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Threatened Heritage

Evaluation of East African Natural History Collections amidst restitution debates - Cases from Uganda, Kenya and Rwanda

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Content

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Abstract

In the currently escalating debates about restitution of Africa's heritage, the question remains whether Africa's museums have the capacity to host and maintain collections while continuing to use them for their intended purpose. This paper is based on a 5-months survey in 2018 of 17 museums/collection institutions in East Africa; Uganda, Kenya and Rwanda. Staff, citizens and other key stakeholders were interviewed on capacity of institutions as repositories, education centres as well as research infrastructures. Institutions were compared against a range of indicators.

Results indicate that all institutions assessed rate on average very low to moderate regarding collections, exhibitions, research, infrastructure and management. The institutions perform better with respect to representing national/regional identity, their usability in education and being repositories of biodiversity and cultural heritage. The low ratings are mainly attributed to insufficient personnel and expertise to manage, research, curate and develop collections and exhibitions, to poor buildings and other infrastructure, and to a lack of money and political will to support museum activities in these countries. The paper further discusses the strengths, weaknesses, opportunities and threats for the museum sector in the region and provides recommendations for capacity building therein. For almost all the institutions assessed here, restitution does not seem a realistic option unless capacities for curation are vastly improved.

Keywords biodiversity | museums | natural history | ethnography | collections

Disclaimer: The aim is not to undermine individuals, institutions or their management but rather to provide a basis for building capacity in the region and the rest of the world. Any new developments after field research are not considered.

1. Introduction

ICOM's definition of a museum (ICOM, 2017a) includes a wide range of collections. The present paper focuses on natural history collections, yet several other ethnographic museums/ collections are also included. Museums not only play an important role as archives for development and occurrence of nature in space and time for academic purposes, but also as centres of intellectual engagement of children and adults, influencing their attitudes and behaviour (Steiner & Crowley, 2013; Falk and Dierking, 2016; Andre, 2017).

Presenting environmental issues to the wider society remains a challenge (e.g. Pooley & O'Connor, 2000). Natural history collections can increase understanding of the drags, consequences, and complexity of environmental problems thus triggering debates about environmental policy options (Stine, 2002). Museum

specimens are a unique resource providing users with information on biogeography, taxonomy and ecology. Collection data can be used to assist biodiversity assessments (Ponder, 1999; Ponder et al., 2001; Winker, 2004). The current loss of biodiversity is unprecedented and biodiversity inside and outside of protected areas is at risk (WCS, 2016; Ehrlich and Wilson, 1991). Collection institutions, therefore, act like reference libraries (Winker, 2004). However, these face several challenges such as political and economic instability, and natural disasters among others (Wegener, 2015). There is an urgent need to assess the capacity of natural history museums and other collections to meet these challenges.

East Africa is commonly known for its diverse flora and fauna, and the unique landscapes (Stuart et al., 1990; Griffiths, 2005). For example, Uganda is just 241.551 km² in size but harbours 10.2 % of the globally recognised bird species, 6.8 and 4.6 % of the dragonfly and butterfly species respectively and 7.5 % of the mammals (Winterbottom & Eilu, 2006). This is not different from the rest of the region including most African countries, where many endemic, threatened or rare species occur. Surveys and projects have already yielded a lot of information which is, however, not readily available to decision makers (Darwall et al., 2005). With respect to biodiversity, some data are centrally available at national databases (e.g., National Biodiversity Data Bank (NBDB) for Uganda; Plumptre et al., 2017); other databases are run by private or public institutions. Databases become rapidly outdated as project finances dry up, and access to information deteriorates (Darwall et al., 2005).

Little is known on the situation of museums/collecting institutions in Africa, even by people dealing with collections as research infrastructure. For East Africa, there is very limited information e.g. in literature, about biodiversity repositories such as museums and herbaria. The existing sources are old, hidden in tourism blogs or websites, and without relevance for assessing their current state. Few new publications are available online (e.g. Ssenyonga, 2016). Only few countries such as South Africa, have sufficient online information about their museums.

2. Study aim and methods

The main objective of this paper was to find out '*What is the present state of African Natural History Museums & Collections regarding their function as biodiversity repositories as well as research and education infrastructures*?' Thereby, the aims were;

- to describe the state of natural history collections in Uganda and selected institutions from Rwanda and Kenya, and
- to assess public opinion on museums in Uganda

Study design

For this study, institutions from Uganda, Kenya, and Rwanda keeping zoological, botanical, geological and/or palaeontological collections were investigated. In Uganda, all major collections with zoological and botanical material were investigated, and a few ethnographic collections were included because of their popularity and/or national relevance. For Kenya, the National Museums of Kenya (Nairobi National Museum), which is the umbrella body of all museums and the main repository of most of Kenya's natural heritage, was investigated. Rwanda does not have a 'real' natural history museum. Therefore, three museums under the 'Institute of National Museums of Rwanda' (INMR), which mainly have an ethnographic focus were assessed. A herbarium, not listed under INMR but previously known as the National Herbarium of Rwanda, was also visited and assessed. In total, 12 collections in Uganda, 4 in Rwanda and 1 in Kenya were covered by this survey.

The qualitative and quantitative study focused on, (a) the museums as an entity and (b) stakeholders. The stakeholders comprised (1) museum staff (curators, collection managers, researchers, directors, security, staff at coffee shop), (2) the public (citizens from the area) and (3) governmental officials (e.g. responsible for tourism, education and research).

Data collection

Data were obtained from questionnaires, databases, literature on natural history collections, and interviews with key stakeholders. Questionnaires were optimised by sending them to colleagues, and collection institutions were informed about the intended research. Data sampling included (1) visiting and evaluation of the museums, (2) interviews with museum staff and personalised assessments, and (3) public engagement. It took 1 to 6 days to obtain the required data from each institution/area.

Assessment of the museums/collections

First, the institution was inspected, and prior to the interviews, the intentions were explained to the managers who then informed their staff. Most institutions gave unlimited access to almost all their sections. A semi-structured questionnaire was used to rank collections under different aspects, and to clarify if the institution has been successful in achieving its objectives, involvement in academic education, collection size and structure. For each institution the director, collection manager and/or

several members of staff such as researchers or tour guides were interviewed. In interviews, additional information (challenges and solutions, local auditing, among others), were recorded.

After profiling the museum and assessing the significance of each aspect, a five-rank based matrix, similar to that used by the Smithsonian Museum in their collection assessments, was used to rate quality:

> 5 – very satisfactory (very high quality), 4 – satisfactory (high quality) 3 – just satisfactory (moderate quality), 2 – somewhat satisfactory (low quality) and 1 – not satisfactory (very low quality). '0' meant the indicator was missing or could not be assessed.

The ranking criteria (**Table 1**) followed standards in the care of museum collections (Museums & Galleries Commission, 1992a, 1992b, 1996; Professional Networks Council, 2012; Stanley, 2004; ICOM, 2017b; Ambrose & Paine, 2018). At the core of the assessments, conditions, drags, and risks were analysed, characterized and prioritized (Dardes et al., 1998). The institution's staff were also asked to rate different aspects based on the above criteria for comparisons.

Data from the government and official institutions

Data from government and official institutions concerned with museums, tourism or related to natural history research, were obtained through face-to-face interviews and telephone calls. An introduction by colleagues before the meeting proved beneficial. Interviews were recorded yet sometimes respondents objected to that. Most respondents preferred to stay anonymous and have their positions not revealed. Some governmental institutions, therefore, are not mentioned here.

Public engagement

An online questionnaire was set up prior to field work, and the link shared via Facebook and WhatsApp, for four months. In the field, visitors and citizens were asked to fill out a questionnaire and/or interviewed about natural history collections and other museums in Uganda. The questionnaire was used as a guide for the interviews. Participants were randomly selected; including visitors in museums and individuals outside the museums. Similar interviews were done in Kenya and Rwanda but only Uganda was considered during analysis of the public engagements while data from the other countries fed in the discussion only.

Ethical considerations

Though all institutions were very cooperative providing institutional data, they preferred that data such as visitor numbers and sources of funding should not be published. Likewise, individual staff respondent data such as their positions and departments were collected but are not disclosed in this report. Before taking any interviews or recordings, respondents provided a written or audio recorded consent. Moreover, no respondent's name or position will be revealed unless unavoidable like collection directors or managers.

Data analysis

The research was mainly qualitative but resulted in some semi-quantitative data. For purely qualitative data, this report adopts the storytelling method of presentation and interpretation. It draws from experiences and the stories the respondents shared to make sense of the observations, and narrates this (Mahoney, 2007). The assumptions and conclusions are subjective and may differ from one individual to another (Temple & Edwards, 2002).

The resulting semi-quantitative data originated mainly from the rankings. The data was treated based on two assumptions. Ranks indicated; (1) the state of quality of a given aspect e.g., low or high quality and (2) a quantitative score (rating 1 = 1 point, 2 = 2 points, 3 = 3, 4 = 4 and 5 = 5). The potential maximum score based on 34 indicators per institution was 170 (34 x 5 points) and considering the 5 categories was 25 (5 x 5). The total points scored were used for comparing the overall state of quality between institutions.

Spider plots were used to see if assessments by the staff and the author's were similar. A Kruskal-Wallis was performed to test variance between the author's ratings for the different institutions assessed.

The recommendations for building capacity for Africa's museums were a result of a collaborative understanding from the observations described in this report and of consultations from professionals dealing with museums/collection institutions in Africa and beyond.

3. Results

In total, 24 institutions were investigated, including 17 collections/museums and seven institutions for natural history research, education or management from three countries (Uganda, Kenya and Rwanda). 54 staff questionnaires and 54 face to face interviews of the institutional staff were considered originating from 83 respondents (**Table 2).** Some attempts to get were neglected and hence not included.

Table 1. Assessment criteria, categories, indicators & codes (Table extends over three pages).

Cat.	Code	Indicators	Description	Ranking criteria
Collections	001	**Units**	State of collection cabinets	Damages e.g. by pests or breaks etc., suitability for type of collection such as wet or dry specimens (wooden, metallic or glass)
	002	**Conservation**	State of collections in storage	Signs of infestation, wet specimens well preserved (e.g. fully submerged), frequency of checking, methods of preservation (harmful?) etc.
	003	**Storage**	Units and conservation, environments of collection cabinets and hall	Regulated internal temperature, space, illumination, UV, collection, signs of leaking e.g. from the roofs etc.?
	004	**Safety**	Safety of collections, staff or visitors in the storage rooms	Safety measures in case of fires, e.g. fire extinguisher, slippery floor, emergency exit, alarm system etc.; Is space sufficient especially when visitors come in?
	005	**Identification**	Identification of specimens	% of identifications, is there research going on?
	006	**Meta-data**	Collection meta-data	Collections meta-data associated, storage of these, state of hard copies?
	007	**E-record**	Collection data in digital database	Any soft copies of specimen data? How often updated? All collections included? Data base protected against cyber-attacks?
	008	**Publication**	Publications on collection material	Publications based on the collections? Accessibility online? Involvement of staff?
Exhibition	009	**Educational programs**	Education program	Written concept for educating kids/target audience? All target age groups considered? Other amenities e.g. for kids in case they are bored? Informed guides on the collection?
	010	**Dioramas**	Dioramas	Present/absent? Quality (appealing, informative)
	011	**Scenography**	Artistic emphasis and staging of exhibits	General appearance/structuring of the exhibits, space use (also between exhibits)
	012	**Labels/caption/ text panels**	Labels/caption/text panels	Readable, informative, appealing and in decent shape? Well placed to refer to the objects intended? Writing style on the labels
	013	**Illumination**	Lighting in exhibition halls and on specific units	Appropriate illumination for visitors to view the exhibit? Any light attenuations to bring out detail of objects? Natural light influx?
	014	**Objects**	Objects of exhibit	Conservation of exhibited objects (see conservation of collections in storage)
	015	**Multimedia**	Include visual and audio guides, virtual realities, screens, etc.	Presence or absence, and state, functioning?
	016	**Arrangement**	Arrangement of objects	Structure detectable or objects just scattered around? Does the arrangement tell a story? Any safety measures in case of fires?
	017	**Background**	Background	Is there a background behind exhibits? State of dioramas if present?

Cat.	Code	Indicators	Description	Ranking criteria
Research	018	**Staff researchers**	Staff researchers	Do all the profiles/represented taxa have at least one scientist responsible for handling research? Are they qualified regarding their work? Any field works? No. of publications from the researchers? Are they involved in teaching?
	019	**Staff technical**	Technical staff	Separate from research staff? Human resources sufficient considering the size and needs of the collection? Qualifications/ training/experience to handle their work?
	020	**Microscopes and other equipment**	Lab equipment	Sufficient to meet their targets?
	021	**Funding**	Funding for research	Reliability of funding for research?
Management	022	**Management system**	Organisational structures	Organigram structured to meet goals? Functional departments present?
	023	**Finances**	Sufficient budget to run the museum	Ability to pay the basic daily errands e.g. electricity and water bills, staff salaries etc. (this does not include research)
	024	**Relationship with government**	Government	Any governmental support e.g. Funds, subsidies, advertisement by responsible bodies etc? Recognition by the state as existing etc.
	025	**Relationship with other institutions**	Collaborations	Any collaborations: local and international e.g. exchanges? Members in other associations e.g. ICOM etc.
	026	**Security**	General security around the museum	Security department? Any security personnel hired? Any cameras installed? Checkpoints before you leave the exhibition halls etc.
Infrastructure	027	**Website**	Website	Informative enough e.g. does it include the location, opening times, costs etc.? Does it depict collection's profile?
	028	**Building condition**	General internal and external condition in all buildings including offices	Signs of leakage, state of the roof, windows, doors, floors and walls?
	029	**Building style**	Architecture	Does the architecture reflect the museum profile? Would one tell it is a museum from first view?
	030	**Facilities for disabled**	Only applying for those on wheel chairs	Accessibility up and down stairs, toilets user friendly?
	031	**Laboratory**	Labs for research	Any safety measures in case of fires? Condition of the floor; slippery? Is space enough for available audience? are there exit/ emergency doors? Alarm system present or absent? Are they well equipped, microscopes, chemicals etc to meet their objectives available?
	032	**Cafeteria**	Coffee shop or restaurant	Accessibility and visibility? Meet target demand in terms of numbers and structure e.g. Local and foreign meals etc?
	033	**Gift shop**	Museum Gift shop	Accessibility and visibility e.g. sign posts for direction? Variety of objects? Do the contents reflect the profile of the museum?
	034	**Carpark**	Parking for visitors and staff	Space for parking adequate for objectives (for public or research)? Is it secure?

Table 2. Institutions surveyed, their focus and number of respondents, questionnaires or interviews.

	Country	Institution visited	Abbrev.	Rank assessments	Respon-dents	Question-naires	Inter-views	Department/focus
Collections/Museum	Uganda	Makerere University Zoology Museum	MUZM	Yes	5	3	3	Zoology
	Uganda	Makerere University Herbarium	MUH	Yes	4	3	3	Botany
	Uganda	Uganda Martyrs Museum	UMM	No	1		1	Ethnographic
	Uganda	Kawanda Invertebrate Museum/Herbarium	KIM/KHM	Yes	1	1	1	Zoology and Botany
	Uganda	Uganda Museum	UGM	Yes	18	16	3	Natural History (Zoology, Botany, Ethnographic, Geology etc.)
	Uganda	Igongo Cultural Museum	IG	Yes	10	10	9	Ethnographic
	Uganda	Great Lakes Museum	GLM	Yes	4	4	2	Ethnographic
	Uganda	Institute of Tropical Forest Conservation Herbarium	ITFC	Yes	1		1	Botany
	Uganda	Makerere University Biodiversity Field station	MUBF	No	1		1	Botany
	Uganda	Zoological Museum Mweya	MM	Yes	1		1	Zoology
	Uganda	Buganda Museum	BM	Yes	2	1	1	Ethnographic
	Uganda	Ssemagulu Royal Museum	SRM	No	1		1	Ethnographic
	Rwanda	Ethnographic Museum of Rwanda	EMR	Yes	1		1	Ethnographic
	Rwanda	Kandt House (Previously Natural History Museum of Rwanda)	KH	Yes	1		1	Ethnographic and Zoology
	Rwanda	Environment Museum Rwanda	MH	Yes	1		1	Energy and Botany
	Rwanda	National Herbaria of Rwanda	NHR	Yes	3		3	Botany
	Kenya	National Museums of Kenya	NMK	Yes	25	16	17	Natural History (Zoology, Botany, Ethnographic, Geology etc.)
Other institutions	Uganda	Makerere University Administration		No			1	Administration
	Uganda	National Biodiversity Data Bank	NBDB	No	1		1	Biodiversity Database
	Uganda	Uganda Wildlife Authority	UWA	No	2		1	Wildlife and research
	Uganda	Uganda National Council of Science and Technology	UNCST	No	1		1	Research
	Uganda	Wildlife Conservation Society	WCS	No	1		1	Wildlife and research
	Uganda	Uganda Tourism Board	UTB	No	1		1	Tourism
	Rwanda	University of Rwanda	UR	No	1		1	Education and research

3.1 Evaluation of the collections/ museums

Only 15 out of 17 collections/museums were included in the assessment because Ssemagulu Royal Museum (SRM) and Uganda Martyr's Museum (UMM) were very different from the target collections and hence excluded. The trends of assessment by staff or the author's, were similar (**See 3.1.2**). Based on the author's assessment, institutions were on average rated to be of very low to low quality (**Fig. 1**). Ratings for indicators were very low to just satisfactory (**Fig. 2**, See also assessment of each individual institution).

Of all institutions assessed, NMK had the highest scores; 15/25 and 107/170 considering categories and indicators respectively. In Uganda, IG had the highest points (14/25 and 102/170) while EMR was highest in

Rwanda (13/25 and 91/170). Most institutions scored poorly (less than half the points) on average (**Fig. 3**).

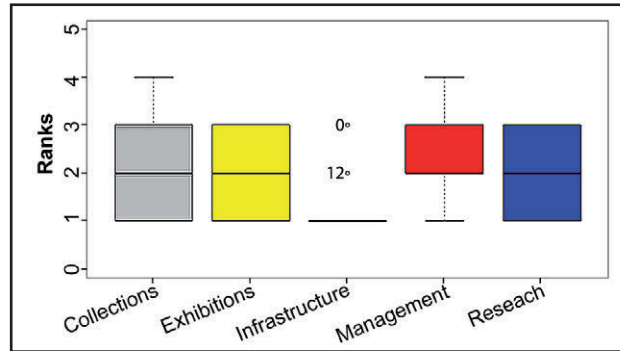Using Kruskal-Wallis test, there was a significant difference between the author's mean ratings for the 15

Figure 1. Box plot for the author's median ratings of categories for all museums/collections.
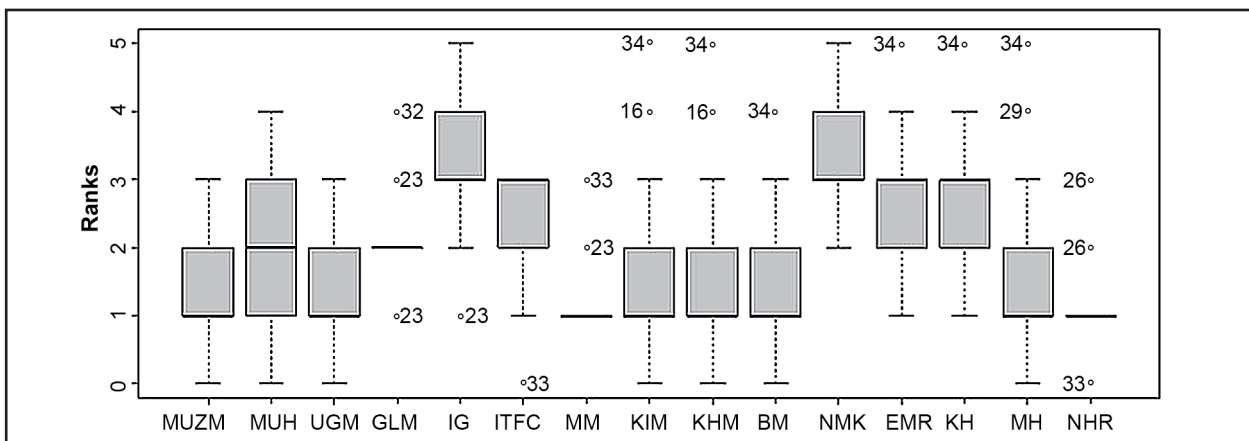
Figure 2. Box plot for the author's median ratings for all museums/collections based on the 34 indicators considered. Refer to Table 2 above for abbreviations
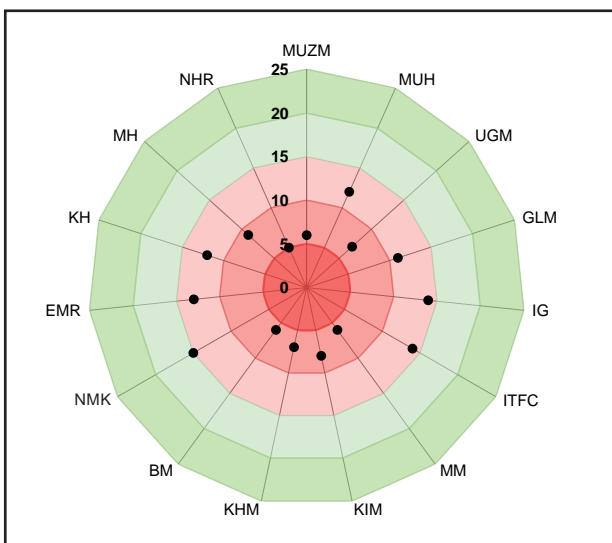
Figure 3. Comparative evaluation of all institutions assessed based on scores obtained from the author's rating for categories. Score criteria: 0 is worst, 25 is best. Refer to Table 2 above for abbreviations

Figure 4. Author's assessment for all museums/collections assessed based on categories. Quality criteria: 1 – very low quality, 2 – low quality, 3 – moderate quality, 4 – high quality. Refer to Table 2 above for abbreviations

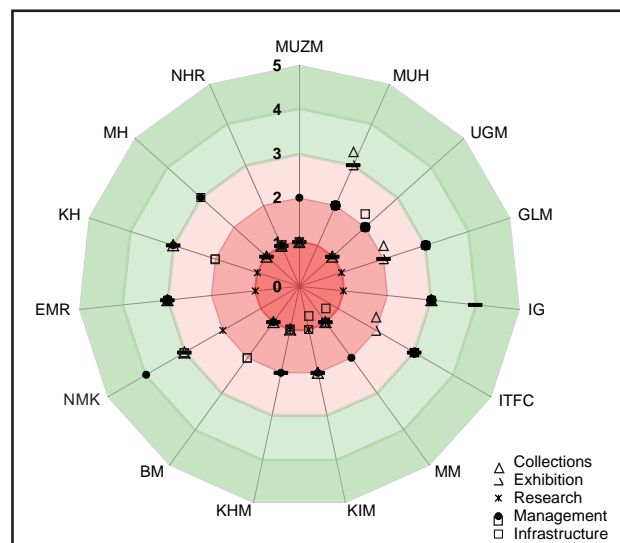institutions assessed, considering indicators ($H_{14} = 177.38$, $p = < 0.001$). The test gave a similar result (a significant difference) when considering categories [$H_{14} = 39.69$, $p = < 0.001$). Though ratings varied from one institution to another (**Fig: 4, See also 3.2.**), there were general trends across all museums/ collections assessed.

At the national and institutional level, there were often deficiencies regarding institutional standing, professional conduct, legal frameworks and exhibitions, funding, collection acquisition, care, and use. Sometimes there was no clear policy regarding these aspects.

Regarding their functions as biodiversity repositories and as research infrastructure, several museums had good collections, but curation was often poor. Pest infestation and dust on specimens and inside storage cabins were obvious. Buildings were often old or inappropriate for the long-term well-being of the collections (no dust, humidity or temperature control, and in some cases leaking). Research was on-going in several collections but with poor or no infrastructure (labs and equipment). Deficiencies in human resources to manage or investigate the collections were obvious. Often, no budget was set apart to do research. One museum staff member said: '*Sending specimens to colleagues with better facilities is inevitable. However, we can rarely afford to go or send our students to these labs to learn the techniques or be able to find or purchase alternative equipment. We also need to build capacity for our institutions*'. One staff added that some visiting researchers feel frustrated because they cannot do the research they would have done under such conditions.

Profiles of collections and exhibitions in most of these museums still resemble those of the colonial days 'museums within museums', with minimum or no developments to match a modern museum. The exhibitions often lacked structuring or even a clear profile; many had concepts developed during colonial times. New museums also followed similar patterns, without any museum-specific profiles. The expertise required to improve profiles and exhibitions was lacking. Administrative and governance structures for most museums and responsible state bodies were insufficient.

Museums that had relatively good publicity, at least a website, social networks and or signposts on the roadside, were relatively more well known to respondents and had more visitors, including a large share of local visitors compared to their counterparts.

3.2 Staff and author's ratings

For the 8 institutions where staff also did the evaluation, examination using spider plots shows generally similar patterns between the two ratings (**Fig. 5**). No statistical tests for correlation or significance were made since the author's ratings were partly dependant on the staff's views.
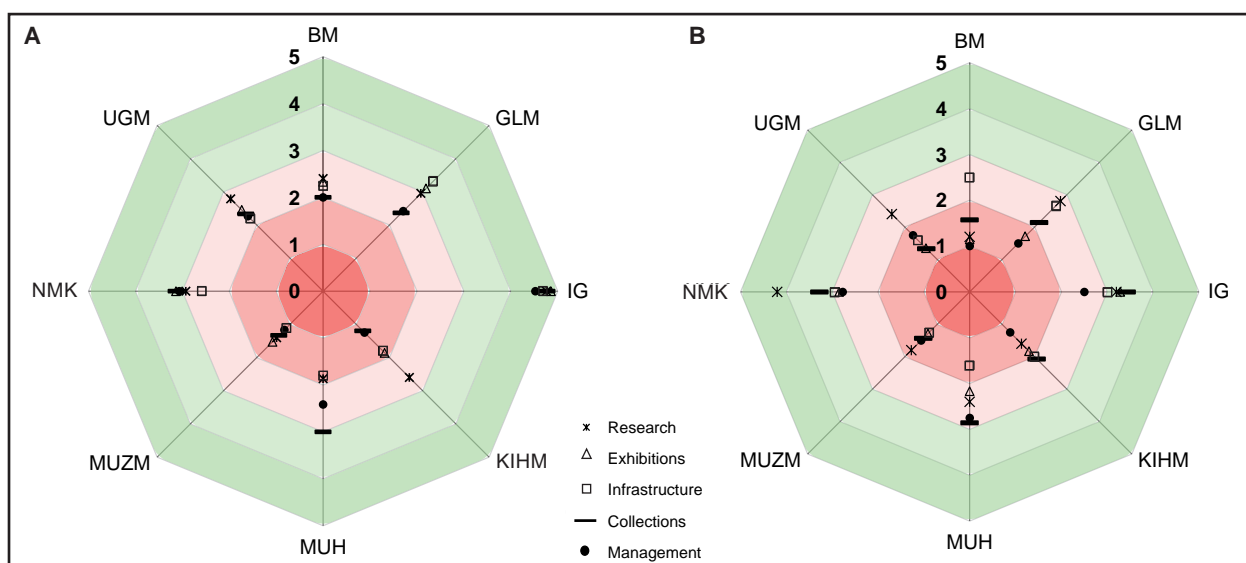
Figure 5. Comparison of staffs' (**A**) and author's (**B**) assessment for those categories rated by both. Quality criteria: (1- very low quality, 2- low quality, 3- moderate quality, 4- high quality, 5- very high quality).

Abbr.: MUZM – Makerere University Zoology Museum, MUH – Makerere University Herbarium, GM – Uganda Museum, GLM – Great Lakes Museum, IG – Igongo Cultural Centre/Museum, KIHM – Kawanda Invertebrate Museum and Herbarium, BM – Buganda Museum, NMK – National Museum of Kenya

Table 3. Grouping of museums/collections visited and/or assessed.

Country	Group	Institutions
Uganda	Collections/Museums with over 10000 records of zoological and botanical material	Uganda Museum, Makerere University Zoology museum and herbarium, Kawanda invertebrate collection and herbarium
	Collections with zoological and botanical material less than 10000	Herbarium at the Institute of Tropical Forest Conservation, Mweya Zoological Collection
	Ethnographic collections	Igongo Museum, Great lakes Museum, Buganda Museum, Ssemagulu Royal Museum, Uganda Martyrs Museum
Kenya	Natural History collection of Kenya	National Museums of Kenya (Nairobi National Museum)
Rwanda	National Museums of Rwanda	Ethnographic Museum, Museum of Environment, Kandt House Museum
	National Herbaria of Rwanda	National Herbaria of Rwanda

Table 4. Number of records and taxonomic focus in some of Uganda's museums/collections (data obtained from collection records and curator).

Museum/collection	Section(s)/Taxa	≃ No. of records	No. of types
Uganda museum (UGM)	Reptiles	7000	Unknown
	Other vertebrates	100000	
	Geology	NA	
	Palaeontology/fossils	1500000	
	Invertebrates	NA	
Makerere University Zoology Museum (MUZM)	Large mammals	5000	Unknown
	Small mammals	10000	
	Birds	4000	
	Herpetiles	5000	
	Fishes	3000	
	Insects	50000	
	Fossils	200	
Makerere University Herbarium (MUH)	Herbarium (plants and fungi)	50000	120 + Unknown
	Botanical garden	NA	Unknow
Kawanda Invertebrate Collection (KIM)	Invertebrates (Insects)	25000	Unknown
Kawanda Herbarium (KHM)	Herbarium	10000	
Herbarium at Institute of Tropical Forest Conservation (ITFC)	Herbarium	1500	
Mweya Zoological Collection (MZC)	Zoological	100	Unknown
Igongo Museum	Ethnographic	500	
Great Lakes Museum	Ethnographic	400	
Buganda Museum	Ethnographic	100	

*NA-Data was not provided

3.3 Description and assessment for each museum

The institutions are grouped by number of objects, focus, and country, on which basis they are also described and/or assessed (**Table 3**).

3.3.1 Museums in Uganda

In Uganda, museums are subordinated to the Ministry of Tourism, Wildlife, and Antiquities in the Department of Museums and Monuments. The ministry is responsible for sustainable tourism, wildlife, and cultural heritage. The Department of Museums and Monuments is headed by a commissioner, who was the director of the Uganda Museum at time of the survey. The department is responsible for monitoring and guiding all museums including private community museums in Uganda. The number of records by specimens from some institutions assessed varies significantly (**Table 4**).

(a) The Uganda Museum (UGM)[1]

UGM is Uganda's national museum and the oldest museum in East Africa, established in 1908 at Lugard's fort (currently Buganda Museum) on Old Kampala Hill in Kampala city. Its current building (**Fig. 6**) was established in 1954 and designed by the architect Ernst May. The collection grew from archaeological and paleontological excavations by scientists such as Edward Wayland, Bishop J. Wilson, and Church Hill among others from 1920 to 1940 (Pers. comm., see also: Rivard, 1984; Ogura, 2005; Demissie, 2012; Byerley, 2019).

Objects recorded during the survey included home tools, cultural wears, and models of indigenous houses, musical instruments, a collection of Ugandan music, material from science and technology such as an old vintage car of Captain Lugard, and photographs depicting the history of the country. However, the museum also had a considerable collection of natural history specimens including round skins, and bones of mammals, birds and reptiles, as well as a geological and palaeontological collection containing many fossils. The reptile wet collection is the oldest collection in Uganda.

The better part of the ethnographic collection was exhibited permanently, while natural history collections were kept mainly in cabinets in storage rooms (only a few specimens were in the exhibition). The collection rooms were in the basement of the building where also dioramas are located. Specimens were kept in wooden

[1] All information is first-hand, obtained through interviews with key respondents and resources from the museum. Other resources are cited for cross reference.

cabinets, cardboard boxes especially for paleontological collections, and glass jars for the wet specimens. Others such as mounted skins of large mammals and their bones were on top of the cabinets. The curator revealed that they have some specimens likely of locally extinct species, and presumably several type specimens (See also: Fleagle, 1975; Walker & Rose, 1968; Rossie & MacLatchy, 2006).

The museum has a large exhibition hall with a room for temporary exhibits. The exhibition was seemingly structured to depict different stages of civilisation in Uganda, from the stone age, pre- and post-colonial times, present day life to natural history. The objects were kept mainly in wooden cased cabinets and a few objects such as Lugard's vintage car were left open for the public to feed their sense of touch. For each section, there was a lead staff with a team of tour guides, responsible for education during visits. Some objects are loaned to schools for education. The museum hosts lectures, public talks, and workshops on topics relevant to the public. Reportedly, museum staff occasionally carry out education programmes in remote local communities which cannot visit museums.

Assessment of the Uganda National Museum

UGM is a public institution financed by the Ugandan Government and well known among local citizens but scored very low (**Fig. 7**) compared to its counterparts with a similar status considered in the survey.

UGM has the largest collection in Uganda with ca. 3 million objects including very old records. However, research by museum staff was practically lacking in all departments (**Fig. 7, 018-022**) apart from that done during joint excavations resulting in collecting. A few publications based on the collection mostly authored by foreign researchers are available online (e.g., Rossie &

Figure 6. Part of the Uganda Museum's building showing the entrance to the exhibition hall.

MacLatchy, 2006). Reportedly, most objects collected during excavations are taken to other countries for further research due to lack of proper infrastructure and expertise. No voucher specimens were returned although the museum expected so. The museum lacks human resource to deal properly with all of its natural history collections. There was only one scientist for life sciences in the entire Uganda museum who is the curator of the complete natural history section. Other staff were mainly social scientists, with no specific education to handle collections.

In the collection rooms of the natural history sections there were no lights for the past six months. Due to lack of space, collections were crowded. Both, the cabinets and specimens, showed signs of either infestation with moulds and other pests, poor maintenance or both. Several chests were already broken but still contained specimens. Some palaeontological collections were in cardboard boxes piled without a clear plan. Most objects in the fluid collections were not fully submerged and were rotting. Some stuffed skins had been partly or totally damaged by moulds or other pests. No collection data, neither written nor electronic, were available for large parts of the collections (**Fig. 7, 006-008**). The curator noted that the natural history section had been abandoned from around 1999 until 2005, leading to loss of many specimens and associated data. Of the initially 24,000 reptile specimens, they managed to secure only 7,000 and discarded the rest. By the time of the current survey, they started to re-document the collection by placing the right tags and digitising. As of now, these data are not available.

In the entire museum building, there was no regulation of the external environment: The rooms lacked installations to control or regulate internal temperature, humidity, and UV-light, and to keep out dust and pests or
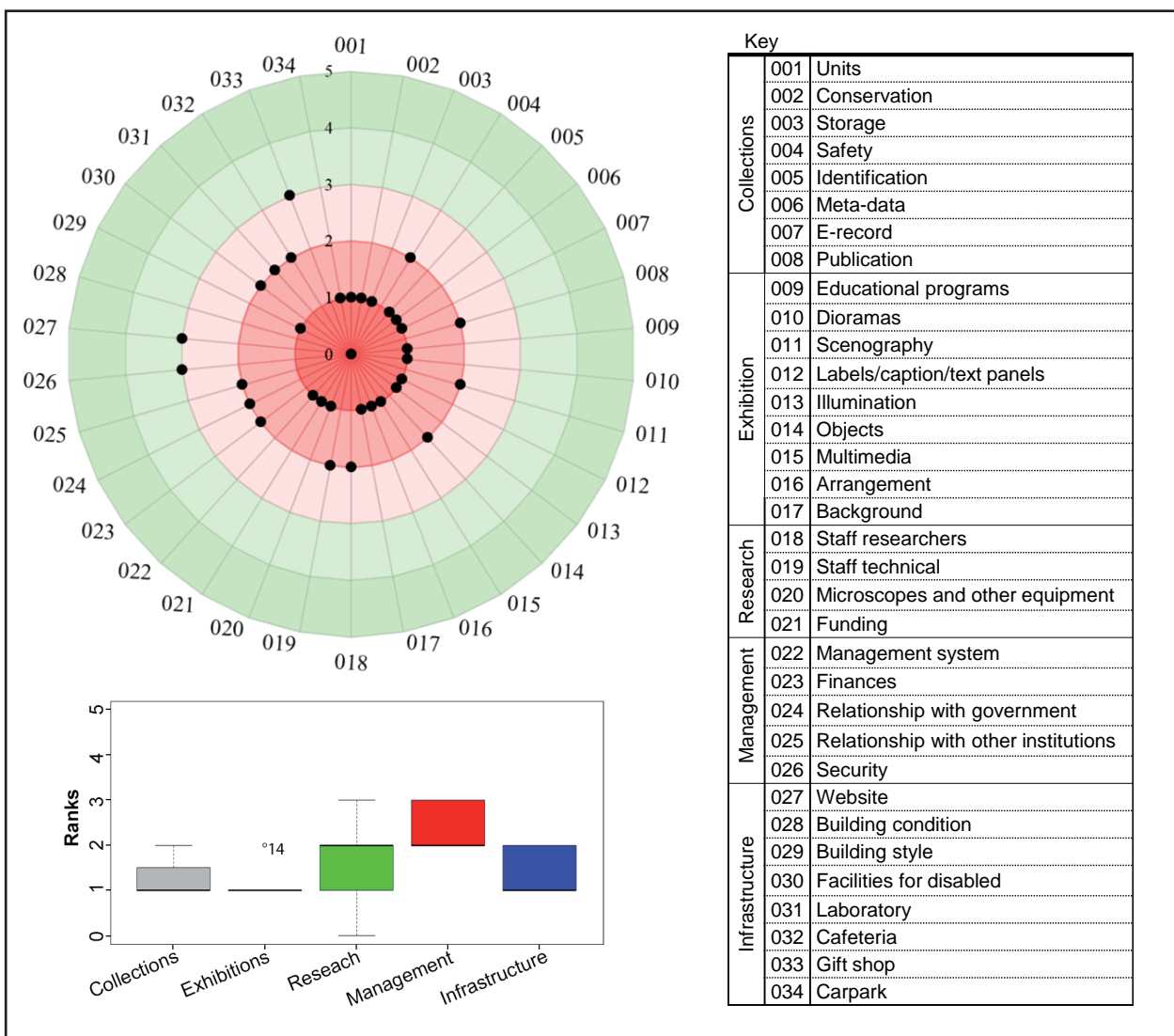

Key		
Collections	001	Units
	002	Conservation
	003	Storage
	004	Safety
	005	Identification
	006	Meta-data
	007	E-record
	008	Publication
Exhibition	009	Educational programs
	010	Dioramas
	011	Scenography
	012	Labels/caption/text panels
	013	Illumination
	014	Objects
	015	Multimedia
	016	Arrangement
	017	Background
Research	018	Staff researchers
	019	Staff technical
	020	Microscopes and other equipment
	021	Funding
Management	022	Management system
	023	Finances
	024	Relationship with government
	025	Relationship with other institutions
	026	Security
Infrastructure	027	Website
	028	Building condition
	029	Building style
	030	Facilities for disabled
	031	Laboratory
	032	Cafeteria
	033	Gift shop
	034	Carpark

Figure 7. Author's summary assessment for the Uganda Museum. Quality criteria: 1) very low quality, 2) low quality, 3) moderate quality, 4) high quality, 5) Very high quality.

either (**Fig. 7, 029**). Since establishment, there were no capital improvements with only a few fixes such as on the roof, reportedly after significant damages. In the storage rooms, dust and leakage were obvious. The museum had proposed a new building with a lab and offices, more space and better conditions for the collections, but there were no financial sources. It was not clear whether the new building would have an adequate science lab.

The exhibition hall was dusty (including cabinets and objects). Concept and structure of presentation remained unclear in some parts of the exhibition. '*You cannot just print out random pictures of any icons (athletes, musicians, footballers) and display them in a national museum.*', a visitor expressed when asked about the exhibition profile during an interview. Pointing at some pictures and searching them on the web he added, '*These are from a web page! I would at least love to see Uganda's past presidents or kings or heroes in Uganda's National Museum*'. In the exhibition, standard fluorescent bulbs did not bring out any detail of the objects. Several cabinets were out of lights. Many objects received direct UV-light. The dioramas were pitch dark (**Fig. 7, 011-014**).

For most exhibits, labels were printed on regular white paper and positioned next to or directly on to the specimens. Sometimes they were already flying off or had disintegrated (**Fig. 7, 012**). Some labels were informative while many just displayed the name of the object without any additional information. There was no form of multimedia or other aids thus the visitor had to read or depended on the guides for explanations. Most of the objects in the exhibits were in good condition apart from a few objects in the natural history section which were disintegrated; partly or completely eaten by pests.

Regarding safety, two fire extinguishers (one around the administrative offices and another close to the entrance of the exhibition hall) were installed. There was also a 'water-based pipe system' as a supplement but maintenance was reportedly lacking. Fortunately, there were no fire incidents in previous years. The museum had a meeting point in case of a fire and several emergencies exists. Space to allow easy exit in case of fire was limited in the storage rooms (**Fig. 7, 004**). There were no other technical instalments for safety observed (**Fig. 7, 027**).

Internal organisation of workflow seemed insufficient on different levels. For instance, the museum set up a cultural village during the Commonwealth Heads of Government Meeting (CHOGM) celebrations but that looked abandoned and was disintegrating. UGM also did not have an official website. One trusted source revealed that the responsible ministry had the opinion that having a museum website would misrepresent the non-profit nature of the institution, and hence it was

better to have one embedded within the Ministry's. By this report, however, there was none. Though financed by the state, several members of staff admitted that the budget is only able to cater for staff salaries, cover daily operational costs such as electricity and water, and maintain a few exhibits. No budget is set apart for research or maintenance of the collections. '*We have to depend on additional funds which are not easily accessible partly because the museum is not autonomous making the process slow and strenuous.*' one member of staff revealed. Notably, this is the only state-financed museum in Uganda.

(b) Makerere University Zoology Museum (MUZM) and Herbarium (MUH)

These institutions are the largest zoological (MUZM) and botanical (MUH) collections in Uganda. Both are under Makerere University which is the most prominent research and education institution in Uganda. MUZM was opened by Sir Julian Huxley on the 10th of September 1963 (unpublished reports found at the museum) and is currently under the Department of Zoology, Entomology and Fisheries Science. MUH was established in 1945 at the College of Natural Sciences under the administration of the Department of Botany, where it is still to date. Both MUH and MUZM were set up primarily as resources for education at the University, to preserve biodiversity and make collections nationally and internationally available for research.

Makerere University Zoology Museum (MUZM)

The MUZM building is part of the zoology/botany complex which includes offices and lecture labs (**Fig. 8**). The vivarium and aquarium at the basement were not functioning. The exhibition and storage rooms are at two other levels. The exhibition space is about

Figure 8. Part of the Zoology Botany building complex at Makerere University, where MUZM is located.

40m^2 with mainly permanent exhibits, stored in wooden cased-cabinets and a glass face.

Several skeletons are placed on top of concrete platforms. The exhibits were mostly permanent and as old as the museum itself. The exhibition shows different taxa from Uganda, seemingly arranged to depict 'evolution of higher taxa'. One large exhibit showed totems of the Buganda Kingdom that include stuffed skins and photographs. Inside the exhibition hall was also the principal curator's office (about 15m^2), where he stores specimens in a fridge prior to further processing. Underneath most of the exhibit's collections are wooden shelves. In the shelves are mainly insect collections stored as pinned specimens, and in envelopes. Other specimens are stored in rooms away from the exhibition hall. One of the storage rooms contains mainly skins of birds kept in wooden cabinets. Two others have several large skeletons (some on top of shelves and on the floor), and wet specimens in glass jars (**Fig. 9**) and plastic buckets.

Since the opening of this collection in 1963, many researchers have studied or consulted the collections and/or deposited material here. It is the principal active repository of zoological objects as the commissioner of museums in Uganda confirmed. It held a significant number of birds, mammals, butterflies, and dragonflies representing biodiversity from most of Uganda's ecosystems. By 2015, the collection consisted of over 10,000 mammals, 3500 birds, 3000 amphibians, 2000 reptiles, 40,000 invertebrates, 2000 osteological specimens, and over 200 fossils. The uniqueness of these collections (with respect to rarity, provenance and type specimens) could not be ascertained. Two important collections are the butterfly collection assembled by the late geneticist Professor Denis Owen and the Orthopteran collection of Professor Hugh Rowell. The Curator was also working on a bat-call database for the region.

The number of specimens is rising in contrast to any other institution in the country. Over 5000 objects are added or temporarily stored here yearly. Many of the recent specimens were voucher specimens saved by staff members of the department including the museum's only official staff member, who is involved in several field expeditions throughout the year together with graduates and other researchers.

Makerere University Herbarium (MUH)

The herbarium is located about 500 meters from the lecture labs, together with the departmental botanical garden. The garden cultivates numerous vital medicinal plants, including many threatened species of the country. The herbarium building complex (**Fig. 10**) comprises staff offices, a library, and a collection room. At the entrance, a preparatory area with a large freezer as part of measures against pests from incoming specimens is located. The collection houses about 50,000 plant specimens including about 120 types, mainly from

Figure 10. Makerere University Herbarium building.

Figure 9. An elephant embryo at Makerere University Zoology Museum exhibition hall.

Figure 11. The carpological collection at Makerere University Herbarium (Source: http://cns.mak.ac.ug/makerere-university-herbarium).

Uganda and a few from neighbouring countries. The collection also includes some fungi specimens and a carpological collection of dried fruits and seeds (**Fig. 11**). The specimens were stored in wooden cabinets mainly preserved as herbarium sheets, in about 100 m² space. The chests were arranged taxonomically in plant families.

The specimens came to the collection mainly from staff, students and research expeditions, and had taken up collections from the National Forestry Authority. The herbarium covers most families and genera of the known Ugandan flora. Staff indicated that they keep few duplicates of each species due to the limited space. Just next to the collections was a small library with about 1000 books. The herbarium gives access to the public including e.g. schools thereby also acting as an exhibition hall. They also loan out specimens on request to individual researchers and other institutions.

Assessment of MUZM and MUH

The collections of both institutions have their major relevance as repositories for biodiversity and as research institutions. Several key respondents indicated that they are the most important repositories for zoological and botanical research, for training in taxonomy and as reference collections for the national biodiversity. They serve as teaching facilities for biological sciences, fine art, journalism, architecture, pharmacy and other disciplines. They are also used for practical teaching at their respective departments.

Although data on the number of visitors or researchers coming to or using these collections were not available, staff confirmed each year about ten students from the university and over 50 individuals/organisations are hosted for research affiliated with these collections or are supervised by their staff (**Fig. 14, 026**). Staff at both institutions helped with identification of specimens, teach at the university and/or have produced publications on the collections. The 'Regional red list' and the 'Bat atlas of Uganda' are based on data from MUZM, and the 'Plant checklist and medicinal plants of Uganda' on data from MUH. There are also publications from other individual staff members e.g., Kalema (2008) in which the use of the herbarium plant databases in identifying areas of biodiversity concentration is documented (**Fig. 14, 008**).

In both institutions, the specimens and the cabinets were mostly in good state, with only a few skins, skeletons, and chests damaged by moulds and other common museum pests such as rats and bugs in MUZM; wet specimens were well submerged and preserved in ethanol (**Fig. 9**) or formalin, although the preservatives had corroded most of the glass jar-walls (see also Neuhaus et al., 2017). Collections that were in a poor state had already been sorted out and discarded. MUH collections and cabinets were mostly in a good state and had regular maintenance checks.

Meta-data of objects were both documented in catalogues and as electronic records on computers in the principal curators' offices. There was, however, no protection of the electronic records from cyber threats. As a back-up plan, most data were already transferred to the National Biodiversity Data Bank located a few meters away from MUZM. The manager confirmed this, but a member of staff from the department highlighted that there needs to be streamlining of the databases. He added that some of the records in the databank referred to already discarded specimens. Efforts had started to digitise further parts of the collections. MUH had digitized the type specimens, economically useful plants and endemic species in its collections with a grant from the Andrew Mellon Foundation and the BGCI-JRS project. By the time of this research, a similar project was ongoing in MUZM and NMK to digitise economically important insect taxa from the region. MUH and MUZM collaborate and work together, and

Figure 12. An old exhibit at Makerere.

also closely with other institutions and collections both locally and internationally regarding training in taxonomy and exchange of expertise.

Both institution buildings were not 'museum style' (**Fig. 14, 029-031**) and hence difficult to control with respect to e.g. humidity, temperature and blocking out pests and dust, necessary for the long-term wellbeing of the collection. Even with regular cleaning, it is difficult to keep out dust and pests in these collections. The MUZM building had not undergone any significant development since its establishment. It was old with cracks, some windows were not closing, and it was leaking in several places.

MUZM exhibition was in a poor state regarding its structure, information panels and objects. Several specimens and cabinets were already disintegrating or damaged by moulds and other pests. Although the labels were informative, most of them were falling apart, and the writing was not easily readable. Some objects had no labels. Like in UGM, fluorescent bulbs were used in the exhibits with no attenuations to bring out detail. The exhibition room also received direct UV-light (**Figs 12 & 14A, 010-017**).

Like MUZM, MUH building had not undergone any significant development. The staff had previously reinforced the louvered windows with a wire mesh to control some pests and dust. However, they still struggled deterring pests from the collection and regulating humidity. One staff member noted that the building was threatened due to its location: '*...especially when it rains, water floods in on one side of the building, raising the humidity and attracting insect pests*'.

In both institutions, space in the exhibits, storage rooms, and for research was too little. Researchers work within the corridors of the collection units blocking passages for other persons . Due to the limited space and that MUH was not designed for exhibitions, staff noted that they can hardly manage kids during school visits. '*Visitors are also bringing pests*,' a staff member added. Regarding safety, there were no special measures in case of fires for both collections: no emergency doors, fire extinguishers or alarm systems, nor any other technical installations.

Furthermore, as the collection are not advertised the attention of the public is low. So, if someone is not familiar with the departments, they may not locate these collections. MUZM, has no own website nor does it occur on the university's website. MUH has its website embedded in the university's website but it was last updated in 2013.

MUH and MUZM both lack sufficient human resources to develop and organise activities a good museum would (**Figs 13 & 14, 018-019**). MUZM has only one staff (Dr. Robert Kityo) officially hired by the institution, who ideally manages everything. The institutions' governing body/authority is not clear, whether under the state, University Departments or self-autonomous. The organigram and the responsibilities that should result are not clear (**Fig. 13**). Both institutions lacked a budget to run daily activities or do any meaningful research as full entities. They mainly depend on donors and individual staff funds to buy equipment or carry out research. In general, the states of MUZM and MUH were on both average of low quality (**Fig. 14A&B**).
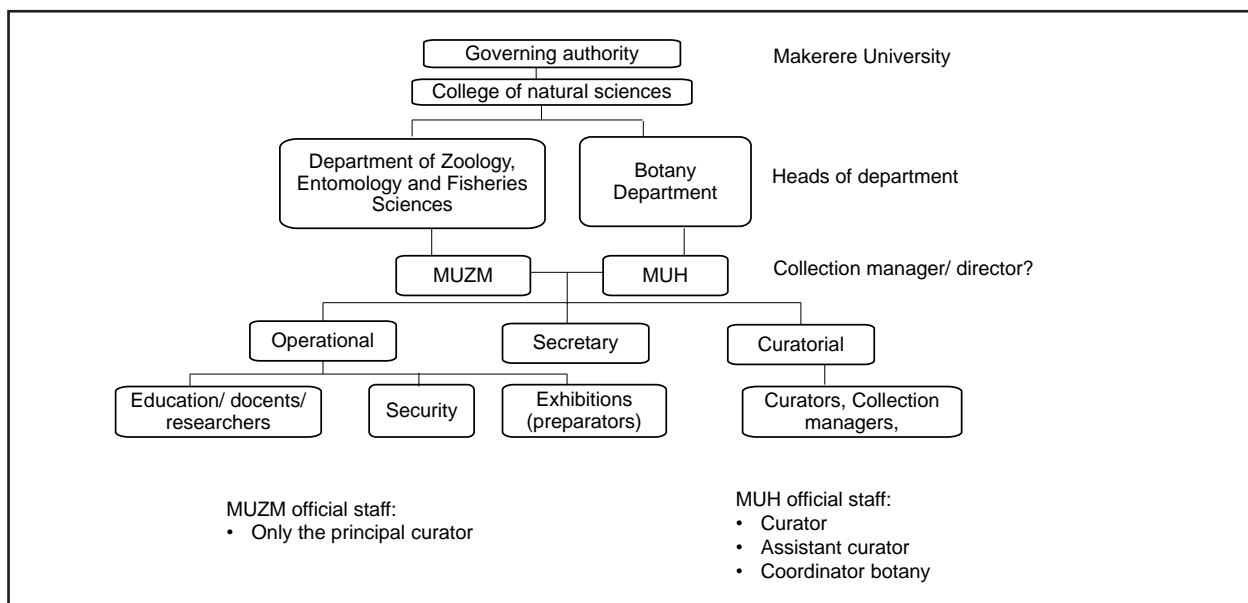

Figure 13. Simplified organigram indicating positions under which MUZM and MUH should ideally operate. Most of the positions are not occupied, the responsibilities are carried by a few individuals.
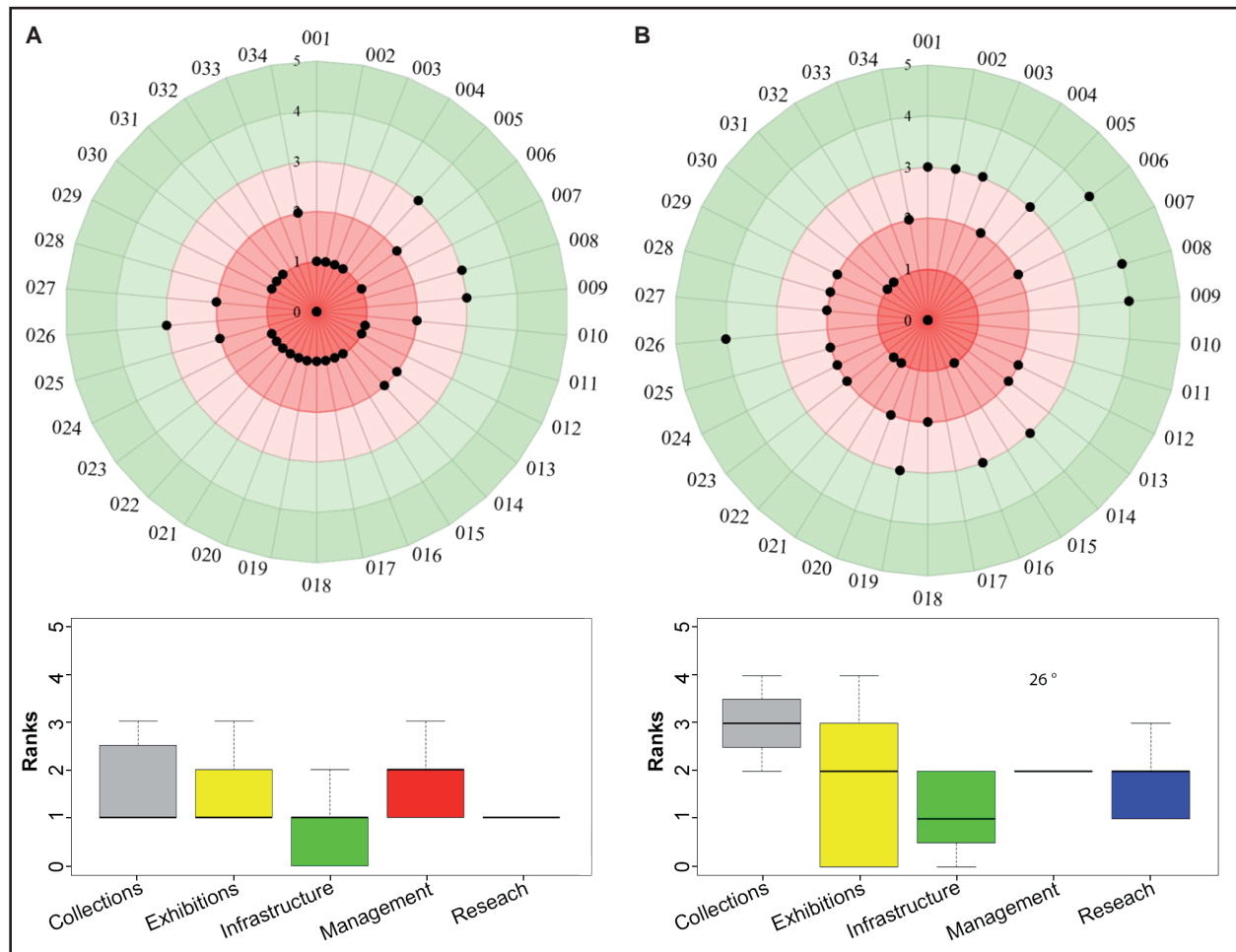
Figure 14. Author's assessment for Makerere Zoology Museum (**A**) and akerere University Herbarium (**B**). For quality criteria and number codes see Fig. 5.

(c) Kawanda Invertebrate Museum and Herbarium/other natural historical collections

Kawanda Invertebrate Museum (KIM) and herbarium (KHM) are at the Kawanda Agricultural Research Station, an institute under National Agricultural Research Organisation (NARO). NARO is a public institution established by an act of Parliament, to guide and coordinate agricultural research activities in Uganda (The National Agricultural Research Act, 2005). KIM and KHM are among the oldest officially recognised zoological and botanical collections in Uganda. KIM is also known as the Commonwealth Institute of Biological Control / Uganda Insect Collection. Both institutions started around 1937 under the Ministry of Agriculture. Since 1993, they have been under NARO. Both collections are in the same room with cabinets separating the two sections. By the time of this survey, there was no curator for the KHM. The curator for the invertebrate section was primarily curating the plant collection. Reportedly, KHM collection had about 10000 plant specimens.

KIM houses over 25000 insect specimens; collections date back to 1909. The specimens seemed properly curated, preserved mainly as pinned specimens stored in chests, and others on slides. The institution offered services such as identification and training in collecting, curation, and preservation techniques mostly to students and individual researchers through its curator.

Other collections assessed include the Herbarium at the Institute of Tropical Forest Conservation (ITFC). It is financed and managed under Mbarara University of Science and Technology. The herbarium reportedly has about 1500 plant specimens collected mainly from the Albertine Rift in and around Bwindi Impenetrable National Park in Uganda. Mweya Zoological Collection (MM) and the herbarium at Makerere University Biodiversity Field station (MUBF) were also visited. Unfortunately, MUBF was not officially open hence no further assessments were done.

Assessment of KIM, KHM, ITFC and MM

The conditions of KIM, KHM, and MM were generally alarming (**Figs 15 & 16B**); staff was lacking, there were

no clear management structures and the collections were seemingly dying out. In MM's exhibitions, the specimens had disintegrated and were dusty. KIM and KHM had their collections still preserved amidst insufficient curation. Scattered literature revealed that KIM was and still is a significant insect repository used for research (Arnett et al., 1993; Bafokuzara, 1994; Miller & Foottit, 2009). However, efforts to revamp/maintain these resources seemed minimal.

ITFC's herbarium was generally satisfactory regarding most aspects compared to its counterparts (**Fig. 16A**). The institution had documented all the plant species in their collection, made these available on their website, but still had 'un-resolved' taxa names that needed further checking and revision. Research on the collections by the institutional staff and by visiting researchers was on-going.

(d) Community/ethnographic museums in Uganda

Most museums in Uganda are ethnographic and at the same time local or regional; they exhibit and preserve the heritage of their communities. Cross-cultural foundation[2] lists 22 such museums in Uganda but several others exist.

Those considered here include 1) Igongo Cultural Centre Museum 'Ekijukiro' (IG; **Fig. 17**) which focuses on the cultural and natural heritage of Southwestern Uganda, 2) Great Lakes Museum (GLM) with a focus on Southwestern Uganda as well as areas from nearby countries such as Congo (**Fig. 18**), as well as 3) Ssemagulu Royal Museum (SRM), 4) Buganda Museum (BM; **Fig. 19**) and 5) Uganda Martyr's Museum (UMM) which all focus on the Buganda Kingdom, the largest tribe in Uganda. SRM and UMM use sculptures and photo galleries to tell stories about the kingdom ('that have not been written in history books'), and about Uganda's martyrs (from the moment they were captured to the point they were executed), respectively.

IG, GLM and BM, all had almost only exhibitions with only a few other collections. The exhibitions concepts were similar, structured to represent the daily lifestyle of the people, pre- to post-colonial era. Objects included e.g., photo galleries in glass
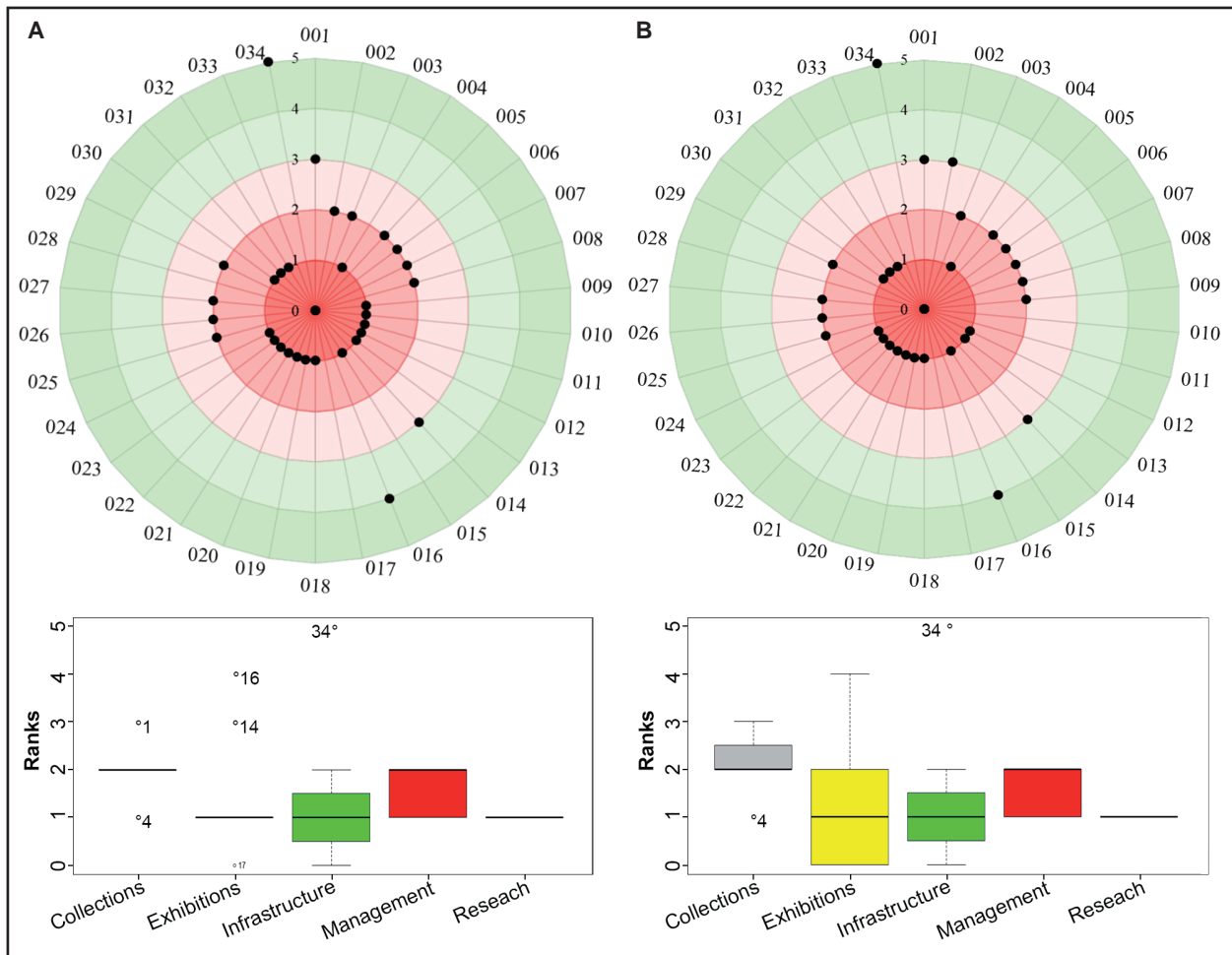
[2] https://crossculturalfoundation.or.ug/

Figure 15. Author's assessment for Kawanda Herbarium (**A**) and Kawanda Invertebrate Collection (**B**). For quality criteria and number codes see Fig. 5.
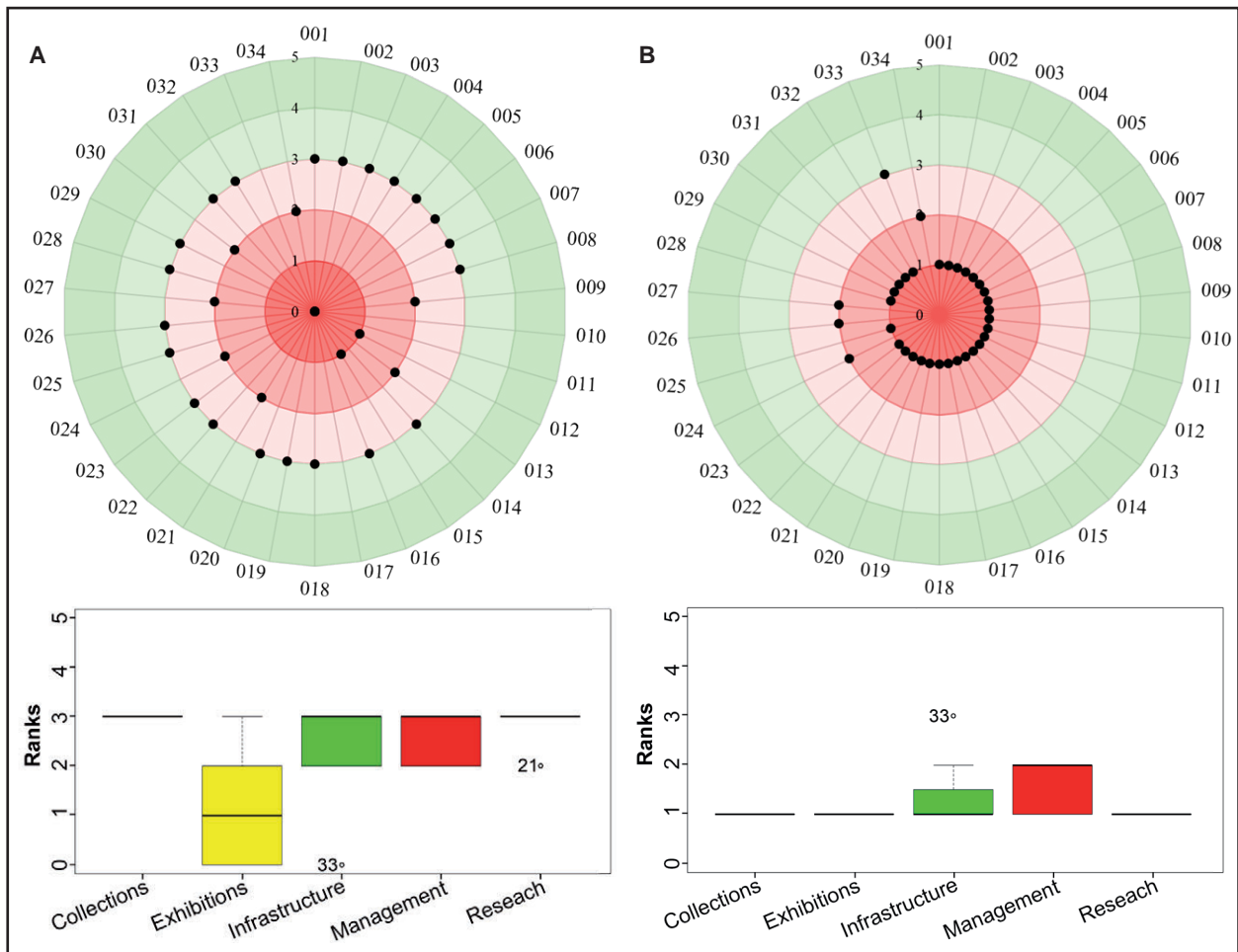
Figure 16. Author's assessment for the Herbarium at the Institute of Tropical Forest Conservation (**A**) and Mweya Zoological Collection (**B**). For quality criteria and number codes see Fig. 5.

Figure 17. An aerial view of Igongo Cultural centre and Hotel taken from a nearby hill. The red arrow points to the museum building.

Figure 18. Great Lakes Museum. Left is the museum's monolith signifying the "tree of life and cyclic transcendence of the African culture".

holdings, artefacts and handcrafts of the local people (pottery, basketry, farming tools etc.), and dioramas of the traditional architecture. Most of the objects were given by indigenous families and individuals during expeditions. The oldest objects were estimated to be 200 years. GLM, in addition displayed natural history objects such as animal skins, dried medicinal plants, and a small geological collection. The Director of

IG, Mr. James Tumusiime, expressed that plans were underway to start a botanical garden that would depict the flora of the local region. IG and GLM had cultural villages, craft shops, and accommodation depicting their museums' profiles.

Assessment of Uganda's ethnographic museums

For the two institutions, IG & GLM, their states varied but were generally better than the natural history collections described earlier (**Fig. 20 B & C**). IG had good collections and exhibitions (**Fig. 20 C, 001-017**). Though generally good, the exhibition profiles for IG and GLM still need improvement. The structure and intention were often not clear.

In GLM, objects were displayed in the cabinets with

Figure 19. Fort Lugard's house turned into Buganda Museum. Behind the museum is the Old Kampala mosque.

no clear order. Many chests were virtually empty. The museum also intended to include a natural history section but admitted that they lacked a clear concept and expertise to organise it. Like UGM, GLM still had labels with only the object and no additional information panels. Without a tour guide, understanding of the exhibition and its objectives was hardly possible. There was also a natural light influx in the exhibition hall. IG rated a little better regarding most of these aspects.

On the other hand, the state of BM, which had just been opened in 2017 was not any different from the collections assessed before (**Fig. 20 A**). BM still had many things wanting, e.g. the lack of a clear concept, and still had many collections presented on the floor.

In all these institutions, there is little to no research nor any type of publications based on their collections (**Fig. 20, 020-029**). Many seem to aim at preserving heritage for its own sake and partly for tourism with a minimum focus on research. All the five institutions had most of their collections under exhibition. Target groups are schools and tourists. Staff lacked training and expertise to develop their museum, profile, collection as well as exhibition. Many staff members had not visited any other museums locally or internationally to have insight about similar institutions. Seemingly, the initiator who is the director and one curator were the only informed personnel regarding aspects of museology and developing their collections. Of course, money was lacking to hire expertise, but it was not clear if this was a priority.
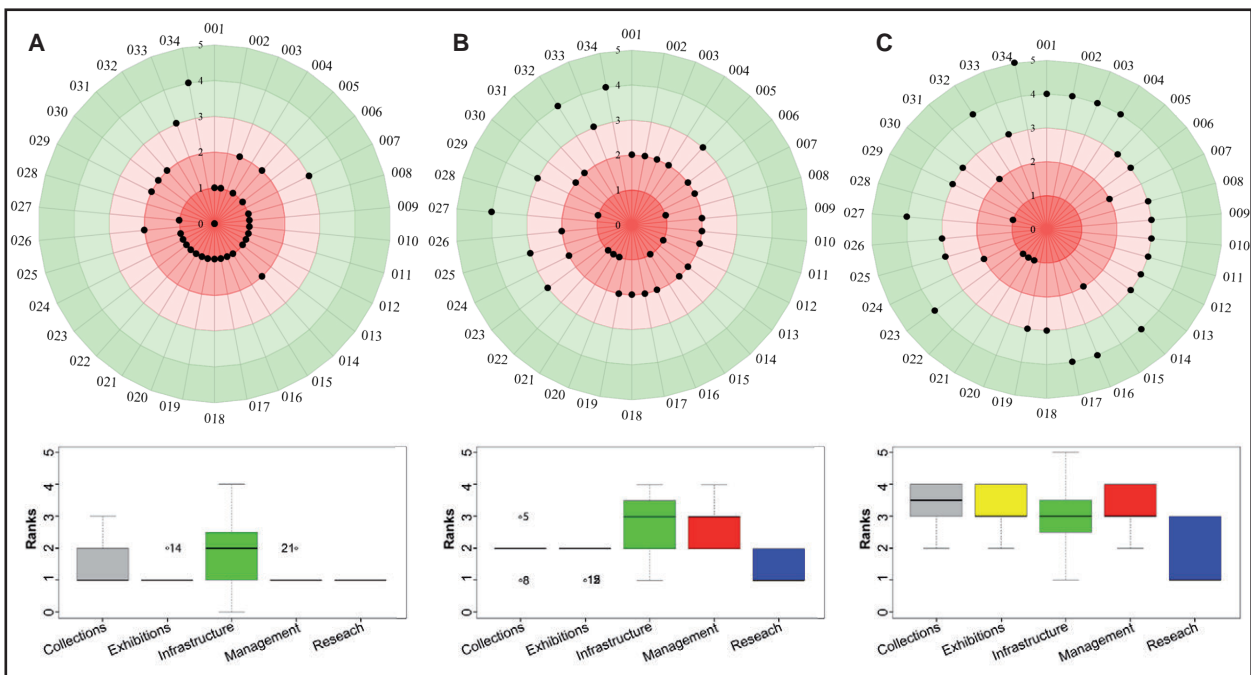

Figure 20. Author's assessment for Buganda Museum (**A**) and Great Lakes Museum (**B**) and Igongo Museum (**C**). For quality criteria and number codes see Fig. 5.

3.3.2 Museums in Rwanda[3]

All museums in Rwanda are under the Institute of the National Museums of Rwanda (INMR), a public institution affiliated to the Ministry of Sports and Culture (**Fig. 21**). Thus, they are managed and financed by Rwanda's government. There are currently eight museums under INMR which include the Ethnographic Museum (EMR), King's Palace Museum, Museum of Rwesero, National Liberational Park Museum, Campaign against Genocide Museum, Rwanda Art Museum, Kandt House Museum (KH), and the Environment Museum (MH). All these museums have an ethnographic focus. The Environment Museum was in this survey because it is considered a natural history museum. There are likely other natural history collections, but they are not listed as museums under INMR. One of them is a botanical collection assessed here, previously referred to as the National Herbarium of Rwanda (NHR).

Natural history collections in Rwanda date back to the 1980s when the partnership, between Rhineland-Palatinate and Rwanda was established. The specimens' divisions were geosciences, zoology, and botany. Parts of the collection, especially the herbarium, are still in Germany. A unique part of the zoological collections still in Rwanda are the skeletons of several gorillas at the Dian Fossey's research institution. Trusted sources indicate that American scientists curate these skeletons. The Kandt-House Museum in Kigali also used to be a natural history museum but changed into a museum for the Rwandan-German history in 2017. The collections were transferred to MH in Kibuye.

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[3] Information was obtained from visiting the museums, interviews with key informants dealing with collections in Rwanda, staff from individual m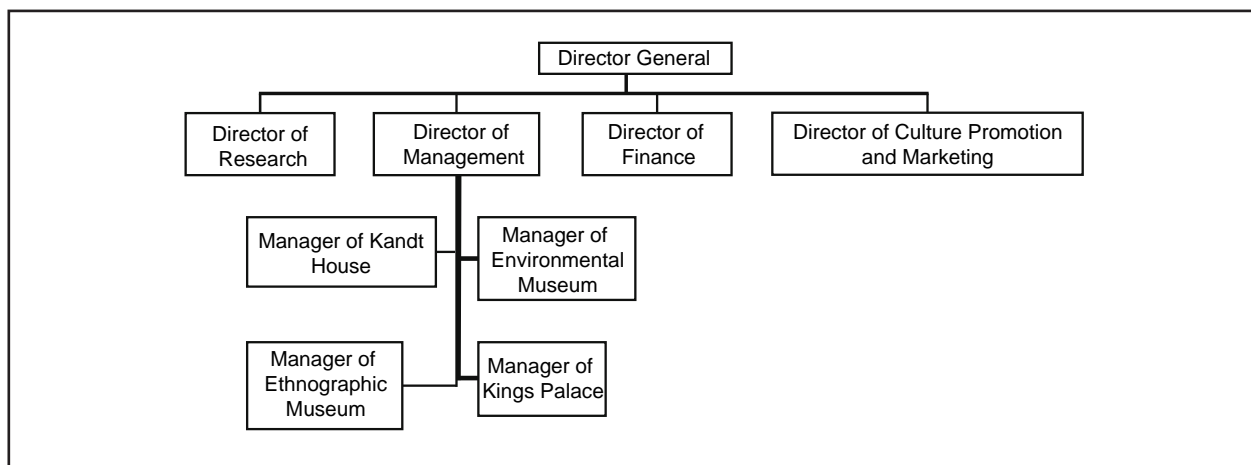useums and the national museums of Rwanda's website at https://www.museum.gov.rw/index.php?id=3 – , unless stated otherwise

(a) The National herbarium of Rwanda

A few kilometres away from EMR is one of Rwanda's oldest botanical collections, the National Herbarium of Rwanda opened in the 1930s (NHR; **Fig. 22**). A staff from the Institut de Recherche Scientifique et Technologique (IRST) to which the collection has been affiliated until today provided a brief history of the institution. The herbarium was founded during Rwanda's colonial days under Belgium rule. Initially, the institution was under the 'Institut de Recherche Scientifique en Afrique Centrale' (IRSAC), renamed 'Institut National de Recherche Scientifique' (INRS) after independence before being renamed IRST in 1987.

The herbarium housed about 17000 specimens of ferns and flowering plants mainly used in traditional medicine, collected from the 1930s to 2000s (records at IRST). These are stored as herbarium sheets and kept in metal cabinets (**Fig. 22 & 23**), that are organised taxonomically into families. Outside the herbarium building is also a botanical garden with traditional plants commonly used in ethnic medicine in Rwanda.

(b) Environment Museum in Kibuye

The Environment Museum (MH) is located at Lake Kivu in the Western Province of Rwanda. The museum building is new, opened in 2015. It has two floors with exhibitions and collections with a herbal medicinal garden on the rooftop displaying traditional plants of ancient Rwanda. The exhibition presents energy sources (expansive display of solar panels, indigenous sources of energy such as coal and charcoal, and the process of electricity production from methane gas in Lake Kivu). One section showed Rwanda's minerals such as gold, archaeological objects such as hand tools from chipped stone dating over 2000 years and human fossils. The natural history section had objects reportedly relocated from the Richard Kandt Museum in Kigali. It included

Figure 21. Organigram of Museums in Rwanda under the Institute of National Museums of Rwanda (INMR).

mounted specimens of animals found in Rwanda including birds, reptiles and mammals.

(c) Ethnographic Museum of Rwanda and Kandt House Museums

EMR, also referred to as the National Museum of Rwanda (**Fig. 24**). is located in Butare about 135 km south of Rwanda's capital Kigali. The museum sits on over 50 acres with the buildings covering 9,000 square feet and the rest being gardens displaying indigenous vegetation and a traditional craft training centre. The collections are housed in seven halls each about 30m² in size. The exhibition displays the historical, cultural, art and archaeological heritage of Rwanda. The display includes e.g. photo galleries placed in glass showcases (presenting the climate, vegetation, wildlife), handcrafts of the Rwandan people since ancient times (basketry, pottery, beekeeping and farming equipment), photographs and dioramas of pre- and post-colonial architecture.

There were also exhibits on traditional religious practices, marriage and music, and on metallurgy. While most of the exhibition is permanent, a staff member reported that they occasionally have temporary exhibits on different topics mainly for education of school kids in the temporary exhibition hall. In this hall was the metallurgy (knives, spears, and swords). The ground floor contains a nature trail and a crafts school where local youth are taught indigenous handcrafts once commonly used in Rwanda. The museum has a botanical garden with examples of Rwanda's indigenous vegetation. Here, they offer plant identification services.

Compared to EMR, Kandt House is quite a small museum (**Fig. 25**) located in Kigali close to the city centre and the Jari mountains. The exhibition displays Rwanda's social, political and economic aspects from pre-, during and post-colonial periods through a photo gallery. One section is what used to be the office of Richard Kandt (from which the museum derives its name). Behind the exhibition hall were the remains of the natural history collection, having a temporary exhibition of live snakes, a few old mounted skins and a live crocodile.

Assessment of Rwanda's collections/ museums

Museums under INMR have a good relationship with the state. They reportedly received the necessary funding to run daily errands and pay staff salaries.

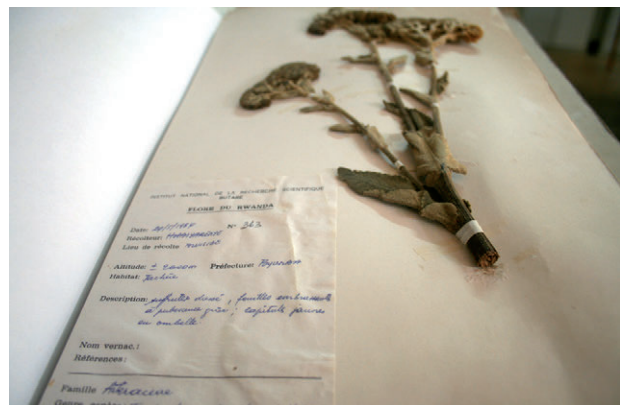**Figure 22**. Inside the National Herbarium of Rwanda's collection.

Figure 23. A plant specimen at the National Herbarium of Rwanda

Figure 24. Part of the building complex of the Institute of National Museums of Rwanda where the Ethnographic museum is also situated.

Figure 25. Kandt-House Museum.

However, funding does not allow to develop the museum and their profiles, collection and research. Nonetheless, the management under INMR seemed to be successful supervising all recognised state museums and ensuring that they received state support to meet their basic objectives. Accessing all museums under INMR was quite easy through their active website. Most of these institutions are in busy urban centres and local drivers knew them.

The conditions were generally satisfactory in EMR and KH (**Fig. 26 A & B**). The artefacts, cabins and photo galleries looked good with no visible signs of damage or infestation. The labels and other information panels were in good shape and strategically placed beside the objects. The museums also have education departments, with guides to help visitors to understand the exhibition. Ethnographic museums/sections had a pretty good exhibition with clear concepts. However, unlike EMR and KH, MH's ratings were generally lower (**Fig. 27A**). MH seemed to lack a clear exhibition concept. The space for exhibitions and storage was small. There were no trained

personnel to develop or manage this collection. The Minister of Environment and other key persons criticized the state of MH as a key informant mentioned.

For all the museums in Rwanda considered here, the displays take about 90 % with only a few objects in collections not displayed. All museums lacked multimedia or other amenities such as those to entertain kids.

The building conditions were generally satisfactory for all the three museums. Moreover, several museums such as MH in Kibuye had new buildings. All the museums had at least fire exists, extinguisher and fire meeting points, but with no other technical safety installations apart from supervisory staff. An exception is EMR which had a fire alarm system and CCTV cameras installed at strategic positions.

Research was lacking in all the museums. As far as we were informed, there are no Rwandan scientists or qualified curators responsible for the collections, and there is no publication by the museum staff about the collections. Although the guides were quite informed about these collections, they had no qualification to
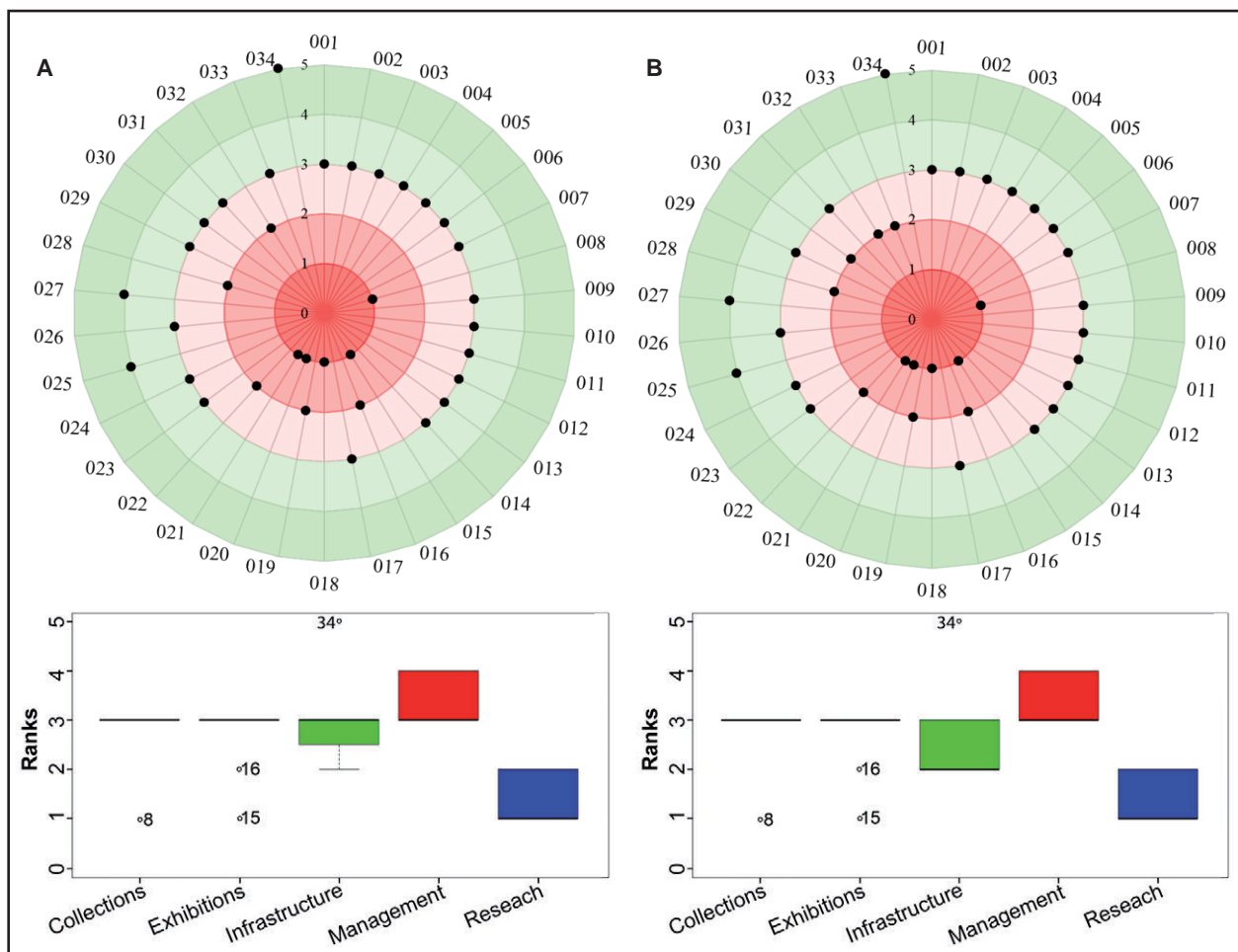

Figure 26. Author's assessment for the Ethnographic Museum of Rwanda (**A**) and Kandt House Museum (**B**). For quality criteria and number codes see Fig. 5.

research, develop or do curational work. Reportedly, the museums are building collaborations, to train their staff in collection management. A source confirmed that INMR is in partnership with the Natural History Museum in Mainz to implement modern programs and facilities for education in Rwanda: An exchange of experiences has already been started for Rwanda's museums but should be expanded further.

The case of the National Herbaria Rwanda

Like its natural history counterparts in Uganda, the National Herbaria Rwanda (NHR) was in a poor state (**Fig. 27B**). Its management and other infrastructures were mostly unsatisfactory. By this survey, there was no proper management or curator apart from workers who clean around the building and take care of the botanical garden. However, the specimens were still in a relatively good shape. There was also a freezer with specimens. A staff member from IRST said that NHR was mainly used in pharmaceutical and/related research, but the 'herbarium collection' was increasingly getting abandoned and

only consulted on rare occasions. By this report, efforts had started to transfer its affiliation to the University of Rwanda, to serve as a research and education facility for students. Trusted sources confirmed that they had received a grant to have it properly curated and digitised.

3.3.3 Museums in Kenya[4]

Kenya has several state museums organised under the National Museums of Kenya (NMK); a non-profit organization and umbrella for museums and monuments in Kenya. NMK's mission is to study and preserve Kenya's past and present cultural and natural heritage, aimed at knowledge enhancement, appreciation, respect and sustainable utilization of these resources to benefit the people of Kenya and the world. NMK first received its legislative authority under the 1983 Antiquities and Monuments Act, which states that NMK should govern

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[4] All information were obtained through interviews with key respondents, resources from the museum and the museum's website
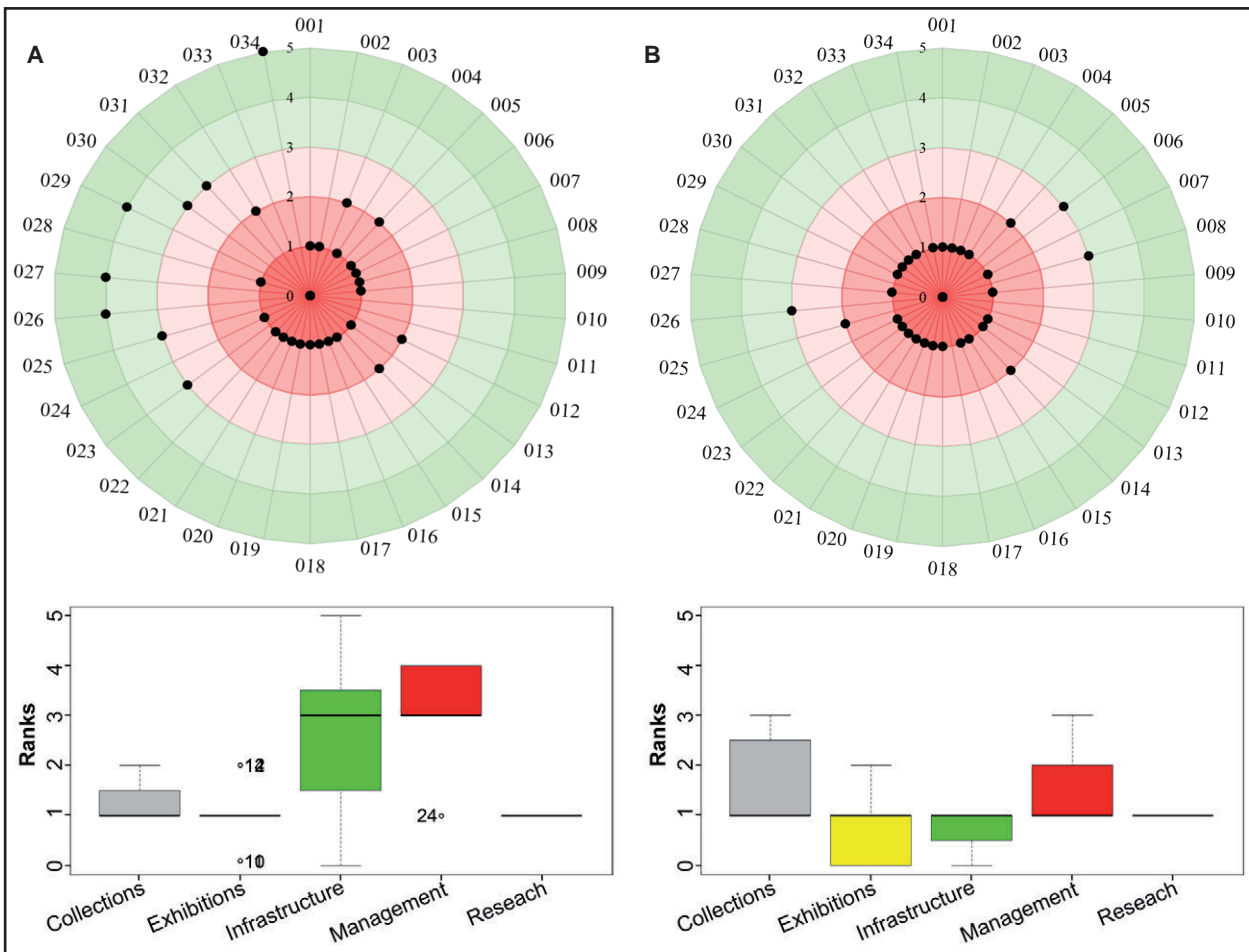

Figure 27. Author's summary assessment for Environment Museum Rwanda (**A**) and National Herbarium of Rwanda (**B**). For quality criteria and number codes see Fig. 5.

all the movable and immovable relics of historical, archaeological and paleontological significance in the country. NMK as a state corporation was established by an Act of Parliament under the Museums and Heritage Act 2006 (More information on http://www.museums.or.ke/).

Compared to other museums in the region, the NMK's organisation structure is complex (**Fig. 28**). Under NMK, there are 15 regional museums scattered throughout the country and eight historical/archaeological sites open to the public. Of the 15, the Nairobi National Museum (NNM) is the largest and prominent natural history collection, whose premises also serve as NMK's headquarters. Other museums/sites, under Director Antiquities, Sites and Monuments (**Fig. 28**), are mostly ethnographic. Institutions like Fort Jesus also have natural history units or are involved in scientific research, but this is not their primary focus. For instance, Fort Jesus has a malacology unit which is a branch of the Institute of Primate Research (IPR) hosted by NNM. It is difficult to separate the operations of NMK and NNM. For ease of reference NMK has been used.

Unlike in Uganda and at least partly also Rwanda (whose museums are not well documented), there is a lot of information and online resources on Kenyan museums under NMK. For example, NMK's website gives all the fundamental information including collection resources and activities, and several tour companies and bloggers have already written about their experiences at the museum. Thus, only a brief introduction into NMK is given here and the focus is mainly laid on the assessment of the state of the museum regarding its functions and physical structures.

The National Museum of Kenya (NMK)

The national museum in Nairobi (**Fig. 29**), is the largest institution and the flagship museum of NMK. It was built in 1929 as a small repository of natural history specimens, growing over the years into a multi-disciplinary research institute of international reputation (Harris et al., 1988). In principal, the museum is under the Directorate National Repository and Research of NMK. NMK has six departments; Zoology, Botany, Earth Sciences, Cultural, CBD and Resource Centre which are further divided into sections (**Fig. 28, Table 5**). Each of the departments and sections have a head, scientific and technical staffs (e.g., curators, researchers) and trainees. It also hosts centres of scientific excellence, such as the Centre for Biodiversity, the East African Herbarium, and the Institute of Primate Research.

By 2018, the museum had the largest collection in East Africa with over 9 million objects (including library; **Table 6**), having added 154,000 new collections in 2017 to the average 60,000 previously added every year. The principal source of new specimens is from research expeditions. Reportedly, for research expeditions to Kenya scientists need a permit from the National Council of Science and Technology (Kenya) and must be affiliated to a research institution. When the research involves
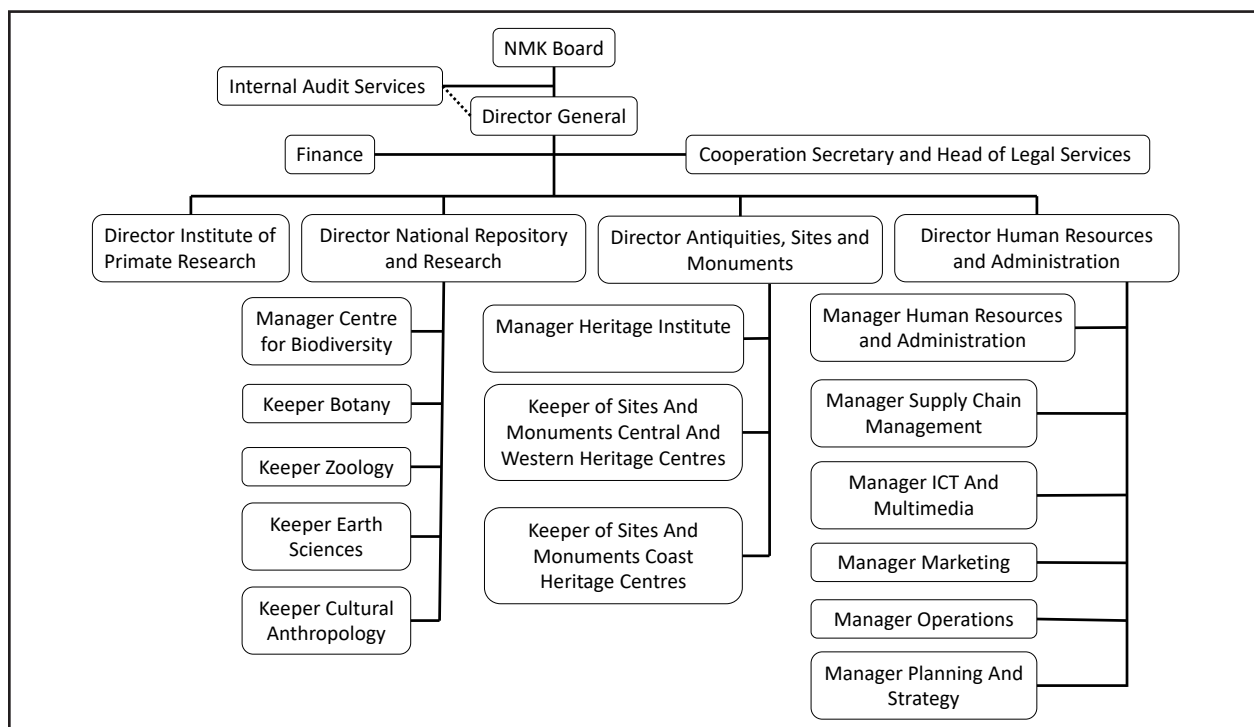

Figure 28. Organigram of the National Museums of Kenya (NMK). Reconstructed from their website.

collecting and/working with specimens or is natural history in nature, NMK is usually the best affiliate. All collections must be deposited at NMK unless there is a special permission.

A partnership with NMK means easier access to biodiversity objects and related data important for biodiversity research in Kenya. The registrar of collections confirmed that every day they receive accessions, and collections increase. She added that they receive 5-10 loan applications daily from institutions all over the world. Additional information on the respective sections including missions, objectives and other reports are on the museum's website, under research- directorate brief (https://www.museums.or.ke/directorate-brief/)

Assessment of NMK

NMK's state was better regarding most of the assessment criteria compared to all other institutions considered in this survey (**Fig. 33**). The conditions were mostly satisfactory in each section though with some variation. Botany, Earth Sciences and the Cultural divisions were, for example, housed in the newer buildings with generally fair conditions. There were no

physical signs of damage or leakage. Due to regular checks by the staff, dust was kept at a minimum. Storage and documentation of collection units (**Fig. 30**) were mostly satisfactory.

The Zoology Department was housed in the older building whose conditions and architecture did not seem to be suitable for collections. Even with constant cleaning, it was not possible to keep dust and pests out of the storage rooms. Parts of the collection rooms were leaking and some windows already damaged. No improvements were planned to keep out dust or pests (pers. comm.). Although a big part of the specimens was well curated, in several sections, collections were physically damaged, some not well prepared and a few others showed moulds or had been attacked by other pests (**Fig. 31**).

For all departments, collection space was a major constrain. However, reportedly plans are underway to build a new state of art collections facility that would act as a collection building with new labs for the museum. There is significant research done using the collections, which has resulted in numerous relevant publications, several of which are available online.

Table 5. Number of records (June 2018) in the Nairobi National Museum's research departments (source: registrar of collections pers. comm., and museum website: https://www.museums.or.ke/directorate-brief/.

Department	Section(s)	No. of records	Key notes
Botany	Herbarium &Fungarium	1100000	The herbarium is also the East African herbarium and the largest botanical collection in tropical Africa housing over 700,000 plant specimens. Mycology research is on Basidiomycota, Ascomycota, Arbuscular Mycorrhizal Fungi (AMF), and lichens.
	Nairobi Botanic Garden		
Zoology	Herpetology	28,500	The zoology collection is the largest in Tropical Africa
	Ichthyology	48,500	
	Invertebrates	3,000,000	
	Mammalogy	30,000	
	Ornithology	35,000	
	Osteology	12582	
Earth sciences	Palaeontology	1,316,056	Earth sciences is one of the core Research Departments of the Museum
	Palynology & Palaeobotany		
	Geology		
	Archaeology		
Centre for Biodiversity		1500 books	
Cultural heritage	Library	60,000	The library is jointly managed with Nature Kenya and the East Africa Natural History Society
Resource Centre		3,700,000	Objects are mainly ethnographic
Exhibition		400 0bjects	

Some of these include field guides, flora and fauna checklists for Kenya and many more (e.g., Musila et al., 2019; Mbuni et al., 2019). The research is attributed to the staff and visiting researchers, technical expertise in each department and builds on other resources such as a well-stocked library, and the Centre for Biodiversity. In 2018, NMK had over 50PhD holders and over 200 MSc researchers in addition to several other staff with different academic certificates. Nevertheless, NMK still needs further expertise such as taxonomists as well as technical experts such as specimen preparators and taxidermists.

Like the other museums, NMK lacks well-furnished labs to conduct more complex research. One visiting researcher expressed that NMK would be more efficient if it had more and well-equipped labs. The collection meta-data kept both in hard copy catalogues and electronically seemed well managed by respective departmental sections. Databasing specimens was ongoing in some divisions. There were attempts previously, to digitise the collections but resources were lacking leading to data loss in several cases. In the ornithology section, for instance, they had built an online database that got crushed after some system failure. They were now trying to redo the process. The botany department had an electronic database available online, but staff expressed fear to lose data in case they failed to have their database-software updated at the right time. '*The software is not only expensive but also needs regular updating. We once almost lost all our efforts due to lack of funds to buy new updates for our database-software*' one staff expressed when asked about their database.

For such a big collection, the technical safety installations, especially against fires, are not satisfactory, and even worse in the wet collections. In most cases, there are one or two fire carbon dioxide extinguishers for each section, emergency exits and what seems to be a water-based fire management system. Conditions are difficult as shown by the wet collection of the herpetology and ichthyology sections (**Fig. 32**), where space between the collection units is limited (about 1 m between shelves), naked electric wires could be seen, and collection jars could easily slide out in case of a catastrophe such as an earthquake. With the limited space, this could cause a fatal loss.

Figure 29. Nairobi National Museum. Photo by Bountiful Safaris.

Figure 31. A bat specimen deteriorating due to moulds and other pests.

Figure 30. Part of the collections in the Earth Science department at NMK.

Figure 32: Wet collections for the herpetology and ichthyology sections at the NMK.

3.4 Public engagement

A total of 213 questionnaires handed out to the public were given back for assessment. 69 were from the online survey while 117 were directly handed over to respondents. There was also a total of 15 face-to-face digitally recorded interviews with 13 visitors and two groups of local drivers. Several other meetings with local citizens were not recorded digitally.

Most respondents had never visited any museum, in contrast to national parks, zoos and botanical gardens. Those who had visited museums went one to three times and a few even more often (**Fig. 34**). People seem to visit national parks, zoos, and botanical gardens rather than museums. For most respondents the visit of the museums in Uganda was more than three years ago (**Fig. 35**). Many respondents did not know the museums listed in the questionnaire and hence had never visited them (**Fig. 36**). Additionally, there was a general lack of awareness and access to museums/ collections. Uganda has over 30

community museums, but many citizens failed to mention more than two. The Uganda Museum was known and visited by most respondents, whereas natural history institutions were often not mentioned.

Among 'other natural history museums' listed as an open question, Igongo museum (which is ethnographic) was the most commonly mentioned (**Fig. 37**). ITFC herbarium was the only natural history institution given. Notably, the questionnaires and interviews were given around MUZM, MUH, UGM, and IG.

Most respondents considered all the criteria given in the questionnaires, to be very important, for deciding to visit
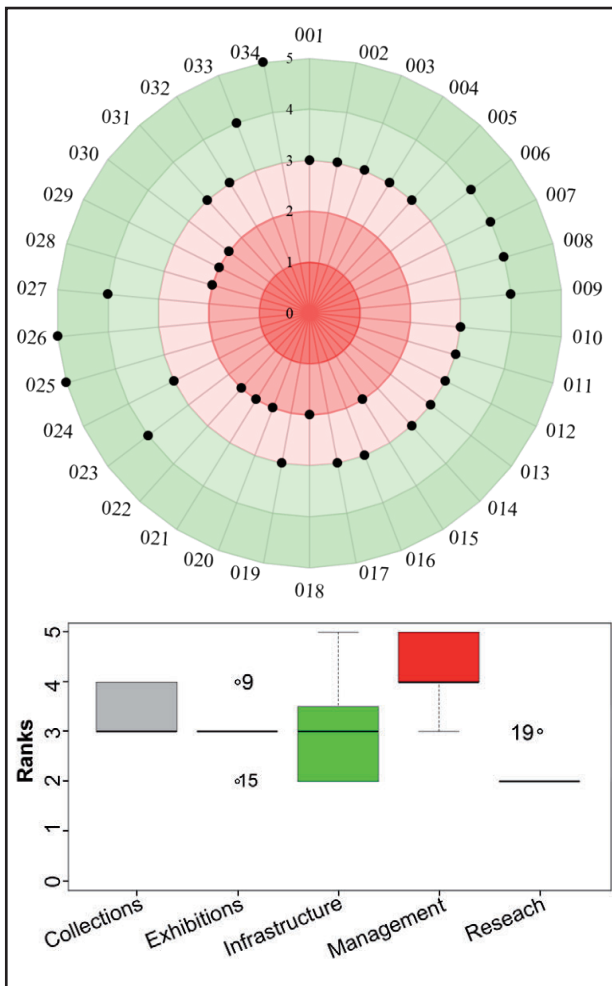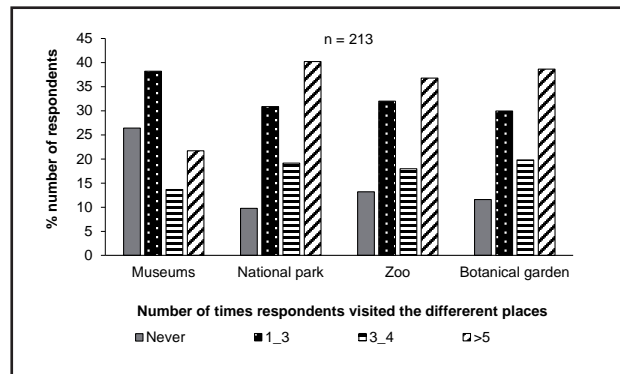
Figure 34. Number of visits to a museum, national park, zoo and botanical garden.
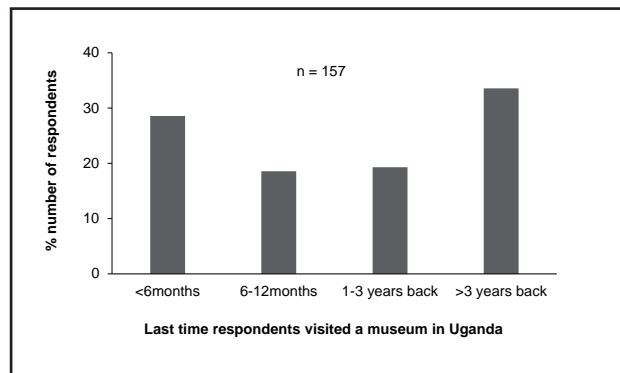
Figure 35. The last time respondents visited a museum.

Figure 33. Author's summary assessment for the Nairobi National Museum. For quality criteria and number codes see Fig. 5.
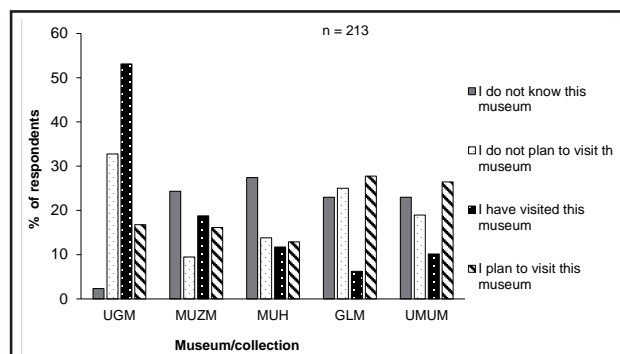
Figure 36. Awareness for and attractivity prior or visits to museums listed in the questionnaire as of natural history in Uganda.

a museum (**Fig. 38**). Respondents seemed to especially appreciate the educational offers (**Fig. 39**).

Many respondents first heard about 'natural history museums' during their primary education. Social media platforms were also listed as the second most avenue
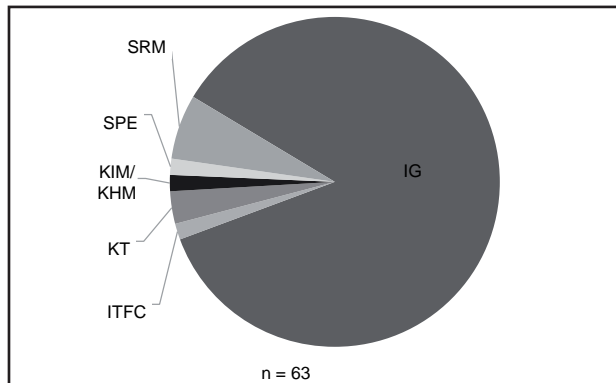

Figure 37. Other collection institutions mentioned as of natural history by respondents.

Abbr.: SRM – Ssemagulu Royal Museum, SPE – Snake Park Entebbe, KIM/KHM – Kawanda Invertebrate Collection and Herbarium, KT – Kasubi Tombs, ITFC – Herbarium at Institute of Tropical Forest Conservation, IG – Igongo Cultural Centre/Museum
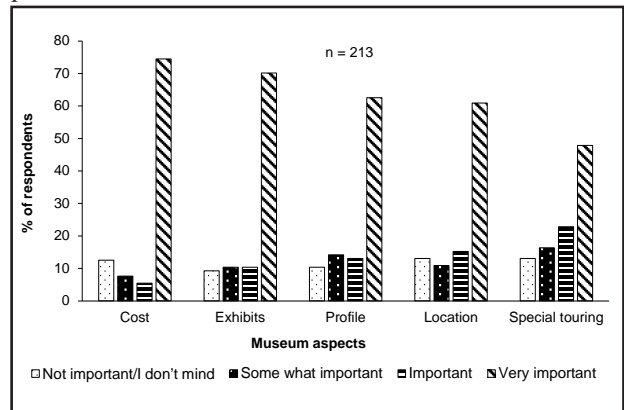

Figure 38. Criteria for the decision to visit a museum by respondents (from a list provided by the author).
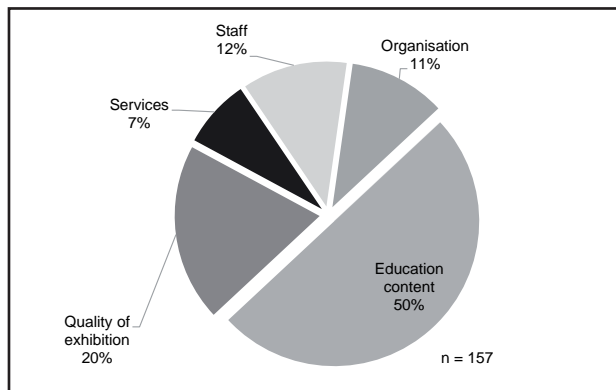

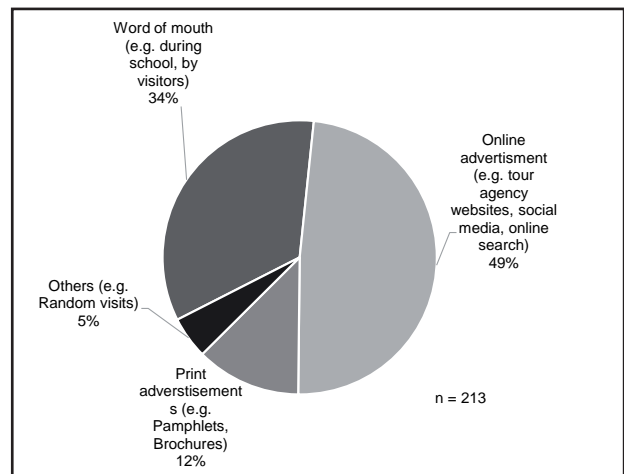**Figure 39**. Assessment criteria for visitors' satisfaction (From a list provided by the author's).

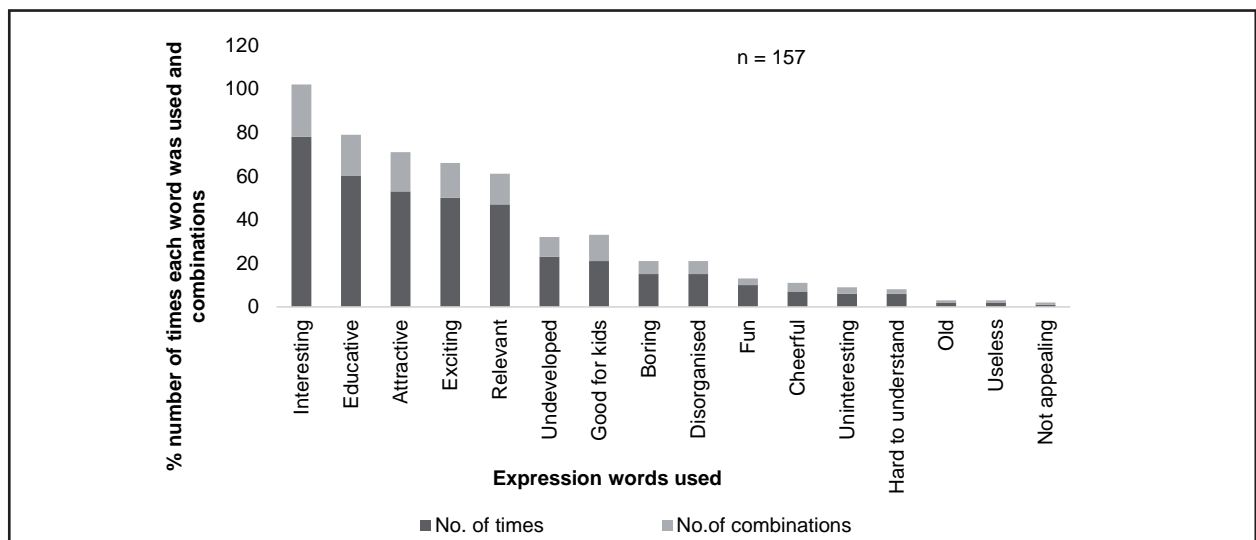**Figure 40**. Ways to reach awareness for existence of natural history museums.

Figure 41. Descriptive assessment by respondents addressed to the exhibitions of museums in Uganda.

people hear about these museums (**Fig. 40**): 90% of these responses were from online respondents. Many foreign visitors (who reportedly constitute the second most important group of visitors after school visits for the museums assessed) highlighted that they depend on websites and reviews to locate and visit their destinations. Several mentioned tourist agencies and other print advertisements as an avenue they learned about museums. Many citizens around the institutions also did not know or were not aware of these institutions or their roles nor had they visited them. Many respondents described museums in Uganda as, 'interesting', 'educative', 'attractive', 'exciting', /'relevant', and 'good for kids' (**Fig. 41**).

4. Discussion

Clearly, the ranking applied could be biased. Including the observations made in the narrative and comparing staff rankings with those of the author was one way to meet this challenge. There was a general agreement between the author's and staff of the museums, regarding the assessments. Observed differences in the assessments may have been due to the uneven structure and number of staff respondents from one institution to another. For example, seven of the respondents from IG were tour guides whereas all three respondents from MUH were scientific researchers. Of course, the priorities of a researcher are different from those of a tour guide. Staff who had visited at least three other collecting institutions, collection managers or curators and those with MSc. or PhDs were better informed about the subject and seemed stricter in their assessments. So, the

experiences, exposure and education level may influence assessments. Future studies should compare between and within staff ratings to determine what influences staffs' assessment. Below is the analysis of the Strength, Weakness, Opportunities and Threats (SWOT; **Table 6**) for the museums in the region based on the assessment.

4.1 Strengths

Fostering national/regional identity

This research compared numerous collections/museums most of which are not known or recognised by the local, national and international community. Among them are several national (maintained by the state/central government) and regional/local museums (mostly privately owned). These are all important in the formation of national and cultural identities (Coombes, 2004). The museums concentrate a significant share of the country's heritage (making it easily accessible). In societies experiencing conflict or emerging from it, museums help to create and portray their identity (McLean, 1998; Nanda, 2004).

The national museums assessed here are big players, acting as major national repositories of biodiversity and cultural heritage, that showcase tits and bits of different regions. They cover different profiles from natural history, to technology, art and ethnography. Even amidst challenges, they try to impact on citizens' perceptions, act as forums for contested issues such as national dialogues for stability and change and try to reach out to new audiences (Aronsson et al., 2012).

The smaller collections (as many university and

Table 6. Summary of the Strengths, Weaknesses and Opportunities (SWOT) for the museums in the region based on the assessment (See discussion below).

4.1. Strengths	4.3. Opportunities
• Fostering national/regional identity • Repositories of biodiversity • Availability and usability for education • Self-financing and local collaborations • Online resources and networking	• Extremely rich biodiversity and heritage • Biodiversity research crucial • Culture development as a civil need • Exploring other support mechanisms • Digital databases • Restitution and hosting material from Europe and America
4.2. Weaknesses	**4.4. Threats**
• Poor buildings and insufficient safety measures • No research infrastructures • Insufficient personnel (expertise) • Insufficient documentation • Lack of clear profiles • Exhibitions poorly developed • Management on institutional level insufficient	• Political awareness and support insufficient • Unclear or insufficient institutional organisation nationally • Lack of public acceptance • Traditional museums in the 21st century • Technological advancement • Damage of collections after restitution or repatriation

ethnographic collections in Uganda and Rwanda considered in the survey), contain regional, some nationally significant material and focus on only one or two items. An advantage of such smaller-scale collections is that they cover specialities that may not be covered by national museums and/or are not yet in global databases such as GBIF (Greve et al., 2016). They provide other options for the representations of the national patrimonies and raise identification of local communities with their local flora and fauna (Aronsson et al., 2012). Moreover, with proper management, such museums need a 'reasonably moderate' financial support compared to a central museum, and hence offer good options for such a distributed museum approach.

Repositories of biodiversity

Collections of natural history serve as 'biological libraries' and reduce need for field work, which is costly, time-consuming and dangerous (Suarez & Tsutsui, 2004). Though the taxonomic coverage in the institutions visited was not thoroughly assessed, the amount of biodiversity data in these collections are invaluable especially given the rich biodiversity of the region (see 4.4.1.). In this part of the world where studies are lacking due to logistical, economic and/ political reasons (Greve et al., 2016), such archives are crucial. Although there are numerous natural objects originating from Africa for the big museums in Europe and America, most were collected in the 19th and early 20th century. These may be historically valuable but are often not very useful for science. This is partly due to the poor quality of associated data, or sampling during an inappropriate season (Sweet, 2010).

As many countries in Africa signed the Nagoya protocol, stricter laws and regulations on access to genetic resources and obtaining comprehensive collecting permits or transport of specimens from one country to another will become increasingly more difficult (Winker, 1996; Kothari and Anuradha, 1999). It is, therefore, foreseeable that national and regional museums worldwide should intensify scientific collaborations to continue sampling and thus maintain biodiversity and conservation research ongoing.

Availability and usability for education

The role museums play in education of all groups of people has been well emphasized (for example Morley, 1956; Hein, 1998). Museums are important places of learning, open to interaction and involvement (NEMO, 2015). The approaches in museum education are broad ranging from exhibitions for visitors, educational materials, platforms for discussion and exchange, outreaches in communities and classrooms, public lectures, excursions, amenities (e.g. dance and music, theatre), and partnerships (e.g. with NGOs and other cultural institutions), to website related information (Hein, 2005).

With respect to meeting museums offer and citizens demand, a network of several smaller institutions is beneficial rather than just a single 'national museum located in the capital'. Even amidst challenges, all museums assessed here still try to play their role as education centres. Natural history collections referred to here all provide specimens as teaching material, with their staff directly involved in courses to students and children among others. For all teaching institutions, museums constitute 'natural partners' for collaboration and offering practical training for students of all ages (NEMO, 2015).

Self-financing and local collaborations

Although museums are primarily non-profit institutions committed to education, they must survive e.g., by financing via public money, entrance fees and donations, and compete with other competitors (Chieh-Ching, 2006). All museums assessed (apart from MUZM and MUH) have developed self-financing mechanisms e.g., admission charges, voluntary contributions, gift shops, corporate sponsorships, food service, tourism facilities and services and fees for travel company. By engaging in such 'profit-making activities', museums can contribute to sustain themselves amidst limited public finances (Boylan, 2004). The museums have also began establishing collaborations locally and internationally. Collaborations also help non-profit organisations such as museums to gain support amidst financial difficulties, share resources, experience and knowledge thus enhancing income, saving costs through economies of scale, scope, and synergies, and maximising performance (Arnold-Forster and Davies, 1998; Austin, 2000; Kotler & Kotler, 2000). Even though the collaborations are still few, they are a major support for the museums in the region.

Online resources and networking

Some museums such as NMK, IG, GLM and those under INMR have already begun utilising online resources and networking. Many museums worldwide run websites and social media platforms to attract a wider audience and share information, exchange ideas and make access to the institution easier. One-third of the world's population use social media platforms such as blogs, chat apps, and social networks among others (Ambrose & Paine, 2018). Although this advancement in the use of social media platforms was still low, it is worth accrediting these institution's efforts. Respondents

(mainly foreign visitors) indicated that they knew certain museums like IG, NMK and those under INMR through their websites and social media platforms.

4.2 Weaknesses

Poor buildings and insufficient safety measures

The natural history collections in Uganda assessed here were established in the early 1900s' starting as small scientific collections. Over the years, they have grown into major repositories of zoological, botanical and mycological material (as responsible authorities revealed), but there were no relevant updates and/improvements of facilities. The case was not different for Rwanda's herbarium or NMK's zoological section.

The requirements for a museum building depend on its functions (including the size of the collection, staff, and involvement in education), finances, but also on its traditions. The building is the major protection for the specimens from outside environment (Boylan, 2004). Collections storage areas must be in the building, away from external walls if possible, to minimize environmental fluctuation; and relative humidity, low natural light influx and temperature should be stable. The collection rooms must be free from atmospheric pollutants and pests, and ideally located away from other activities (Boylan, 2004). Temperatures in collection rooms, especially in the wet collections, should be monitored, use of electronical devices kept to a minimum, and UV light controlled (Museums & Galleries Commission, 1992a, 1992b, 1996).

Modern museums must be upgraded to overcome these challenges, including installing 'state of the art' cabinets such as mobile shelves, to optimise space and seal against pests (**Fig. 42**). These upgrades are all expensive and yet funding is not readily available for many museums. In a region where temperatures and humidity are relatively high and fluctuating (worse due to climate change and global warming; Trewin, 2014; Carty, 2017), and interactions between humans and wildlife are close, good housekeeping alone cannot keep out pests nor control abiotic factors. All observed conservation efforts were seemingly short term, and without quick interventions many collections may still go down the drain.

The building should also have safety installations in case of fires. The devastating fire outbreak in 2018 on Brazil's oldest and most important historical and scientific collection (Museu Nacional; Don, 2018), emphasized why these installations are indispensable. Museums should also have a Disaster and Risk Management Plan. Unfortunately, for most institutions referred to here, all such precautional activities were not observed.

No research infrastructures

Research is one of the irrefutable tasks for museums (ICOM, 2017b). Museums are not just for collecting and preserving but also for documentation, reference, research and education (Graf & Rodekamp, 2016). All these facets require expertise (see 4.3.3.) as well as proper infrastructures. Infrastructure is even more crucial for natural historical research whether for traditional uses such as taxonomy, systematics, and evolutionary biology, or emerging fields like genomics and proteomics, infectious diseases, contaminants, and biological responses to climate change (Winker, 2004). It is impossible to do any meaningful research with biological collections without proper infrastructures. These include labs, instruments, microscopes, shelves, racks, glass and databases/computers. While they may be expensive, at least basics such as microscopes and computers should be available, but these too were lacking for many institutions.

Insufficient personnel (expertise)

Seemingly, many museums have opened without a plan who will do the necessary work (Ambrose & Paine, 2018). The museum's personnel are the most vital asset and the key to the institution's success (Boylan, 2004). Therefore, ICOM's Code of Professional Ethics requires that each museum should have a clear employment policy, recruit qualified personnel, and offer further training (Lewis, 2004). The array of museum activities is diverse and requires sufficient personnel and expertise. The numbers depend on the size of the institution and its goals. For most institutions, both technical and scientific staff were lacking, insufficient in terms of numbers and/or lacked proper qualifications to do the necessary work. Particularly, four kinds of staff that were urgently needed included curators, taxidermists, taxonomists and researchers in general.

Figure 42. Electronic mobile shelves in Senckenberg DEI, Müncheberg with switch inset (left) and manually operated mobile shelves in the Regional museum in Liberec/CZ (right). Photo credit: Willi Xylander, SMNG.

The lack of curators and taxidermists was easily detectable in most institutions due to the obviously poor quality of collections and exhibitions. In natural history collections, most researchers are just experts for a few taxa. Hence, scientific research tended to focus studies on these taxa, resulting in few publications. Like in many other parts of the world, only few groups have taxonomic experts (Narendran, 2000; Drew, 2011) yet, more taxa are becoming of major relevance too (Pennisi, 2001; Stokstad, 2003). In the ethnographic museums, there was hardly any research at all..

The lack of clear concepts and profiles (See 4.3.4.) especially for exhibitions, can easily be attributed to a deficiency in research for most institutions. Seemingly most museums overlook the role of research in developing quality exhibitions and education programs (Smithsonian, 2002). Researching and understanding of the national and international museum community help them to identify and timely offer the right services, at the right location, level and price (Ambrose & Paine, 2018), and to the right customers.

Insufficient documentation

Documentation in the institutions considered was mostly insufficient. Museum objects carry information (Navarrete & Mackenzie, 2016). So, documentation ensures accountability and security for collections, support physical and intellectual access (acquisition policies); it provides a historical archive about the objects for research (CIDOC, 1995). It is necessary to document the history of a collection since specimens with insufficient data (locality, date, conditions of accession) are less useful compared to properly documented collections (Walton, 1907). Unfortunately, the inventories and metadata were poorly managed, with a lot of gaps in the available data for most institutions.

Also, all information must be secure, sustainable and well preserved for long-term (registers stored in a fire-proof safe, paper files in an environmentally controlled archive, backing-up and restricting access to digital information and ensuring that digital information transfer from superseded systems and file formats into current systems; CIDOC, 2012). These standards were not observed in most institutions assessed here. Many institutions had not backed up their data either digitally or in hard copy.

Furthermore, museum collections have a history, as collections, exhibitions, research, and preservation techniques change over time (Navarrete & Mackenzie Owen, 2016). For museums to accurately represent their holdings and communicate effectively to their audience, proper documentation is crucial. Therefore, some exhibitions were hard to understand, and these museums still largely depend on tour guides to provide 'more information' about these objects.

Lack of clear profiles

Every museum must have its own profile. Profiling may help to find a meaningful differentiation between museums and by that enhance visitor experience (Antoniou, 2016). It may also provide arguments to finance many museums. The financial investment required to collect, prepare, install, database, maintain collections (although this does not reflect the actual value of specimens; Bradley et al., 2014) and/create modern, attractive, educative exhibitions are high. Without a profile and clear concept(s), it is impossible to know which objects to acquire, which activities to prioritise and how to subsequently sustain a museum. Many museums lacked clear profiles which was very evident in their collections and exhibitions. Often objects that were out of the museum's scope, sometimes displayed without any convincing explanations, were displayed. Many of the exhibitions lacked a clear structure. Thus, presentations became 'boring', probably a main reason why people do not visit these institutions.

There are several possibilities for the region regarding profiles and concepts. One is focusing on one or a few places, which several community museums in Uganda are doing or on specific taxa/objects. One can find unique history or heritage data in each of these places. Museum exhibitions may also differ regarding topics, for instance, evolution, ecology and human-wildlife interactions.

Exhibitions poorly developed

Respondents appreciated the educational role of museums they visited, but few seemed to love the exhibitions in general. Several studies emphasized the importance of the relevance of exhibition quality for visitors to feel satisfied and hence respect and support for museums (Young, 1996; Timothy & Boyd, 2006). People go through stages of decision making before they decide whether to visit a museum or not (Moyer, 1994). Many studies have already highlighted the motivation of visitors to visit a museum, e.g. 'just for just', 'a day out with friends or family', 'special exhibition', 'education', 'just to spend', 'new experiences', 'passing time', location and/or 'learning' (Hood, 1983; Falk and Dierking, 2000; Packer & Ballantyne, 2002; Codignola & Mariani., 2017). It could be the experience from a previous visit, the context, or for just regardless of the original interest or disinterest in a museum.

Regardless, museums should understand that the motivation of their audience to come is essential for success (Ambrose & Paine, 2018). Unfortunately, many museums referred to in this study failed to satisfy their

audiences as respondents expressed dissatisfaction. Visitors considered the exhibitions and their profiles to be underdeveloped, hard to understand, dis-organised or not appealing in several museums, as captured in the interviews and a few questionnaires. The sample size may be too low to make significant conclusions, but the results indicate trends.

Exhibitions need to be dynamic to be attractive (change with time and audience). For museums with few objects to display, this is even more critical. Many museums displayed permanent exhibits on 90% of their space for decades. 10-15 years should be optimal for permanent exhibits. Setting up new exhibitions is expensive, and museums must consider whether to develop new or boost up existing ones. For instance, (1) they can develop temporary exhibits on different topics and loan it to other museums, (2) include interactive elements into the otherwise 'static' exhibitions (e.g. tunnels for kids, question & answer exhibits, hidden objects to check out, and technological instalments), (3) improve the quality of the display (new structures, informative labels, keep the exhibitions clean, set up dioramas), (4) develop multidisciplinary exhibits (e.g. link up flora and or fauna with light colour, and new forms, and/or nature with which tribes traditionally interact with it), among others. Many of such improvements do not require huge investments but rather planning and use of existing (or external) expertise.

Management on institutional level insufficient

One underlying challenge for the institutions assessed is poor management on institutional and governmental levels. It was evident that institutions with insufficient management were in worse conditions than their counterparts. Whether museum finances or staff, research, education and/maintenance of the collections, they all need proper management (Bradford, 2005). Good governance requires museums to have a mission statement, institutional plan, articles of incorporation and charters to enable legislation, documentation of an affirmation of support from a parent/founding organisation, and proper delegation of operating authority to the museum director (ICOM, 2017b). Thus, all museums must have clear structures with roles well stipulated.

More than any other workers, leading staff (directors and curators) are closely identified with the museum's image and purposes. Hence, they must be well trained in their roles and acquainted with the professional practices in museums (MacLeod, 2001). The director must also be directly responsible and have direct access to the relevant governing bodies which was generally lacking in the smaller museums.

Unfortunately for many museums here, these management structures were not well defined reflecting minimal obligation and commitment (Boylan, 2004). During interviews, significant conflicts of interest between the top management and staff (e.g. regarding budgets and collection profiles and concepts), were recorded. Such conflicts can have a detrimental impact on the museums' success (Griffin, 1988).

4.3 Opportunities

Extremely rich biodiversity and heritage

Africa has a wealth of immovable heritage, from Palaeolithic sites, historic towns, monuments and cultural landscapes to biodiversity hotspots. Regarding faunal biodiversity, an approximate 100,000 species of insects were described from sub-Saharan Africa (Miller & Rogo, 2001), more than 400 species of echinoderms and 599 of Bryozoa enrich East African coral fauna (Richmond, 2001), and more than two thirds of the estimated 2000 families of cichlids are endemic to East Africa's Great Lakes (Victoria, Malawi, and Tanganyika; Farias et al., 2001). More than 1100 mammal species with all the three endemic orders, Tubulidentata (aardvarks), Afrosoricida (tenrecs and golden moles), and Macroscelidea (elephant shrews) are also found in East Africa (Turner & Antón, 2004). Checklists for individual country are long, yet, often there are little or no overviews for several groups, especially invertebrates (Miller & Rogo). With much left to explore, there are huge opportunities for Africa's natural history collections (see also 4.4.2.).

With respect to ethnography, the cultural diversity is also very high. Several museums in the region have made significant contributions to science through discoveries (especially in the field of palaeontology) and maintaining important collections (Cotterill, 2002). Kenya for instance has the site at which Dr. Richard Leakey discovered the oldest humanoid bones, curated at NMK (Brown et al., 1965; Leakey & Lewin, 1978). Several museums referred to here (IG, SRM, GLM), contained artefacts with a rich history that only the museum staff and local people could tell and that was not published in any literature. Moreover, this is just a small part of the heritage that still needs to be documented.

Biodiversity research crucial

There is a growing demand for information on biodiversity and biodiversity loss globally for use e.g. in conservation and policy education (Falter, 2006; McGlynn, 2008; Cook et al., 2014). Increasingly, donors are supporting institutions for biodiversity research and education. Issues such as climate change and global

warming that are currently affecting many African countries have been studied using museum collections (Dunn & Winkler, 1999; Hellberg et al., 2001). Changes in species, populations, and ecosystems, monitoring patterns related to natural or anthropogenic changes and conservation of poorly known taxa can also be studied (Shaffer et al., 1998; Falter, 2006; Gaubert et al., 2006; Lister et al., 2011). A special interest in Africa's natural history collections would be addressing research deficits due to taxonomic biases as well as societal preference and regional biases (Titley et al., 2017; Troudet et al., 2017; Tydecks et al., 2018).

Biodiversity data may also be extracted from ethnographic collections as wooden artefacts, and other objects directly got or made from a range of plant species, teeth, bones, and skin, and unique stones used by humans over generations. The conservation status, past and/present, of species/ecosystems from which these materials were taken, is unknown. Such data are relevant for biodiversity conservation especially with the inextricable link between culture and nature for most African communities (Posey, 1988).

Culture development as a civil need

As countries develop, their cultural industry does because according to Maslow (1970), once basic needs (food, shelter, and security) are satisfied next comes ''self-actualisation'' and ''discovery''. Museums contribute to social cohesion, civic engagement as well as local development through inspiring creativity, boosting cultural diversity, attracting visitors and bringing in revenues (OECD & ICOM, 2018). The cultural sector (including museums) has been unexploited or under-developed in most African countries yet heritage tourism is increasingly cited as a major player for building sustainable economies in developing countries (Perera, 2015). If museum managers understand heritage-tourist behaviour, they will know which services to offer in order to create effective sustainable strategies (Chen & Chen, 2012). An important aspect to consider is that a better educated audience has a demand for high quality education and well-made exhibits.

Exploring other support mechanisms

Museums have the potential to attract public support and diversify their resources. A few museums that were in a good state had strong collaborations, used volunteers and had established self-financing mechanisms (see 4.2.4). All these need to be expanded. More opportunities for collaborations include loans, research partnerships and exchanging exhibitions. Consolidation, mergers, and marketing can also be explored as a self-financing mechanism although these

should be done without compromising the standards of the institution or its public (Boylan, 2004). Competition in the leisure market, and public funding cuts for cultural organizations (Pop & Borza, 2016) are factors that should be well understood since they can have a negative impact on the museum.

Sometimes, support comes from volunteers. Volunteers are still a 'neglected audience' in the region, yet museums worldwide are using them as a fundamental workforce, at times out-numbering paid staff (Holmes, 2003; Holmes & Edwards, 2008). While volunteers are mostly not paid, they still need to be accredited as a significant resource to increase their motivation, which many museums referred to here have failed as reported by several of their volunteers.

Digital databases

Digitising allows scientists to easily access research objects (Decker et al., 2018) thereby increasing the attractiveness and relevancy of collections to the society. For biodiversity, physical specimens combined with online access to specimen-data, provide new opportunities for learning in both formal and informal environments (Efthim 2006). Some visiting researchers at NMK's botany section indicated that they gained interest in the museum's collection via the online database, subsequently asking for loans and/coming to the museum for research. Thus, the lack of digital databases was also part of the reason why access to the collections had been slow/hampered. If local museums are willing to incur costs for online resources, digital methods offer unprecedented opportunities (Arts, 2015; Kemp, 2015; La Salle, 2016).

Restitution and hosting material from Europe and America

There are increasing debates about restitution of cultural heritage to places of origin (Curtis, 2006; Roehrenbeck, 2010; Kakaliouras, 2012). These mainly rotate around cultural remains, but other objects get more and more into the focus of this debate, which natural history museums worldwide cannot ignore (ICOM, 2018). For many large museums (mainly in Europe and America) in possession of Africa's heritage, this will mean parting with part of their collections. The local museums in the regions of origin would become custodians of this heritage and should take complete responsibility. This could boost their significance and serve as an opportunity to lobby for support and develop the museums. Amidst these debates, countries must guarantee the necessary resources and infrastructure to maintain these collections or else, restitution must be postponed until conditions allow long-term storage and unrestricted access for science.

4.4 Threats

Political awareness and support insufficient

Museums worldwide face similar challenges, but the scale seems uneven. The museums considered here represent the state of many museums in Africa, where management still often is insufficient. One essential requirement for the proper functioning of museums is finance which constitutes a big challenge for most museums. Although the exact budget required was not obtained, all institutions were short of finances. Museum financing ranges from public to private sources including; earned income, grants, donations, allocations, sponsorship, lottery revenue, and endowment funds (Martin, 1994; Toepler & Dewees, 2005; Fedeli & Santoni, 2006). While these institutions get financial support from different sources, the state governments play a significant role in their sustainability (Lindqvist, 2012).

Most institutions assessed suffer a dreadful fate because though some are major national repositories, they still received little to no financial support from their governments. Unfortunately, governmental support is often rather marginal due to lack of understanding about the roles of these institutions and conflicting priorities within national agendas (Oliver, Hawley & Hale, 1991; Gropp, 2003; Stokstad, 2003; He, 2017). The general economic situation in the three countries considered here, may also not permit governments to prioritise cultural institutions, and museums often receive less support than others. This is even worse for biological collections associated with academic institutions (like MUH and MUZM). These often undergo dreadful budgetary shortfalls (Dalton, 2003; Gropp, 2003; Stokstad, 2003; Gropp & Mares, 2009) probably because they are considered to be mere teaching institutions while other functions as museums/ collections are ignored. Many natural history collections in the region are part of such institutions. MUZM & MUH still use grants and staff salaries to cover regular financing. Without public support, many museums face an uncertain future (Gropp, 2003). In the United Kingdom, for instance, staff numbers in natural history museums have been dropping, and 64 museums closed since 2010 mainly due to the paucity of public funding (Dance, 2017). The exact consequences for closing collections and other archives of national heritage are not easily foreseen or understood but will with no doubt deter quality information transfer which is crucial for the sustainability of future generations.

Even financing of privately-owned museums as most ethnographic museums mentioned here, can be politically driven through tax deductions and tax relief regulations on their activities (Moen, 1997; Leclair & Gordon, 2000; McIsaac, 2007; Hughes & Luksetich, 2008). Hence, governments directly or indirectly play an influential role. The challenges of poor management, lack of finances and political will, extend to all other aspects, emphasizing that operations of organizations complement each other (Smithsonian, 2002). In this case, it has an impact on the resilience, quality, relevance, attractiveness or sustainability of these museums/collections.

Unclear or insufficient institutional organisation nationally

In Uganda, natural history collections are controlled by governmental departments or academic institutions with parastatal status, while those of ethnography range from governmental or parastatal to private. This system where departments of ministries hold responsibilities over museums leaves museums with little support (Ndoro et al., 2009). Interviewing some staff who were directly responsible for managing museums in the three countries, it became clear why many large collections had failed to make substantial progress. Responsible authorities seemed not bothered, were not aware of, 'did not understand' the relevance or 'how to manage' museums as collections, education and research institutions.

In Uganda, respondents from these authorities knew only the Uganda museum and at times one or two community museums. MUZM was mentioned once by a single respondent. Many acknowledged that they had not visited or even had any clue about the state of these collections because they were not under their jurisdiction. The UGM, MUZM and MUH staff members highlighted that they seldom have a budget or receive support from the central administration to maintain the collections, apart from their salaries. Even the little funds they collect from visitors (in the case of UGM) go to the exchequer and are not used to finance the museum's activities. Several respondents noted that getting third-party funding through such administration settings is strenuous and resulted in conflicting priorities between the museum and central administration. In Rwanda, NHR seemed to be in the same state as the natural history museums in Uganda although a trusted source indicated that plans were under-way to revamp this situation.

Ndoro et al. (2009) concluded that para-state management, which makes museums semi-autonomous is more effective and appropriate in many cases. The impression from museums in Rwanda and Kenya under the Institute of National Museums of Rwanda and the National Museums of Kenya respectively, which are semi-autonomous (although they seem to be centrally administered) support this view. Uganda's ethnographic museums are private and hence autonomous; their states seemed a little better than those under central administrations. While all systems of management may

have downfalls, it seems museums in this region would progress better if they were autonomous. However, there should be a central control that supervises and supports their activities.

Lack of public acceptance

There may be many reasons why people do not visit museums (as earlier discussed), but a major obstacle is acceptance by the local people. For whatever reasons, museums remain elusive to many local people. Several citizens during interviews wondered why trouble about these institutions. Museums worldwide compete with many other amnesties which provide similar experiences (Ambrose & Paine, 2018). Unfortunately for the three countries referred to here, the museums received a comparatively low acceptance as they failed to 'interest' local citizens. Although several respondents knew about these museums through school trips or primary education, this is not enough to convince the public to continue visiting. Awareness about these institutions and their roles in the region is generally lacking.

Traditional museums in the 21st century

In the twenty-first century, museums' principal challenge is knowing that they are for people and that their future success depends on identifying and meeting their needs (Ambrose & Paine, 2018) but also by advertisement of the public function of museum. Modern museums aim at providing information essential to survival of life and of the planet, remain focused on collecting, know that it is their task to transfer understanding of the relevance of museum collections and research by preserving the national natural heritage and the knowledge about it and education, give collection maintenance priority, and work in a global scientific community were information is shared (e.g. through loans and online resources) (Black, 2012; De Varine-Bohan, 2014; Graf, 2016; Greffe et al., 2017).

Many museums assessed have stayed traditional museums or rather 'cabinets of curiosity', with costs of storing collections not being a major consideration, doing opportunistic collecting, collections being proprietary or out-rightly owned (not in trust for the public) and being just physical libraries (no online resources). If these museums continue operating as traditional museums, they will increase the gap between them and the public. Transformation to a modern museum from the traditional museum in the region requires a challenging yet possible 'leap'.

Technological advancement

Similarly, advancement in technology constitutes a great challenge for many smaller museums. It is inevitable that museums continue developing their collections and stay relevant in a changing world (Spalding, 2002). However, this comes at a cost, yet museums must compete with other sectors for new technologies amidst limited funds and expertise (Canadian Network, 2017). This is even worse for the institutions assessed here. For instance, the techniques how museums communicate are changing, and new communication tools to stimulate participation and promotion of citizen science are explored (vom Lehn & Heath, 2005; Bearman & Geber, 2008; museum4punkt0, undated). Among the latest developments are the emerging multimedia and communication technologies which include ethnographic and video-based technology to engage audiences and to make sense out of exhibits through social interaction. These include Personal Digital Assistants (PDAs), touchscreen-based information kiosks, virtual reality (VR) and augmented realities, 3D-printing and scanning, Rob guides, tablet-guided gallery tours, eye-tracking devices, and symbol decoding software.

Unfortunately, many local museums like those considered here, cannot afford these technologies in the present financial environment because they are expensive to purchase but also to maintain. Yet, big museums have already begun to adopt these technologies, turning them and cultural institutions into a booming industry, sometimes receiving more visitors than sports events (Baber et al., 2001; Kelly, 2017). Kelly (2017) ascertains that those large numbers are likely growing as museums boost their technological prowess. With no critical advancements and changes in Africa's collections, they are prone to be rendered useless in the digital era, especially with the changing roles of museums.

Damage of collections after restitution or repatriation

While restitution of collections can be an opportunity for local museums, they should understand the responsibility, commitment and maintenance costs that come when these collections are transferred and have to be managed sustainably. ICOM's Code of Ethics requires that 'collections of human remains' and 'material of sacred significance should be acquired if they can be housed securely and cared for respectfully' (ICOM, 2017b). If these are repatriated, many countries will be at risk of damaging their national and international image due to failure to maintain these collections while continuing to use them for their intended purpose. For most museums assessed here, being custodians of repatriated collections is not an option if they still want to protect their image.

5. Conclusions and recommendations

5.1 Conclusion

This study agrees with Ndoro & Chirikure (2017) that much of Africa's heritage is not documented, unknown, not recognised or poorly maintained and therefore threatened. The state of museums/collections in the region is not satisfactory. The survey reveals several challenges all museums worldwide face. Certainly, museums will continue to meet these challenges, but the scale remains uneven across regions. For African museums, the research is a gateway to many inherent questions that need to be addressed. For instance, regarding collections, what is the significance of the specimens to include provenance, representativeness, or rarity? Is there systematic bias in collecting? if so, why? Regarding management regimes, is it meaningful to have a central national natural history collection in each country and how can this be managed with the current administerial environment? or Should Africa opt for smaller regional collections such as those under academic institutions or have both? Which policy changes are necessary to support collections and related research? Can the available resources for museums in the region be optimised to help these institutions meet international standards? Which is the most effective way to build capacity for these institutions? Many more questions can be derived from this survey. Within the current debates on restitution of Africa' heritage, it is not possible for these institutions to host material if capacities for maintenance cannot be realised. It will take collective efforts to support and revamp these treasures in many African countries. Moreover, we cannot precisely predict future payoffs of such an investment, but failure to support museum collections is the surest way to eliminate any benefits (Suarez & Tsutsui, 2004).

5.2 Recommendations

Based on the observations, five recommendations including priority areas and tasks/actions for building capacity for the museum sector in this region are summarised (**Table 7 & 8**). Also, other museums facing similar challenges in other countries can employ them.

Acknowledgement

Abbreviations

Note: The abbreviations may not necessarily be those used by the institution

BM	Buganda Museum
EMR	Ethnographic Museum in Rwanda
GLM	Great Lakes Museum
ICOM	International Council of Museums
IG	Igongo Cultural Centre/Museum
INMR	Institute of National Museums of Rwanda
ITFC	Institute of Tropical Forest Conservation Herbarium

Table 7. Recommendations, priority areas and proposed actions/tasks for building capacity in the region.

Recommendation	Priority areas	Tasks/Actions (see below)
Secure the integrity of existing collections	Dynamic collection curation and management Physical infrastructure	1, 2, 3, 4, 9, 10 & 16
Develop sustainable funding mechanisms	Adapting to the current funding environment Diversify funding sources (see 4.2)	4, 7, 8, 12, 13, 14, 18, 19
Grow and diversify audience	Public appeal/acceptance Awareness about local museums and their work	5, 11, 13, 21, 23, 24, 26, 27, 28, 29
Prioritise research and education	Define or redefine Museum concepts and profiles for collecting, research and exhibitions	4, 5, 13, 15, 17, 20,
Build and maintain a proper museum workforce	Managers, scientific and technical staff	4, 6, 12, 13, 22, 25

Table 8. Priority matrix for capacity building for the museum sector in the region (matrix design source: acquityppm.com).

		Higher		⇐ Urgency ⇒		Lower
Higher	Must do	1. Discard damaged/ infected collections 2. Minimise collection size until conditions are improved 3. Loan out delicate and/ objects outside the museum scope		4. Recruit/hire qualified staff 5. Define or redefine concepts and profiles 6. Establish proper management structures 7. Adopt mixed funding mechanisms		8. Lobby for public funding through governmental action 9. Establish appropriate physical infrastructures e.g., collection and exhibition halls 10. Develop a long-term maintenance plan
Impact ⇑ ⇓	Need to do	11. Improve/set up quality exhibitions 12. Establish, utilise and support volunteers' activities/programs 13. Collaborate with museums locally and internationally		14. Establish long-term and strategic planning 15. Identify collections as key repositories of the natural and cultural diversity 16. Prioritise and set apart a budget for collection management		17. Foster digital capacity and innovation in museum education and research 18. Revise/strengthen existing regulations to support heritage conservation.
	Should do	19. Establish cooperation with local organisations and companies 20. Increase internship and volunteer placements for students 21. Establish museum courses, summer schools, workshops etc for schools and universities		22. Diversify work force (e.g., more expertise, gender, ethnicities, etc) 23. Set up dynamic exhibitions e.g., on current issues such as climate change 24. Increase community engagements		25. Establish training programs for museum staff locally 26. Diversify museum scope beyond the traditional patronage e.g., identify as centres of socio-political dialogue
lower	Could do	27. Engage local media; e.g., document activities and number of visitors in a local newspaper at least once every month		28. Establish travelling exhibitions across the region		29. Establish a recognised local/ regional association for museums

KHM	Kawanda Herbarium
KIH	Kawanda Invertebrate Museum
KH	Kandt House Museum
KIHM	Kawanda Invertebrate Museum and Herbarium
MH	Environment Museum of Rwanda
MM	Zoological Museum Mweya
MUBF	Herbarium at Makerere University Biodiversity Field station
MUH	Makerere University Herbarium
MUZM	Makerere University Zoology Museum
NHR	National Herbarium of Rwanda
NMK	National Museum of Kenya
NNM	Nairobi National Museum
SRM	Ssemagulu Royal Museum
UGM	Uganda Museum
UMM	Uganda Martyrs Museum

Definitions

Museum: All institutions assessed with specimens/ objects intended for display and/or research.

Natural History: 'Nature' is a vague word but in this report natural history is mostly used to include zoological, botanical, mycological, geological, palaeontological and/or archaeological objects especially for research and/or public display.

Institution: Organisation entity mostly referring to a museum.

Ethnographic: All specimens kept with the thematic focus of being cultural objects.

Ranking: Summing up judgements from the observations and/or conclusions into a single, holistic number or score.

Evaluation/assessment: Making verifiable conclusions from the observations made.

Ranking assessment: Evaluation based solely on the ranking data.

Category: Different aspects of museums in this report summarised as 'collections', 'exhibitions', 'research', 'infrastructure' and 'institution'.

Indicators: Characteristics that were used in assessment

Research: Mostly used as a category to cover aspects related to research.

Infrastructure: Mostly referring to physical structures of a museum.

Public: Respondents online, visitors found in the museum and respondents from communities. In the discussion, it may also refer to potential visitors and other museum stakeholders such as the government.

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Threatened Heritage

Evaluation of East African Natural History Collections amidst restitution debates - Cases from Uganda, Kenya and Rwanda

Solomon Sebuliba