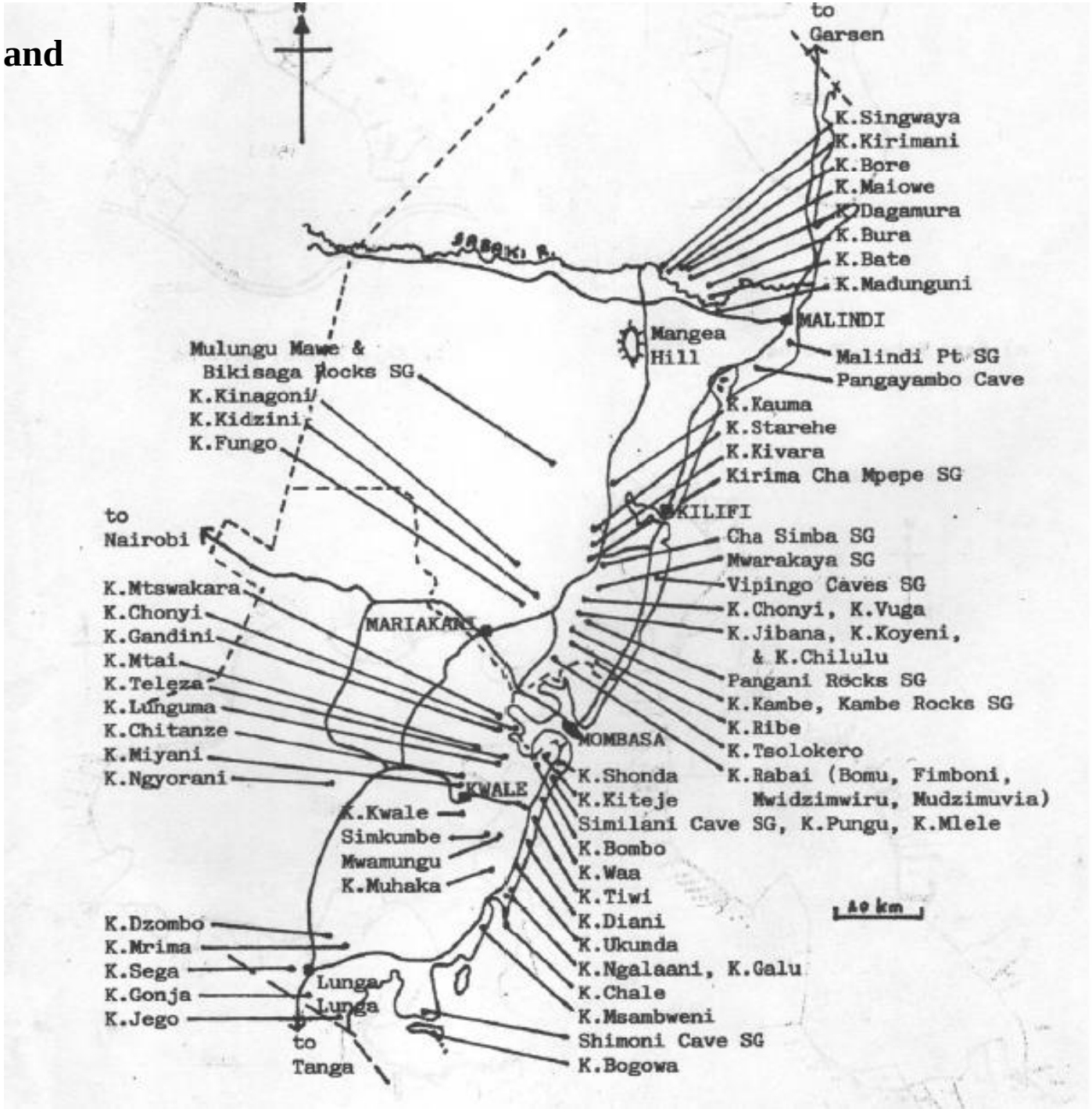
Cultural Items associated with Indigenous Community

A SOCIO-HISTORICAL PERSPECTIVE OF THE ART AND MATERIAL CULTURE OF THE MIJIKENDA OF KENYA by Elizabeth C. Orchardson V o T (144 pages). Ph. D. School of Oriental and African Studies University of London 1986

A region of rich Indigenous cultures and belief systems

Robertson and Luke, 1993

Kaya sacred forests fragments and grooves are part of the larger Zanzibar – Inhambane Phytochoria (which encompasses the Miombo woodlands) disjointed by settlements and farmlands stretching over a 200 Km stretch along the Coastline of Kenya.



Cultural perspective and rulership of Kayas

- Governed by Council of Elders
- Mijikenda community had a male dominated government based on age-sets.
- Age-set was a basis of political organization, and was important for transmission of historical past and customs.
- The rulership controlled wealth, the judiciary process, trade, foreign relations, warfare and regulated movement of people
- Traditional belief systems regulated the use of biodiversity and other natural resourcs
- Since the dispersion of the communities in early 19th Centuary, the system collapsed

Man and Environments

- Man as part of Biodiversity
- Interacts with other organisms and the Abiotic Environments
- Pre-Historically Man lived Harmoniously with the Environment
- Man is more advanced than other biodiversity
- Transformed Ecosystems for Food, Health and Leisure
- Harmony in Ecosystems has been disrupted to benefit Man
  - Domestication period
  - Cultivation Period
  - Biotechnological Era
  - Resulting to massive degradation

Degraded landscapes in Coastal Kenya – forests cleared for cultivation

Riparian Ecosystems characterized by sand harvesting and drying riverbeds

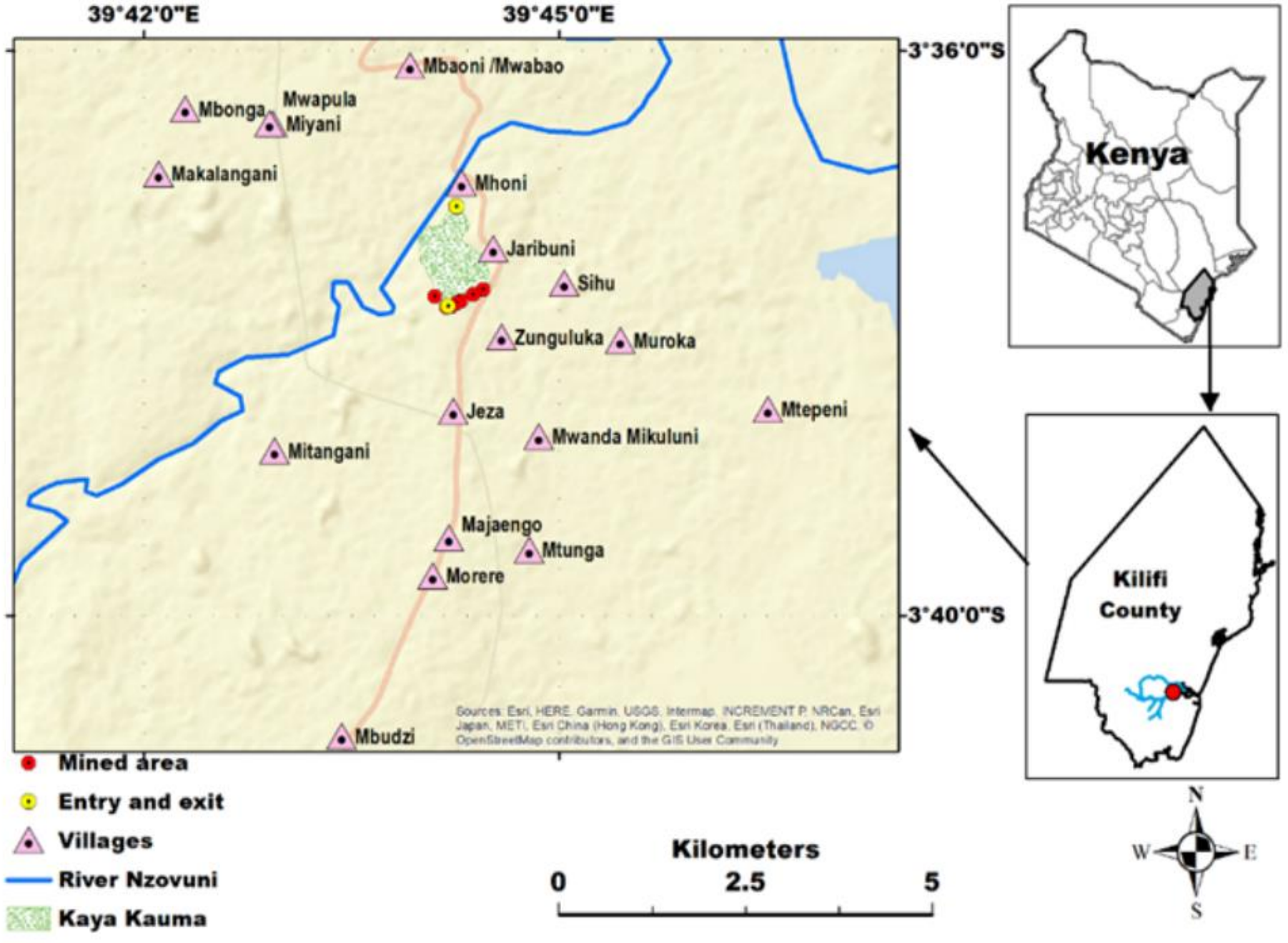
Kaya Kauma forest: UNESCO Heritage site

Size is 75-100 ha , Dry deciduous woodland vegetation type.

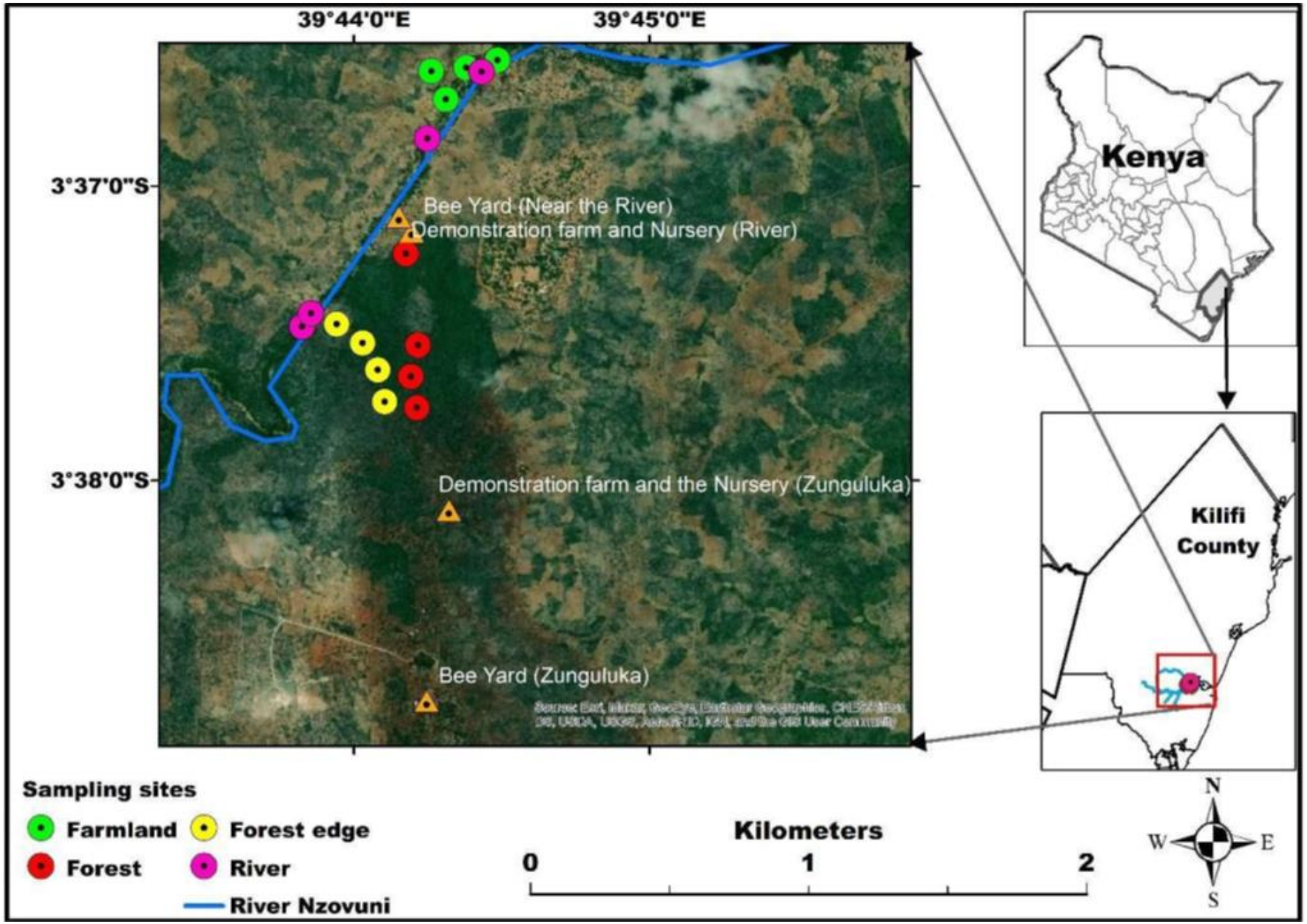
Forest slopes down the north to “Ndzovuni” river which flows into the Kilifi creek at “Mtsanganyiko”.

Once a water catchment area supplying Kilifi town.

Iron-rich soil and rich in iron-ore deposit.



View of Kaya Kauma Environs



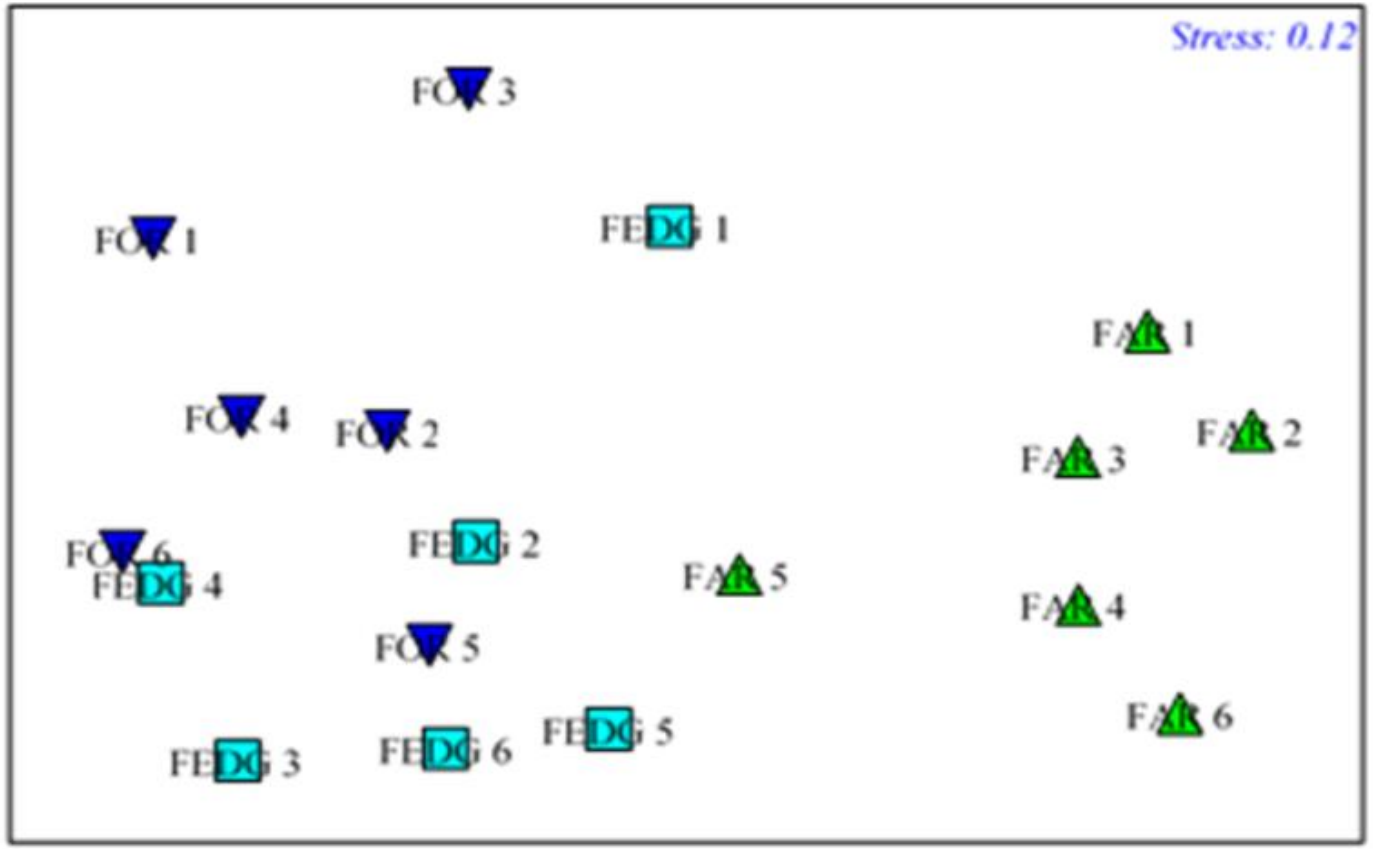
Kaya Kauma and adjacent landscape

Role played by Traditional beliefs in the conservation of Kaya Kauma sacred forest.
A contrast in Kuama landscape
Highly eroded adjacent scrubland occasionally with patches of *Brachystegia* and *Afzelia*.

Features of Landscape of Kaya Kauma Area

Plant communities of Kaya Kauma forest

NMK Team on Flora: Joyce Jefwa, Lawrence Chiro, Josephine Kyaa, Mercy Korir, Deche Mwamuye and Reheha Hassan



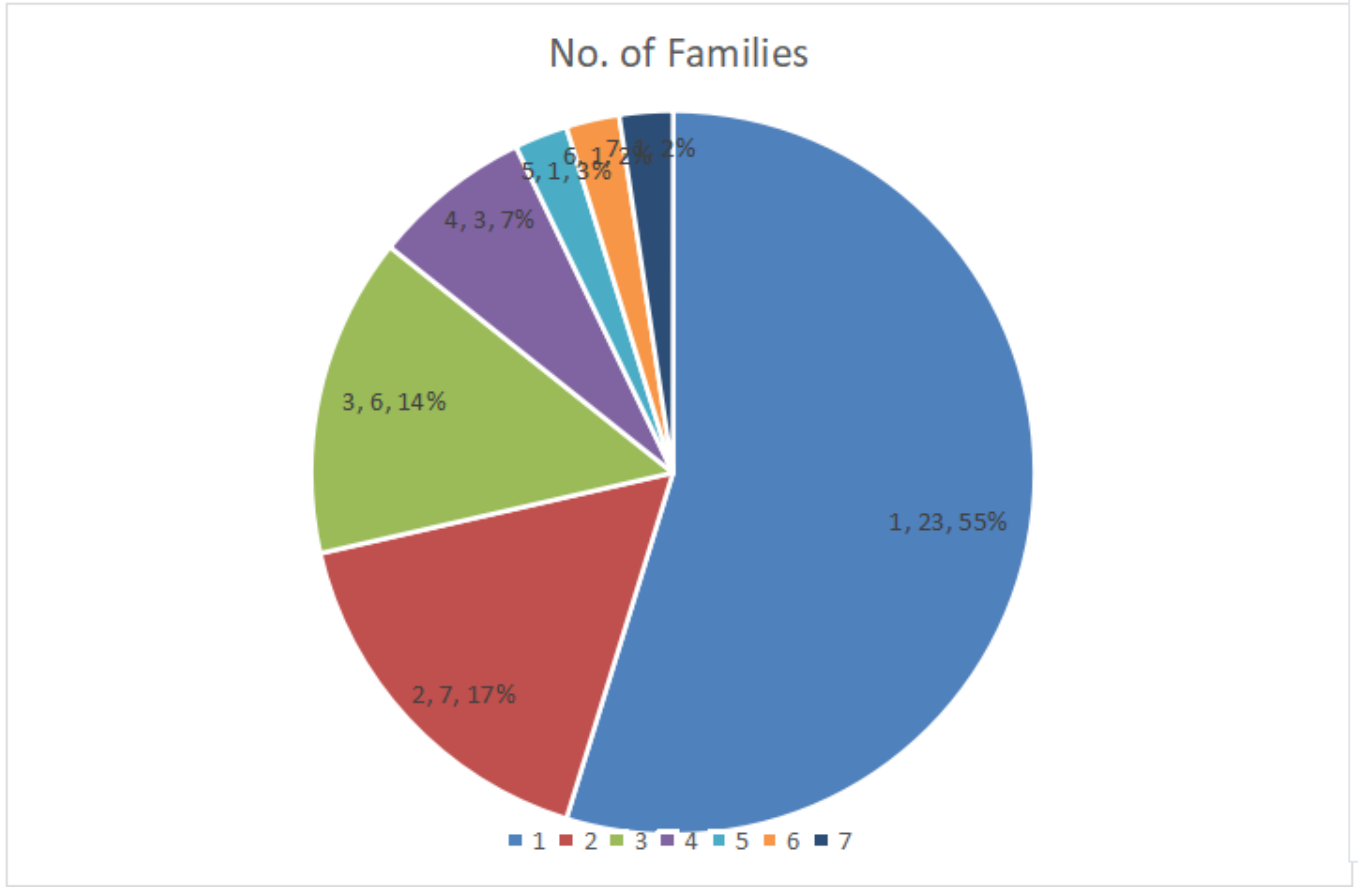
Farmland

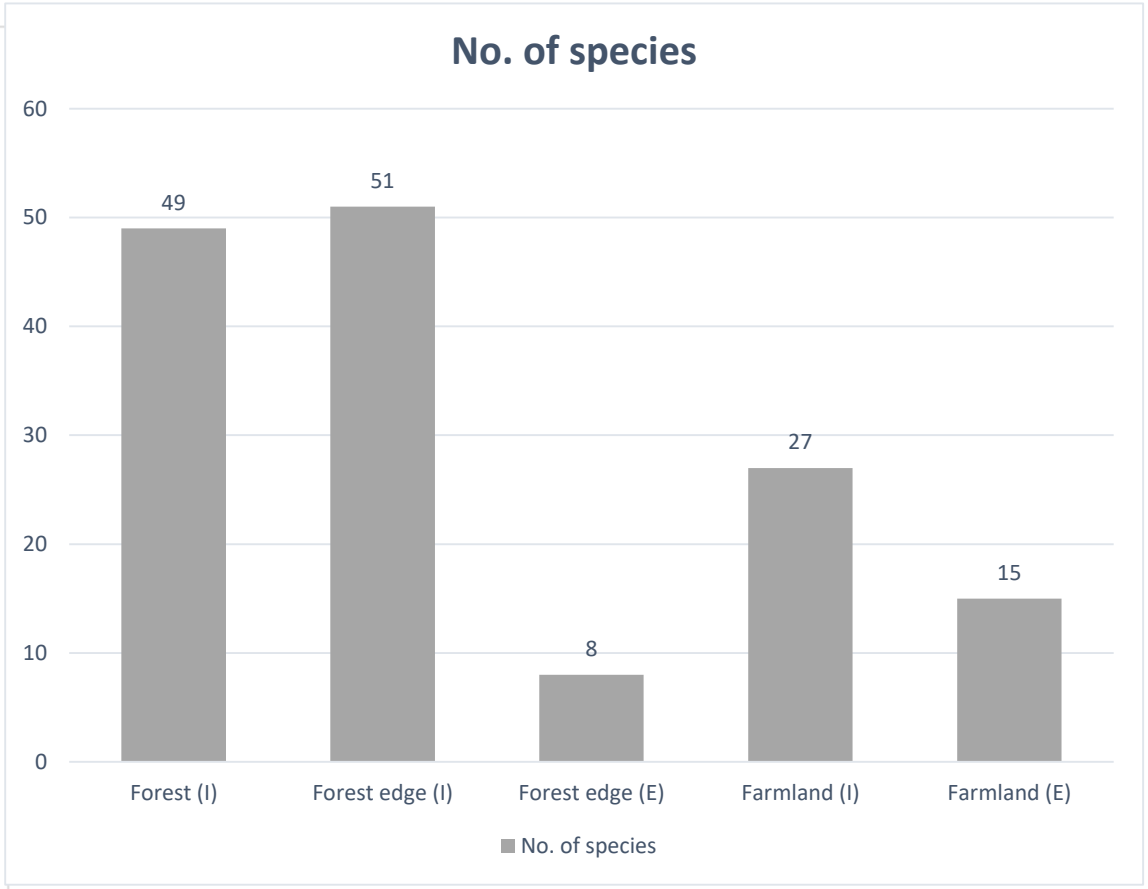
Forest

Forest edge

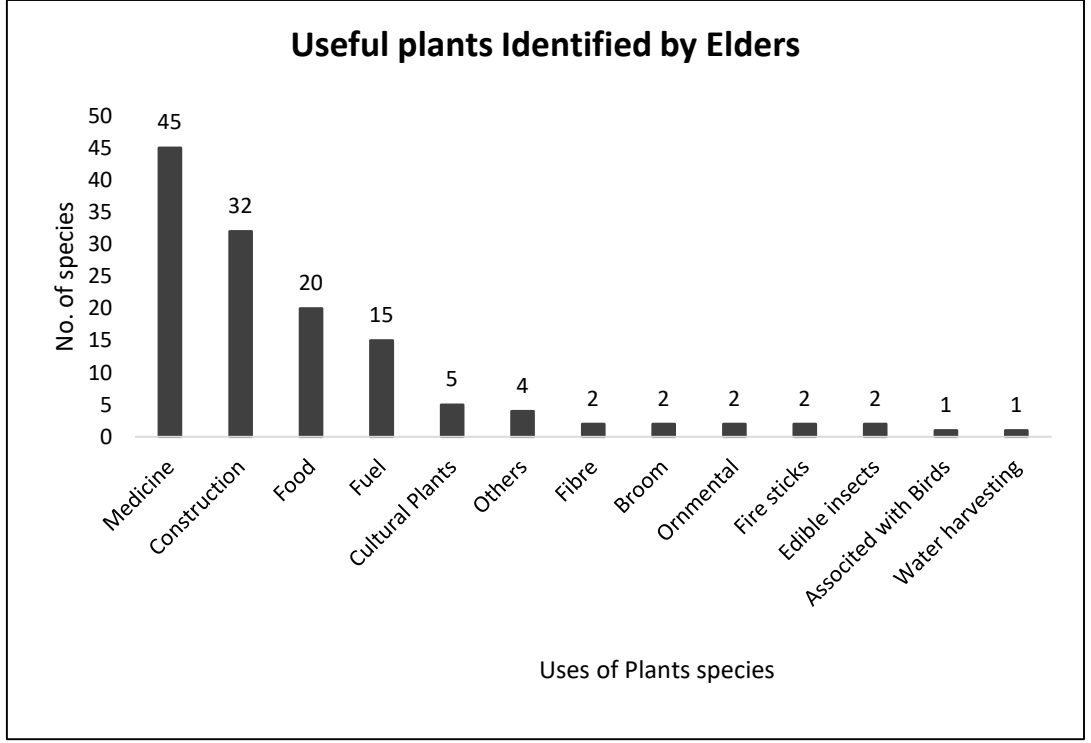
Plant assemblages in Kaya Kauma forest, forest edge and the farmlands

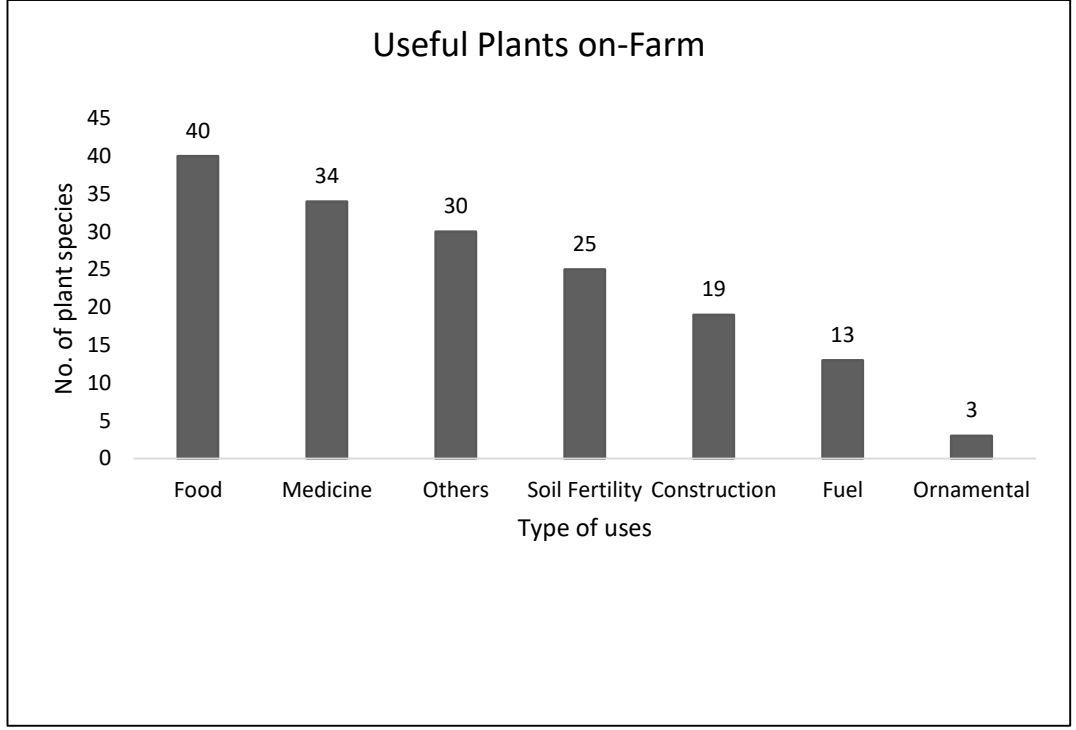
Characteristics of the Flora of Kaya Kauma



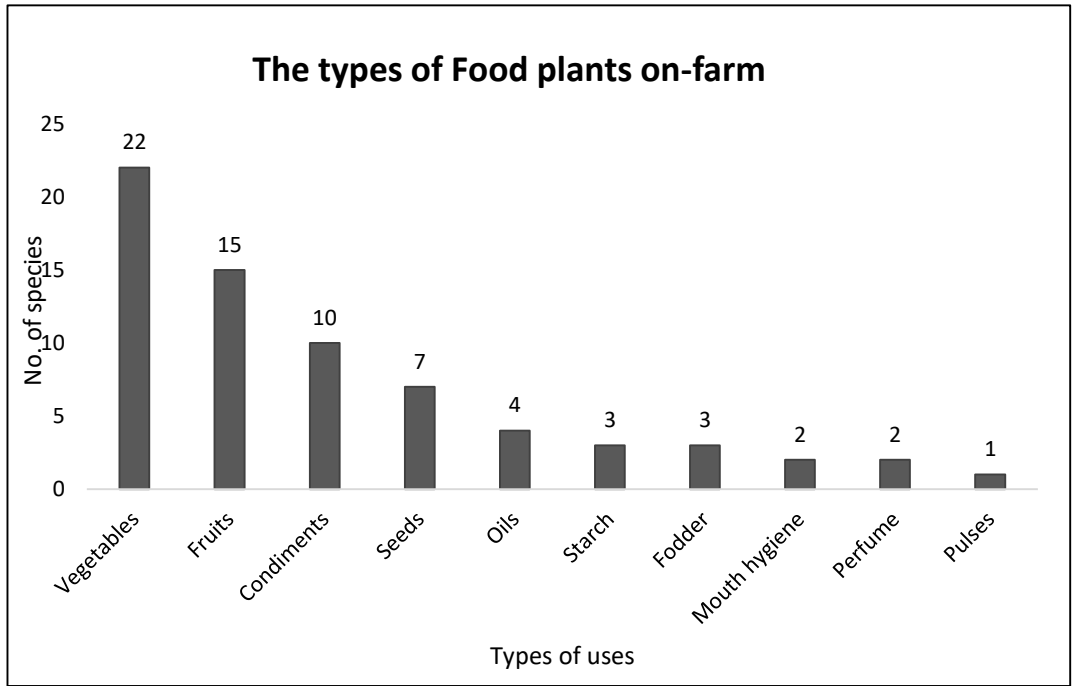


93 plant species in 42 Families. Previous surveys by Roberston, documented 51 species, 1993, and Jolly Rajat, documented 49 species, 2021





Kaya Kauma habours economically food additives, gums and resins, dyes, essential oils, and ecologically important plants as insect repellant. Some of the important plants have been left on farmlands indicating the importance of these species to the community.



Household forest products and extent of use

Traditional fishing basket trap

Wooden trap for small mammals

Wooden cooking stick, whipping stick and wooden bowl

Mortar and pestle

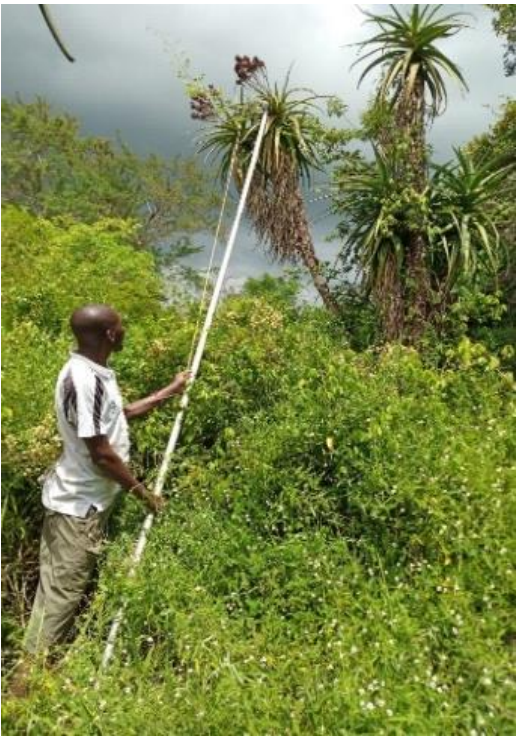
	Product	Local name	When used
1	Mortar & pestle	Kinu & mchi	Daily
2	Wooden Chair with back support	Chihi	Daily
3	Wooden cooking sticks (stirring & whipping)	Mwika & Mfidzo,	Daily
4	Informal sitting benches	Magogo	Daily
5	Wooden Fishing traps		Occasional
6	Wooden building poles	Fiho	Occasional
7	Hives for honey	Mzinga	Occasional
8	Firewood	Kuni	Daily
9	Sleeping mats	Mkeka	Daily
10	Baskets	Chikahana	Daily
11	Charcoal	Makala	Daily
12	Musical instruments (Kayamba, drums)	Kayamba,& ngoma	Occasional
13	Wooden traps for small mammals	Sanduku	Daily

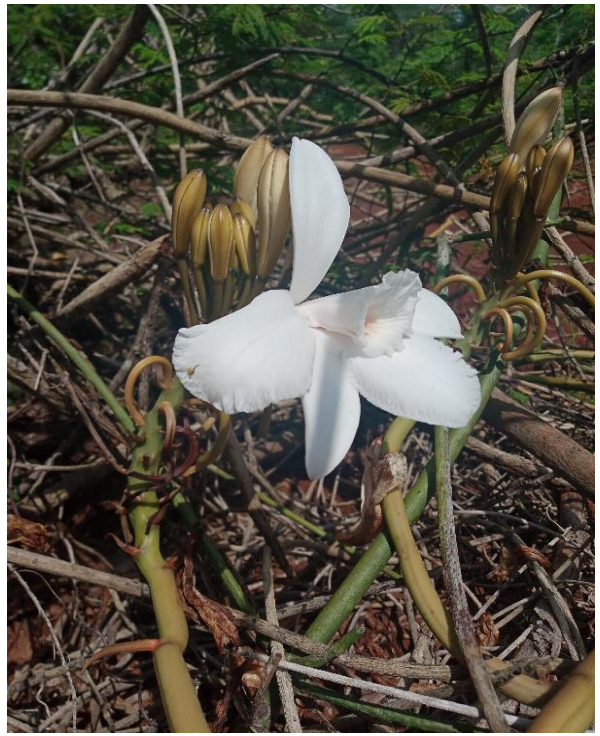
PLANT SPECIES	**FAMILY**	**HABIT**	STATUS
Aloe kilifiensis Christian	Asphodelaceae	Tree	Endangered
*Asteranthe asteria*s(S.Moore)Engl$ Diels	Annonaceae	Tree	Near threatened
*Uvariodendron kirki*i Verdc.	Annonaceae	Tree	Vulnerable
Buxus obtusifolia (Mildbr.)Hutch.	Buxaceae	Shrub	Vulnerable
Afzelia quanzensis Welw.	Fabaceae	Tree	Vulnerable
*Dalbergia vacciniifolia*Vatke	Fabaceae	Shrub	Vulnerable
Cynometra webberi Baker f.	Fabaceae	Tree	Vulnerable
*Erythrina sacleuxi*Lam. ExDC	Fabaceae	Tree	Near threatened
*Memecylon fragrans*A.Fern. & R.Fern	Melastomataceae	Shrub	Vulnerable
*Ozoroa obovata(*Oliv)R$ AFernandes	Moraceae	Tree	Near endemic
Toddaliopsis sansibarensis(Engl.) Engl.	Rutaceae	Tree	Vulnerable
Vitellariopsis kirkii (Baker) Dubard	Sapotaceae	Shrub	Vulnerable
Encerphalartoshilderbrandtii A.Braun & Bouché	Zamiaceae	Tree	Near threatened

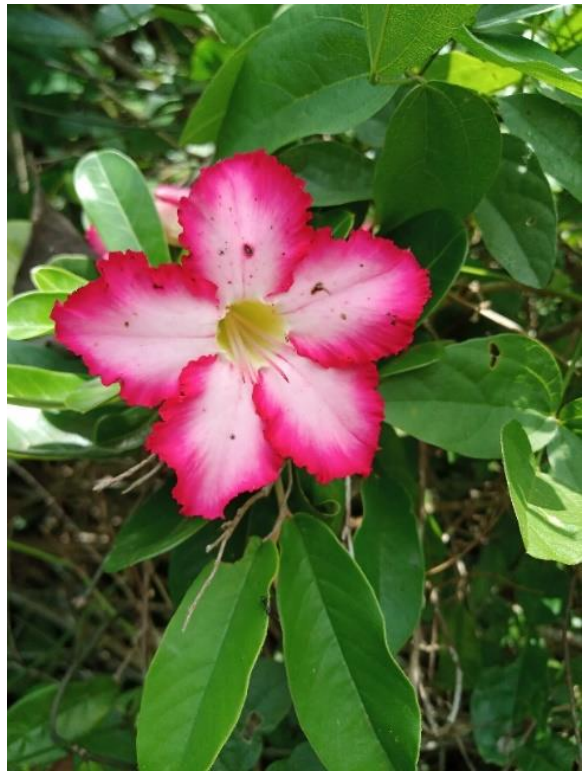
IUCN RED LISTED SPECIES

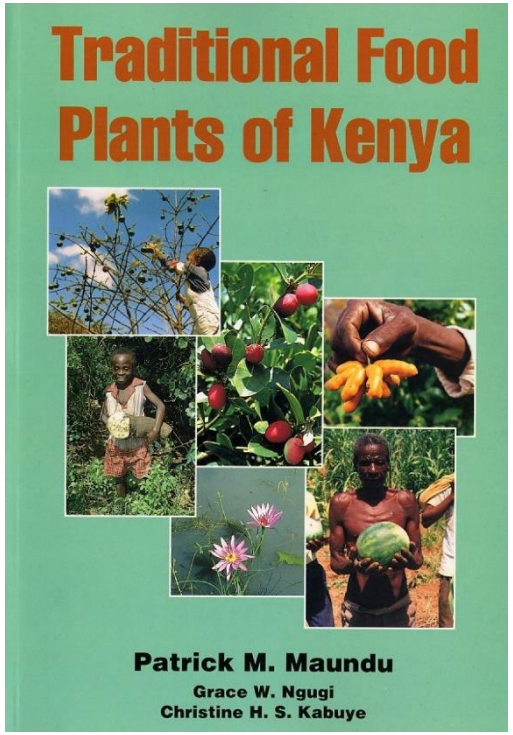
Near Threatened Plants (4): *Lannea schweinfurthii, Pupalia lappacea*; *Brachylaena huillensis* and *Sterculia africana;* Vulnerable (5): *Cynometra suaheliensis*, *C. webberi*, *Gyrocarpus americanus, Euphorbia nyikae*

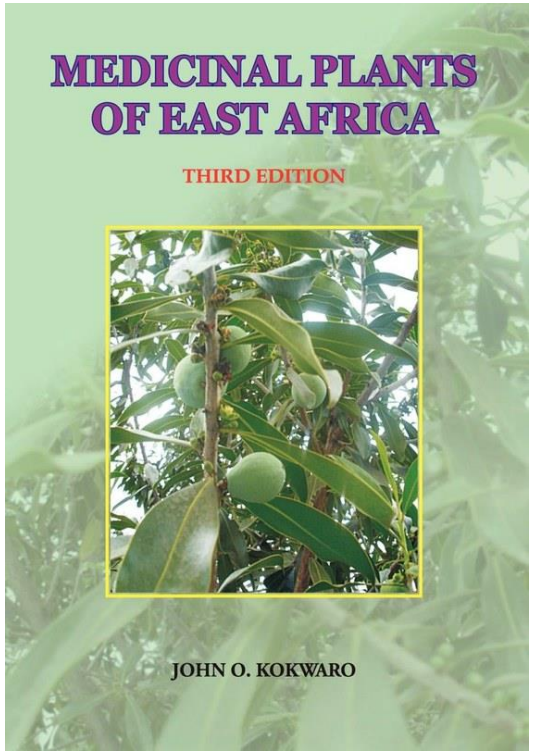
Some Ornamental plant species of Kaya Kauma



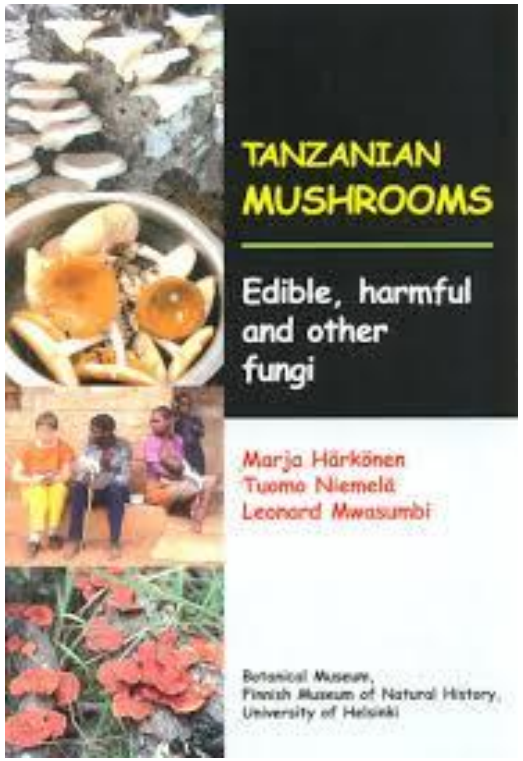


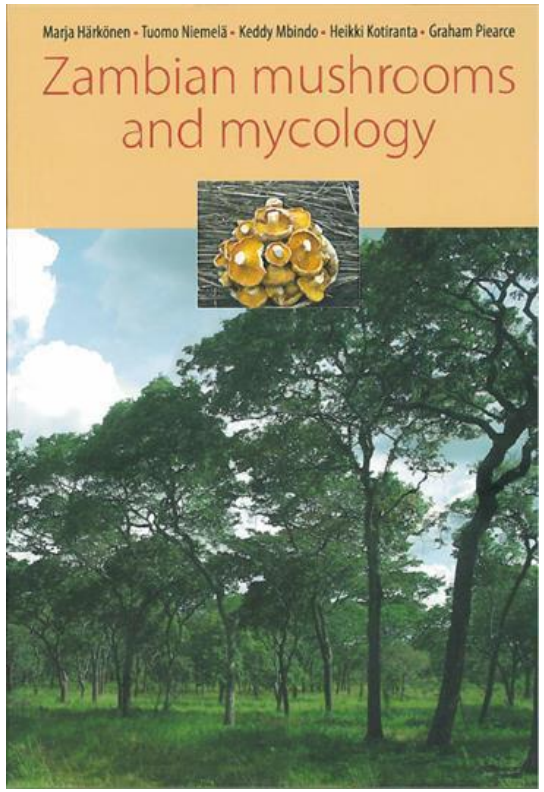


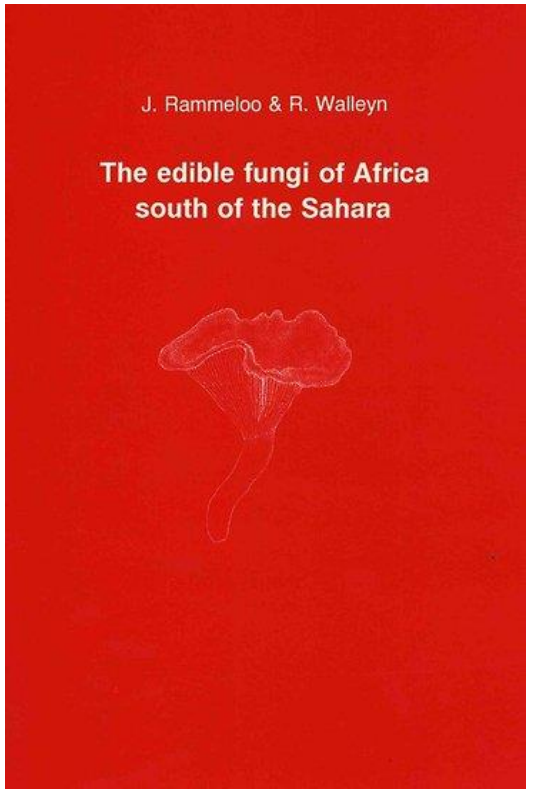




Underutilized plant Resources







Catharellus (Chantarelle) mostly subsistence in some of the coastal forests including some Kaya forests.

In Zambia *Cantherellus* and Truffles highly commercialized. Tanzania has wild mushroom value chain.

Fauna of Kaya Kauma forest

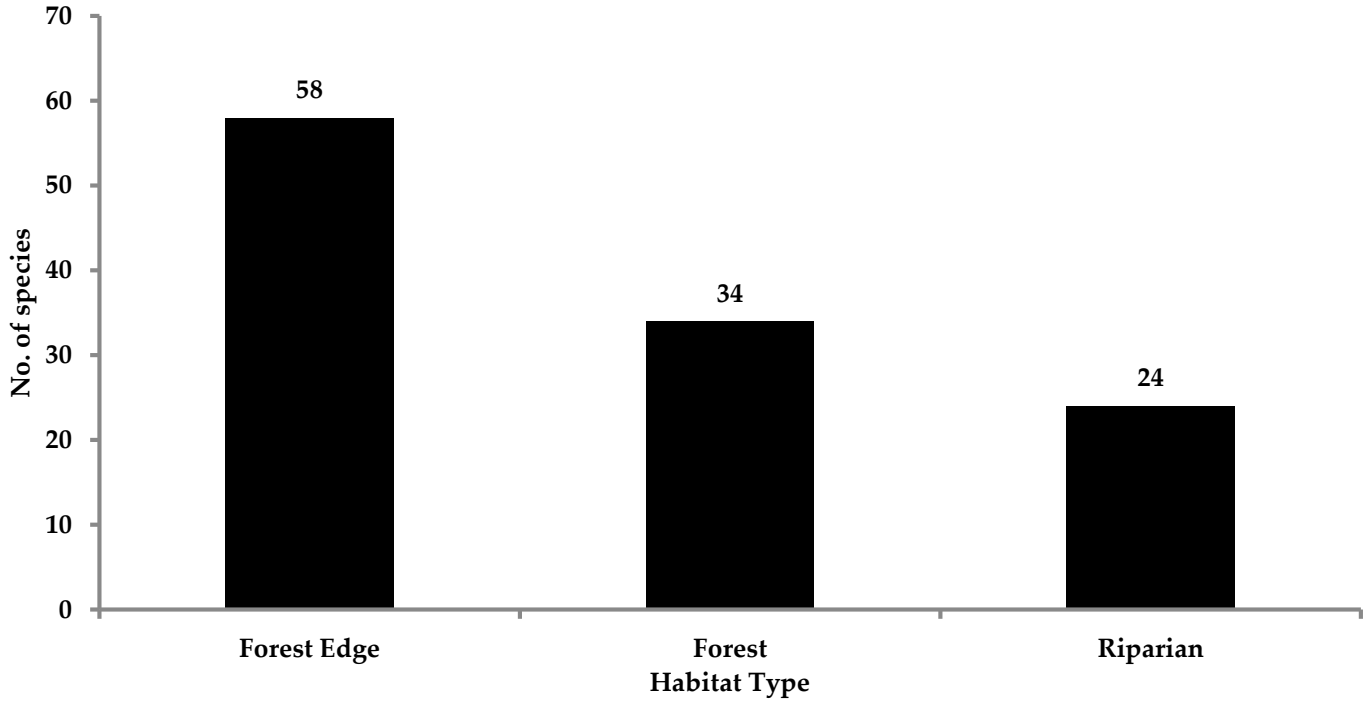
- Conducted by the Zoology department of the National Museums of Kenya. Lead Scientist: Dr. Esther Kioko.
- Bird species list of the two surveys, puts the species richness at seventy-five (75) birds' species in 32 Families.
- A total of 12 mammal species including elephant shrew one (1) species, Primates species four (4), rodents species two (2), bats species four (4), even toed-ungulates)one (1) species.
- A total of 8 amphibians and 18 reptiles recorded in Kaya Kauma forest and its surroundings
- Invertebrates: 415 species consisting of 362 terrestrial and 53 aquatic species among which are 75 Butterfly species
- A total of 5 species of fish and 3 species of prawns and crabs

Kaya Kauma forest fragment is an **important bird area (IBA)** because it is home to the globally threatened Sokoke Pipit. The forest is **a significant stop-over and dispersal site** for intra-African and Palaearctic migratory birds

Most abundant species were;

- Black-bellied Starling **(19)**,
- Tropical Boubou **(18)**,
- White-throated Bee-eater **(18)**,
- Brown-headed Parrot **(14**),
- Speckled Mousebird **(11**)
- Barn Swallow **(10)**.

Bird species richness recorded in the forest, forest edge and riparian of Kaya Kauma



Eastern Bearded Scrub Robin

Dark-backed Weaver Ploceus biclor

Black-bellied Starling restricted to coastal forests - Dominant, (19)

Fischer's Turaco, *Tauraco fischeri*, feeding on fruits of a fig tree along Nzovuni river -IUCN Red List

Forest dependent species, Yellow-bellied Greenbul, *Chlorocichla flaviventris*

Forest dependent species,Lilac-breasted Roller *Coracias caudatus*

Mombasa Woodpecker and **Trumpeter Hornbill** rely heavily on standing baobab or old, over-mature trees where nest-sites can be found or excavated.

Greater Blue-eared Starling *Lamprotornis chalybaeus* at nest on mature baobab tree.

Female and male Trumpeter Hornbill *Bycanistes bucanitor*, near Nzovuni river.

Indigenous Knowledge on Birds: Nzuzi, Puji, Kanga, Mverezi, Gia, Kerengeze, Hondolomwe, Kololo chimburu, matali, kanga, vitswetswe and mwewe- gongonyika.

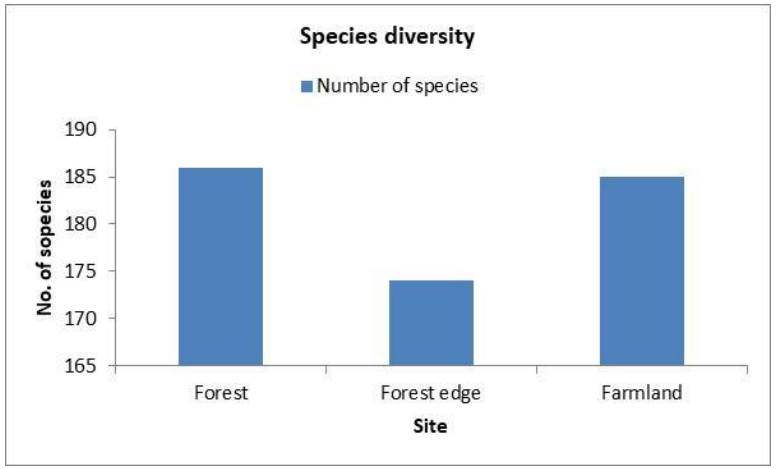
Potential for domestication efforts: Kanga (Guinea fowls), sungura (rabbits) and vitswetswe (small bird) for consumption.

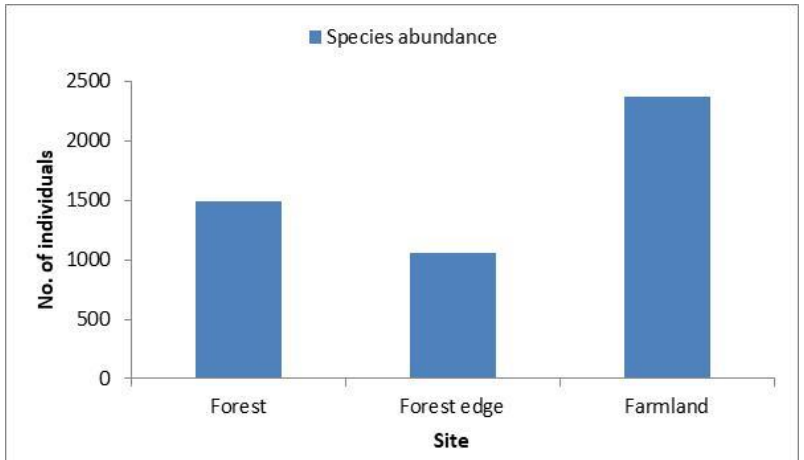
Invertebrates

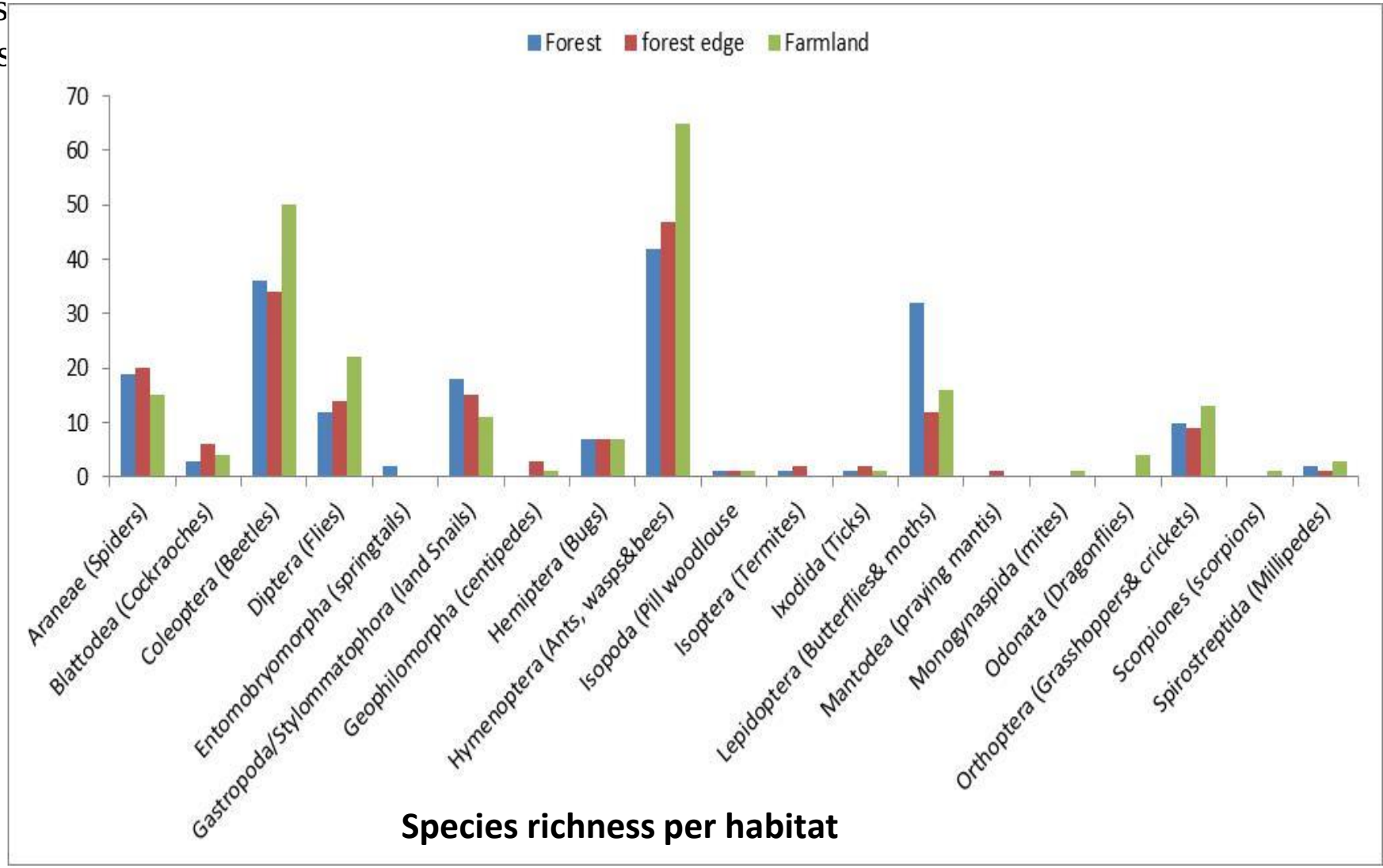
Dr. Esther Kioko, Dr. Kochey - NMK Zoology Dept

Terrestrial and aquatic invertebrates comprised of **415 species** consisting of **362** terrestrial **53** aquatic species in the forest, forest edge, surrounding farmlands and R. Nzovuni within Kaya Kauma fores
.

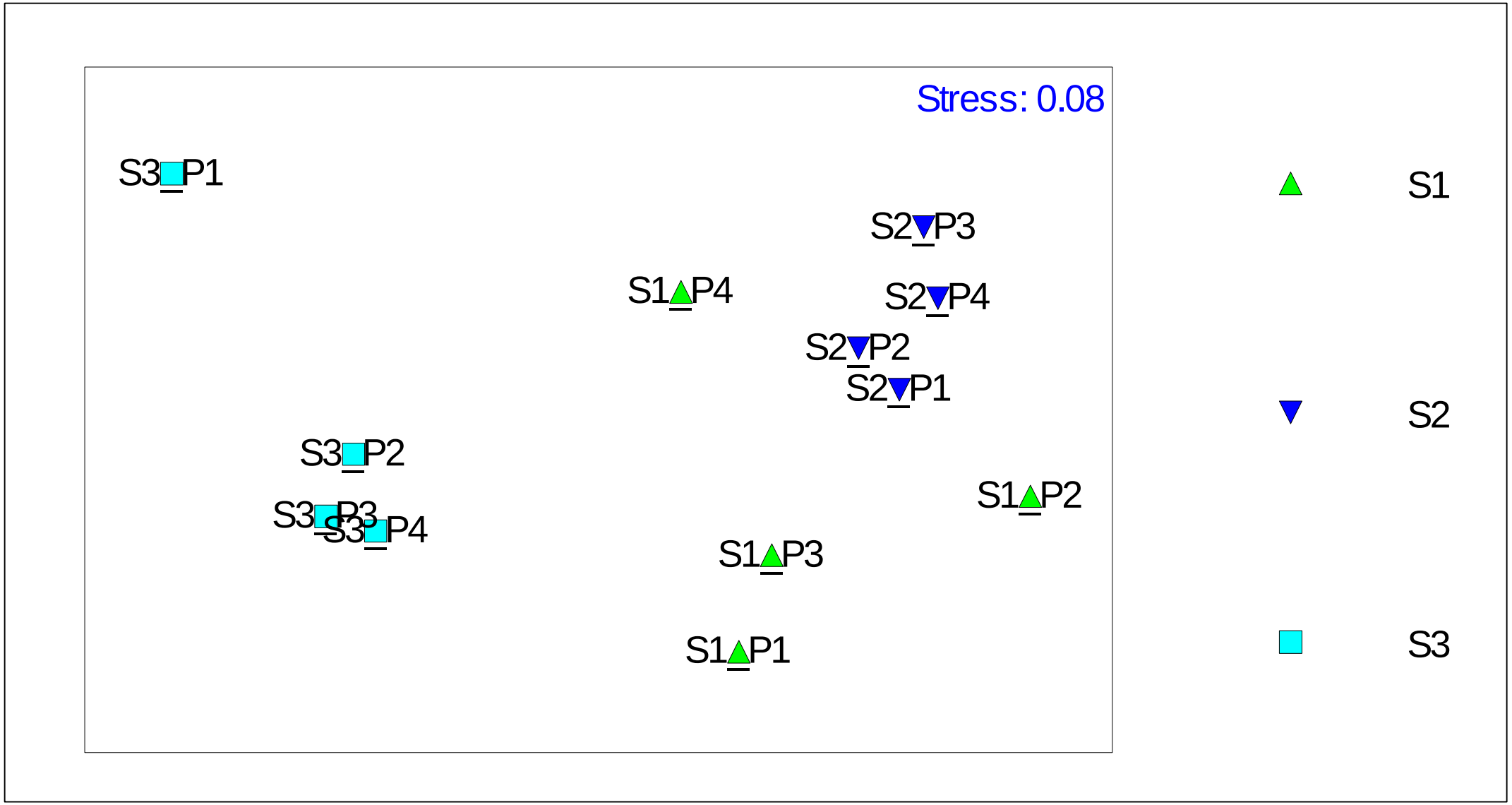
186 species in the forested area, 1**74 species** in the forest edge and **185 species** in the farmlands







Species richness per habitat



Overall species similarity patterns of terrestrial invertebrates collected using all methods in different sites of Kaya Kauma.

Key: S1= Forest; S2= Forest edge and S3= Farmland

75 Butterfly and Moth species (Lepidoptera)

The Christmas butterfly (Lepidoptera) and Blister beetle (Coleoptera) foraging

Adult *P. dardanus* sucking nectar from flowers

Adult *Papilio constantinus*

Adult *Papilio constantinus*

Butterfly rearing cage

Langstroth hives transportation

Modern bee keeping experiential training at Kaya Kauma

Maize crop infested by fall army worm

Snail feeding on maize leaves

The old logs provide breeding sites for saproxylic beetles.

Scale insects infesting a papaya

Blister beetle defoliating vegetable leaves.

Locals collecting firewood in the kaya forest

Edible Insects

- Edible insects are traditionally important foods in Africa. The most commonly consumed insects are termites (*Macrotermes* Spp) and grasshoppers (*Ruspolia nitidula*). In Africa, 250 insect species are said to be edible, 549 in Mexico and 180 in China. The insects range from caterpillars, grasshoppers, crickets, beetles and many others. Mar 18, 2019 (FAO)

Grasshoppers and Crickets of Kaya Kauma (With some edible) species)

Orthoptera	Acrididae	*Acrida sp*	Grasshopper
Orthoptera	Acrididae	*Acrididae sp*	Grasshopper
Orthoptera	Acrididae	*Acrotylus sp*	Grasshopper
Orthoptera	Acrididae	*Aiolopus sp*	Grasshopper
Orthoptera	Gryllidae	*Brachytrupes membranaceous*	Cricket
Orthoptera	Acrididae	*Catantops sp*	Grasshopper
Orthoptera	Pyrgomophidae	*Chrotogonus hemipterus*	Grasshopper
Orthoptera	Pyrgomophidae	*Chrotogonus sp*	Grasshopper
Orthoptera	Gryllidae	*Cophogryllulus sp*	Cricket
Orthoptera	Tettigonidae	*Eugasteroides loricatus*	Bush Cricket
Orthoptera	Gryllidae	*Gryllidae sp*	Cricket
Orthoptera	Gryllotalpidae	*Gryllotalpa sp*	Cricket
Orthoptera	Gryllidae	*Gryllulus gracilipes*	Cricket
Orthoptera	Gryllidae	*Gryllulus sp*	Cricket
Orthoptera	Acrididae	*Heteracris sp*	Grasshopper
Orthoptera	Gryllidae	*Phaeophilacris sp*	Cricket
Orthoptera	Gryllidae	*Platygryllulus sp*	Cricket
Orthoptera	Tridactylidae	*Tridactylidae sp*	Cricket
Orthoptera	Tetrigidae	*Tridactylus sp*	Cricket
Orthoptera	Tridactylidae	*Trigonidium*	Cricket

SMALL AND MEDIUM SIZED MAMMALS OF KAYA KAUMA FOREST

Dr. Musila and Ms. Aziza Hassan
NMK Zoology Department

A total of **12 mammal** species of **5 mammal** orders including Macroscelidea (elephant shrews) 1spp), **Primates** (4spp), **Rodentia** (rodents) 2spp) - *Acomys c. percivali*, *Acomys c. ignatius*; **Chiroptera** (bats) 4 spp), and Cetartiodactyla (even toed-ungulates (1spp).

Individuals of Pousargues's Monkey *Cercopithecus m. albotorquatus*, near-endemic primate

11 species were recorded in Kaya Kauma **forest** and **two (2)** in the **farmland**. **One(1) bat species**; Egyptian Rousette *Rousettus aegyptiacus* **near the forest as well as in the farmland,** while Wahlberg's Epauletted Fruit Bat *Epomophorus wahlbergi* was **in the farmland**.

Bats and primates had the highest number of species. **Rodent species** as well as Genus *Scotoecus* (lesser house bats) were **very rare.**

Traditional trap are used by local people to hunt mammals (Cricetomys ansorgei; Southern Giant Pouched Rat (Panya Buku) in Kaya Kauma Forest

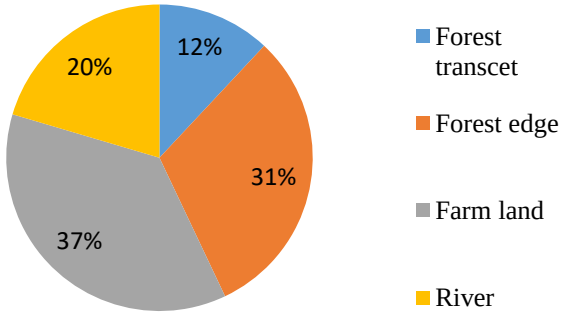
Highlights: Rats and mice, as special kind of rodent considered a delicacy among in Kilifi County. Consumption of the kadzora species of rodent may be a dying habit due to destruction of their natural habitat.Jun 3, 2014

Region where special rodent is a delicacy : The Standard

.A total of 26 species of amphibians and reptiles (8 amphibians and 18 reptiles) were recorded in Kaya Kauma and its surroundings.

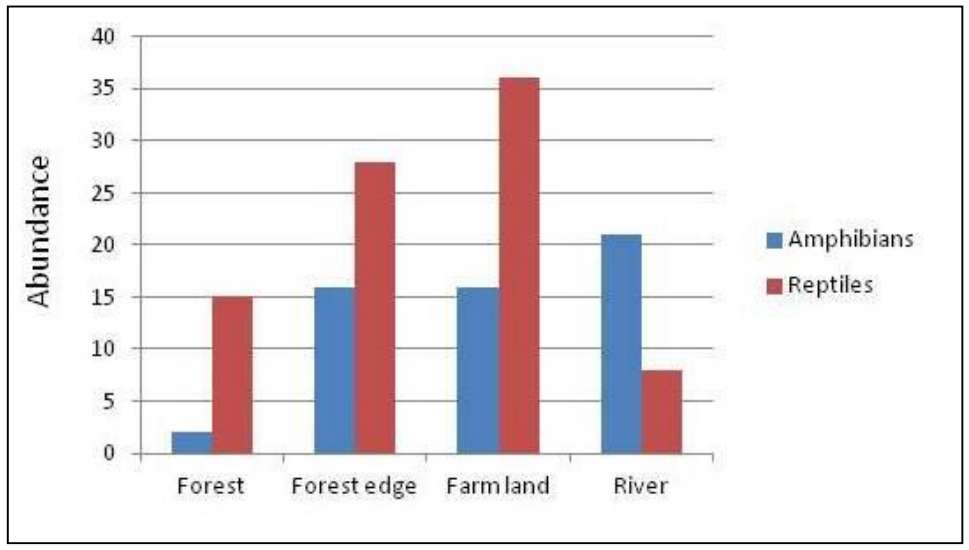
AMPHIBIANS AND REPTILES SURVEY IN THE KAYA KAUMA FOREST, KILIFI COUNTY

Beryl A. Bwong
Herpetology Section, Zoology Department National Museums of Kenya,



Sudan Striped-Belied Sand Snake

Shovel snout Frog



Large-eyed snake

Eastern foam-nest Tree Frog

Species	Forest transect	Forest edge	Farm land	River	2018
Reptiles					
Snakes (10)					
Philothamnus punctatus	2	0	0	0	1
Lethiobia swahilica	1	0	0	0	0
Leptotyphlops macrops	0	1	0	0	0
Lethiobia lumbriciformis	0	0	1	0	0
Afrotyphlops mucruso	0	0	1	0	0
Lizards (8)					
Lygodactylus mombasicus	4	8	15	4	1
Amphibians (11)					
Xenopus muelleri	0	0	0	1	0
Phyrynobatrachus acridoides	1	2	5	5	1

Species of fishes along river Nzovuni - John K. Kochey - Zoology Dept NMK

5 species of fish, 4 species of prawns and 1 crab species that are of commercial value were documented.
Decapods (prawns and crabs) **(724)**, aquatic snails **(281)** individuals, the least abundant Hirudinae (leeches). Fish population **197** individuals sampled of R. Nzovuni.
25 molluscs snails species: the giant African *Achatina fulica* with **potential as food sources, ornamental shell trade, provision of lime and slime used in cosmetics**

Edible freshwater crab ***Varuna litterata***

Clarius gariepinus **(African Catfish)**

Gobiid fish *Awaous aeneofuscus, O. spirulus and M. rude*

Prawn *Macrobrachium dolichodactylus;* a good candidate for aquaculture

Tilapia *Oreochromis spirulus spirulus*, Nzovuni

Young boys use spear guns and snorkels to fish in the clear water.

Percentage(%) population with knowledge on animals

Animal	Male	Children	Female	
Nzuzi (bird)	2	3	0	
Nyuchi (bees)	3	0	0	
Puji (bird)	3	3	0	
Kavii (dikdik)	6	3	3	
Chima (primate)	13	0	0	
Makumba (fish)	14	16	14	
Nyani (primate)	24	0	0	
Maungu(moth-caterpillar)	30	35	24	
Ngulue (mammal)	43	2	0	
Matali (rodent)	43	30	16	
Kuhe (rodent)	46	35	13	
Pala (mammal)	48	8	3	
Vivii (dikdik)	49	3	3	
Parare (grasshopper)	60	71	56	
Kanga (bird)	76	60	6	
Mverezi (bird)	77	59	8	
Gia (bird)	77	63	8	
Kerengeze (bird)	79	60	8	
Hondolomwe(bird)	79	60	8	
Kololo(bird)	81	60	6	
Samaki (Fish)	86	75	81	

Edible Animals in Africa

- 200 animal species as food.
- All large and medium-sized mammalian species and all birds occurring in their area (with the exception of swallows, wagtails, owls and night jars),
- seven species of reptiles, 29 species of insects (larvae and/or adults) and about 20 species of fish.
- 254 species of wild animals harvested by hunters and trappers in Gabon.
- Primates formed the second most important prey group
- Rodents, the brush-tailed porcupine

THREATS to sacred Kaya Kauma forest

Harvesting wood for building poles, firewood and charcoal.
90% of houses constructed from poles and fuelwood only source of energy

Threats

Clearing vegetation for agriculture exposes soil to erosion

Clearing for agriculture and sand mining along Nzovuni river.

A livestock farmer in Makumbo Village in Bamba assessing one his dead cow following the persisting drought in Ganze sub-county.Kilifi county is currently leading in the number of people affected by drought. PHOTO: DAVID NGUMBAO.

Safenets during drought periods

- Residents eat tree barks and leaves to survive severe drought
- Residents are eating leaves of a pumpkin-like wild plant even without caring about how it might affect them.(Daily Newspaper Reports)
- Kenyans Turn to Wild Fruits and Insects as Drought Looms (By Miriam Gathigah)
- About 200 indigenous plant species are used as leafy vegetables in Kenya. Only a few (4) have been fully domesticated, more (15) are semi-domesticated while the majority are wild. (Patrick Maundu, National Museums of Kenya)
- About 10 more exotic species introduced during the pre-colonial period have been integrated into the traditions of various communities

A little boy on top of a tree in search for wild fruits in Bamba. Hunger has become extreme in the area and thousands of residents in Ganze and Magarini are at risk. PHOTO: DAVID NGUMBAO.

A trader in Bamba town off-loads sacks of grass as he waits for farmers to buy the commodity for their livestock as the prolonged drought continue in some parts of Ganze, Kaloleni and Magarini in Kilifi County, October 18, 2016. Traders from Kilifi town are transporting bags of grass to Bamba, about 60 KM to sale them to the farmers at a cost of Sh200 per bag thus making a booming business from the starving farmers. [PHOTO BY GIDEON MAUNDU/STANDARD].

Children scramble for the wild fruits which the villagers say cause stomach and skin problems

Alternative Livelihoods

- The forest Island is a major source of livelihood for subsistence and income generation
- To alleviate pressure from the forest, Nature based enterprises were introduced
- The basis of the enterprises was the rich biodiversity resources and rich cultural heritage
- Three enterprises based on: (1) Cultural heritage (2) Insect enterprises based on the rich butterfly and bee species and their plant resources. Edible insects are also consumed by the community and (3) Plant based on numerous useful plant species

Prior to training on enterprises, the community were taken for an awareness creation tour of existing successful enterprises in the region such us weaving, plant nurseries, butterfly farming, beekeeping, and plant nurseries

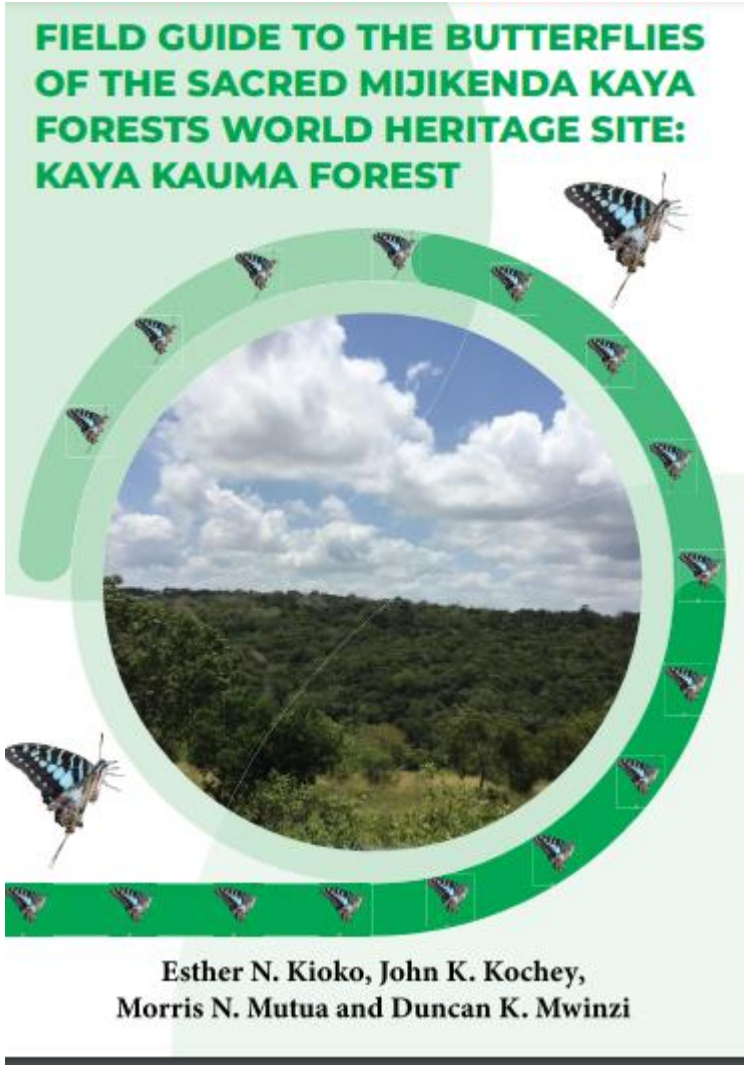
Culture based enterprises with emphasis on use of natural materials such as seeds for beads and natural fibre for weaving. The community was also trained in pottery

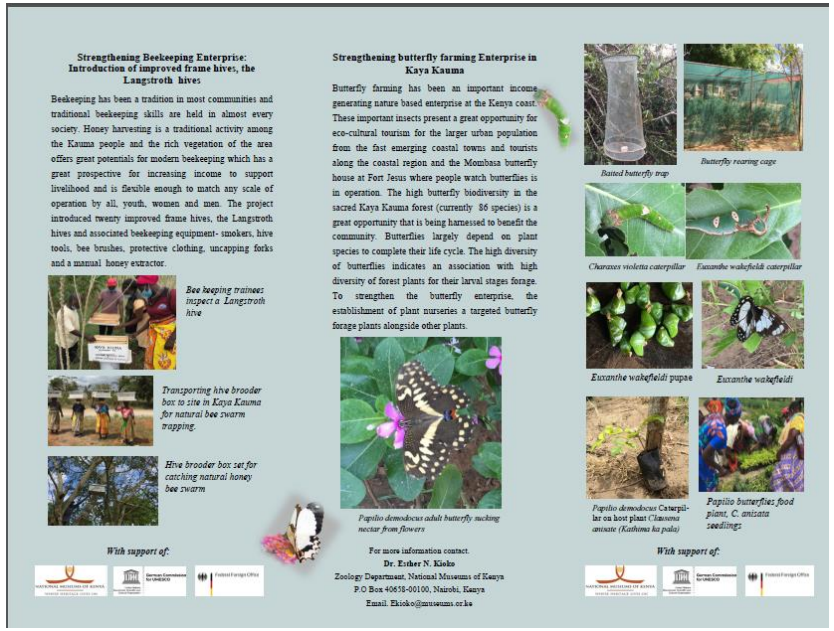
Harnessing bees and butterfly diversity for enterprises

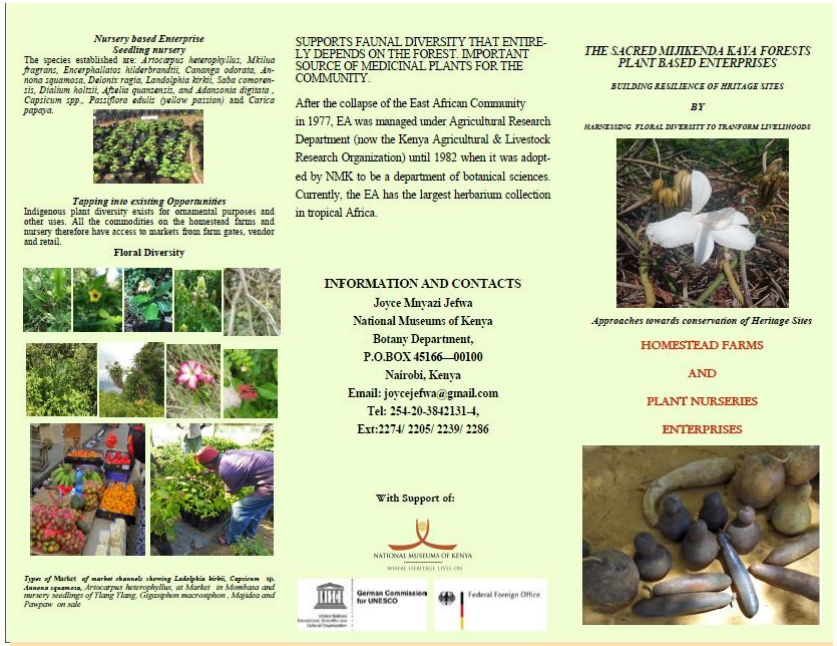
Homestead gardens for food security and business and below seedling nurseries for restoration and business

Team building activities to bridge intergenerational gap and pass on cultural knowledge and enhance cultural tourism. Other team building activities were culture walks, bird watching and building a bee yard.

Additional Conservation and Management approaches Approaches







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Thank you for Listening

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