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Preliminary results on the quantification and taphonomic analysis of the Zoo Park (Windhoek, Namibia) Proboscidean remains

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Keywords: proboscideans, *Loxodont*, Holocene, taphonomic analysis, Windhoek, Zoo Park, butchering site.

Abstract

Landscaping work at Zoo Park (Windhoek, Namibia) in 1961/1962 revealed a Holocene open-air site containing proboscidean remains (*Loxodonta* spp.) associated with quartz stone artefacts. Zoo Park has been cited in various publications as a butchery site with various authors differing on the number of the elephants found at the site. To verify these claims, a taphonomic analysis and quantification of the elephant remains was carried out. The study is ongoing. The preliminary results have documented two elephants and taphonomic analysis suggests possible human exploitation of the remains. The study shows that the exploitation of elephants for subsistence at Zoo Park was likely the result of butchering related to scavenging activities.

Introduction

Proboscidean remains such as *Palaeoloxodon*, *Mammuthus*, and *Loxodonta* have been discovered at several mainly Pleistocene archaeological sites around the world and these findings reveal a once diverse and widely distributed order (MacCalman 1965, 1967; Clark and Haynes 1970; Shackley 1980, 1985; Klein 1988; Villa 1990; Rabinovich et al. 2012;

Saccà 2012; Haynes 2022). Today the order Proboscidea is represented by three species; *Loxodonta africana* (African savanna elephant), *Loxodonta cyclotis* (African forest elephant), and *Elephas maximus* (Asian elephant). Studies focusing on hominin exploitation of proboscideans draws attention to the strategies used to exploit these megafauna. Active hunting of elephants during the Pleistocene is often disputed and it is commonly accepted that elephant flesh was exploited mainly by scavenging (Saccà 2012).

In Namibia evidence pointing to probable hominin exploitation of elephants comes from two archaeological sites, namely Namib IV, and Zoo Park, which forms the focus of this paper. Namib IV is an open-air site and was discovered in 1978 by Myra Shackley (Shackley 1980, 1985). The site is located in the central Namib Desert, approximately 20 km south-west of Gobabeb (Klein 1988:18), and covers an area of over 62,500m^2 (Shackley 1985). A multidisciplinary dating approach has been used to date the site and includes uranium-thorium and biochronology dating methods (Mesfin et al. 2021; Klein 1988; Shackley 1980, 1985). These multidisciplinary dating approaches indicate a lower Pleistocene age of ~350–500ka (Haynes 2022; Mesfin et al. 2021). The artefact assemblage is composed of 75% heavy tools, the majority being cleavers and hand-axes (Shackley 1985), artefacts typically associated with the Acheulean techno-complex. Other tools making up the artefact assemblage include "choppers and cores (4.4%), flakes (16%) and a small amount of retouched formal tools" (Shackley 1985:37). In addition to artefact assemblage, faunal remains including *Palaeoloxodon* (formerly *Elephas*) *recki*, alcelaphine antelope, and black wildebeest were also discovered at the site (Shackley 1980; 1985; Klein 1988). The occurrence of migratory and water-dependent animals such as *Palaeoloxondon recki* and black wildebeest in the Namib Desert is indicative of wetter conditions during the lower Pleistocene. The water dependence of elephants and wildebeest would therefore suggest that the site and others in the vicinity were probably occupied for short periods. The faunal remains were "concentrated together with the bifacial tools, on the southern part of the pan association" (Shackley 1985:37), which supports the argument that Namib IV was a butchery site. The dominance of heavy tools however suggests opportunistic hunting at the site (Kinahan 2020).

Zoo Park is an open-air site located in Namibia's capital city Windhoek, at the corner of Independence Avenue and Fidel Castro Street. Landscaping work at Zoo Park in 1961 and 1962 revealed proboscidean remains which were ascribed to *Loxodonta zulu* (Cherkinsky and Marais 2014). However, palaeontologists Martin Pickford and Friedemann Schrenk (personal communication), have suggested that the remains are most likely *Loxodonta africana*, although confirmation rests on further analysis of the remains. The first date for the site, derived from a tusk sample, is 5200 ±140 BP (MacCalman 1965). Clark and Haynes (1970) were not convinced by the date obtained by MacCalman, suggesting either a late Pleistocene or early Holocene date based on the site's diatoms. The second date for the site is 7.2ka and was obtained from a tooth molar plate (Cherkinsky and Marais 2014).

These dates place the Zoo Park within the Holocene which is significant as the majority of archaeological sites with possible hominin exploitation of proboscideans are dated to the Pleistocene. The Holocene context of the elephant remains is important to finding out and the interaction between the elephant and Later Stone Age (LSA) hunter-gatherers.

The Zoo Park elephant remains were discovered at two separate areas which are located 10m apart (Cherkinsky and Marais 2014). The first remains were discovered in 1961, 2m below the surface (Cherkinsky and Marais 2014), comprising a tusk, lower jaw, and pelvis (MacCalman 1967). The second elephant remains were discovered in 1962, 0.35m below the surface, and include mandible, tusk, teeth, femur, pelvic bones, vertebrae, and ribs (Cherkinsky and Marais 2014). While some level of excavation was carried out at the Zoo Park as shown by the layout of the grids (Fig. 1), it is not entirely clear how systematic the excavation was. As the 1962 discovery is the only area cited where a femur was found, it is highly probably that what is shown in Fig. 1 is the 1962 discovery; additionally, the depth where the remains are exposed appears shallow, thus lending more weight to this having been the 1962 discovery. According to several publications (MacCalman 1965,

Figure 1: Photographs most probably showing the 1962 discovery. Tusk and femur are visible. (Photo: National Archives of Namibia)

1967; Clark and Haynes 1970; Stern and Lau 1989; Cherkinsky and Marais, 2014; Haynes 2022), the elephant remains from both areas were associated with quartz artefacts characterized by choppers , hammerstones and unretouched flakes, which has resulted in the site being interpreted as a butchery site. The lithic artefacts, which are curated at the National Museum of Namibia (NMN) have not been studied by me or other researchers and, as such, no additional information can be provided about them at this stage.

The interpretation of the Zoo Park as a site of probably human exploitation of proboscideans is not secure because the archaeological context in which the evidence occurs is not well documented. There is a paucity of information regarding the spatial distribution of the elephant remains and lithic artefacts. Furthermore, the number of elephants reported from the site is inconsistent: MacCalman (1965) reported three elephants, while Haynes (2022) reported two elephants from Zoo Park. The claims made by Haynes or MacCalman are not supported by any photographic or taphonomic evidence. The motivation driving this study is to shed light on the number of identified specimens (NISP), minimum number of individuals (MNI), and to look for taphonomic indicators that could support the probable exploitation of proboscideans by LSA hunter-gatherers of the Windhoek.

Material and Methods

The teeth are the most morphologically distinct element of an elephant, thus the teeth together with the tusks were used to conclude that the only animals represented at the site were elephants. When the elephants' remains were moved from the Zoo Park to the archaeology collection in the National Museum of Namibia (NMN), no consideration was given to the fact that these remains originated from two separate areas of the Zoo Park and the material was stored as if it came from a single area. The material will therefore be treated as a single assemblage. The remains were not washed or treated with chemicals, which and this would have hampered the identification of bone surface modifications.

There is clear evidence that some of the remains were conjoined/refitted in the past; conjoining/refitting of the remains, specifically the teeth, is still ongoing. Refitting or conjoining plays an important role in the accuracy of skeletal element identification and quantification. Skeletal element identification was carried out using a very limited reference collection from the Mammal Department of the NMN and several published guides (Smuts and Bezuidenhout 1994; van der Merwe 1995; Bezuidenhout and Seegers 1996; Stansfield 2015). The quantification units used to count the skeletal remains is number of identified specimens (NISP) and minimum number of individuals (MNI) based on popular textbooks (Lyman 2008; Reitz and Wing 2008; Gifford-Gonzalez 2018). The use of the two quantification units is significant because, although both are influenced by fragmentation, the degree to which fragmentation influences them differs. The NISP count is always higher than the MNI and therefore tends to inflate the number of individuals, whereas the MNI tends to underestimate the number of individuals. Mandibles were the best-represented diagnostic skeletal elements of the assemblage and thus were used to determine the MNI.

Published criteria of the age profiles of *Loxondonta africana* (Haynes 1991; Lindeque 1991; Stansfield 2015) were used to estimate the age of Zoo Park elephants. The age of elephants was based on the correct identification of the teeth which were identified with the help of Martin Pickford (briefly looked at the teeth) and Friedeman Schrenk (via email communication). The counting of lamellae was not used as an age determination technique because different molars may have a similar number of lamellae (Lindeque 1990; Stanfield, 2016).

Taphonomic analysis was aimed at establishing whether the Later Stone Age hunter-gatherers of the Zoo Park exploited elephants. Evidence of hominin involvement with bones from archaeological sites is obtained by observing bone surfaces for cut marks, which are considered the most direct and reliable evidence of anthropogenic manipulation of archaeofaunal remains (Yravedra et al. 2010; Rabinovich et al. 2012). Only bones that were identified to skeletal level were considered for bone surface modifications. In most zooarchaeological studies, cut marks are verified through use of scanning electron microscope (SEM); however, this was not carried out in this study. Bone surface modifications were also carried out to identify carnivore and rodent gnawing marks.

Evidence of fire can also be used as direct evidence of hominin involvement with bones from archaeological sites. Natural and human activities can both create burned bone assemblages, although to varying degrees. Burned bones were assessed using Stiner et al. (1995) criteria, which consist of six categories that are identified on the basis of colour (see Table 1).

Table 1: Burn level codes from Stiner et al. (1995).

Burn Color Code	**Description**
0	Not Burned (cream/tan)
1	Slightly burned; localized and < half carbonized
2	Lightly burned; > half carbonized
3	Fully carbonized (completely black)
4	Localized; < half calcined (more black than white)
5	Half calcined (more white than black)
6	Fully calcined (completely white)

Results

Faunal assemblage preservation

The state of preservation of the faunal assemblage is not uniform, implying that the faunal remains were exposed to different conditions. The general assemblage is not well preserved and is intensely fragmented. The total assemblage consisted of 984 remains of which only 123 could be identified as skeletal elements. Fragmentation is especially evident on the tusk, which was splitting into tiny pieces (Fig. 2). Two of the tusk parts could be conjoined/refitted but this was not attempted due to the splitting. It is difficult to conclude whether the tusk parts were once the complete tusk shown in Fig. 1. The femur, whose length was 79 cm, is also very fragmented; most of the fragments were conjoined/refitted in the past (Fig. 3), with only one part being conjoined/refitted during this study. Figure 1, shows the distal end of the femur, but this part of the femur did not form part of the analysed material. The state of preservation is most probably attributed to two factors. It is highly probably the remains were damaged by the bulldozers during the landscaping work. The preservation of some of the remains *in situ* in a glass-covered showcase (Fig. 4) caused deterioration of the remains. The specimens showed variable degrees of surface abrasion, with some of the cortical surface missing or falling off. Smoothing and polishing of the bones, although present, are not very common.

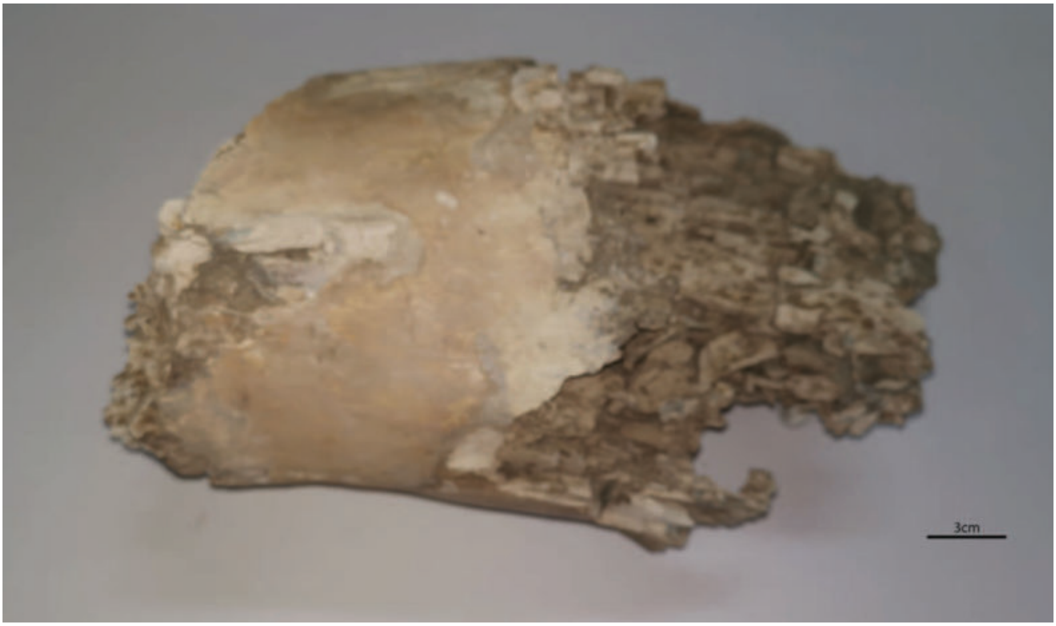

Figure 2: One of the four tusk parts from the assemblage

Figure 3: Femur showing refitting of the fragments

Figure 4: Museum staff building the showcase at one of the discovery areas, most probably the 1962 area. Photo: National Archives of Namibia

Skeletal composition

The NISP (Table 2) is low: only 123 of the remains were identified as skeletal elements. Cranial elements are represented by fragmented tusks, teeth, and skull fragments. There were many large bones that were not identified due to a limited reference collection, but also because the surfaces were eroded. Post-cranial elements are represented by ribs, pelvis, vertebrae, femur, humerus, tarsal bones, and phalanges.

The mandibular teeth (Fig. 5a and Fig. 5b) are M2 (fifth molar) and the beginning of M3 (sixth molar). Therefore, the age of this individual would be around 36-38 years in modern African elephants (personal communication with Friedemann Schrenk). The three complete M2s (Lower M2, Upper M2 and right-sided Lower M2) and the M3s that follow them are shown in Figures 6a, 6b, 7a, 7b, and 8. The M3s still require refitting with the available molar plates. The three M2s are much younger than the individual represented by the mandibular teeth; probably 22-24 years of age (personal communication with Friedemann Schrenk).

Table 2: NISP for the identified elephant skeletal elements

Skeletal element	NISP	Exact identification of skeletal element	
Skull elements	7	Occipital bone	3
		Foraminae	4
Mandible	6	Complete mandible	1
		Left-sided partial mandible with visible symphysis and posterior foramen mentale	1
		Right-sided partial mandible with visible proximal dental alveolus end and posterior foramen mentale	1
		Left-sided partial mandible with visible base of condyle and distal end of dental alveolus mandibular	1
		Left-sided partial mandible with visible condyle and shaft	1
		Mandible condyle	1
Teeth	28	Upper M2	1
		Right-sided Lower M2	1
		Lower M2	1
		Upper M3	1
		Right sided Lower M3	1
		Lower M3	1
		M3	1
		Molar plates	13
		Teeth fragments	8
Tusks	3	Indetermined	3
Vertebrae	18	Altlas	1
		Spinous processes	4
		Vertebral bodies	13
Ribs	47	Indetermined	47
Pelvis	5	sacrum	1
		Indetermined	4
Femur	1	shaft	1
Humerus	1	Condyle	1
Tarsal bones	4	Indetermined	4
Phalanges	3	Indetermined	3
Totals	123		123

Figure 5a: Mandibular teeth

Figure 5b: Interior view of left side of the complete mandible

Figure 6a: Upper M2 (fifth molar)

Figure 6b: Upper M2 (left) and upper M3 (right)

Figure 7a: Right-sided lower M2 (left) and M3 (right)

Figure 7b: Right-sided lower M2 with visible root (left) and M3 (right)

Figure 8: Lower M2 (left) and M3 (right)

The data indicate at least two elephants at Zoo Park. One individual is represented by the complete mandible (Fig. 5a), while the second individual is represented by a left-sided partial mandible (Fig. 8). The possibility of three individuals is not ruled out.

Bone surface modifications

Bone surface modification was observed only on the identified skeletal elements. Bone surface modification was hampered by the fact that the bones had not been cleaned or treated with any chemicals to remove the sediments covering some of the bone surfaces. Visible cracks can be seen on some of the bones covered in sediment, which implies that the remains were buried in a wet environment. Identification of bone surface modification was also hampered by the absence of cortical surfaces on some of the bones. Bones covered in manganese are relatively few.

Multiple parallel striations were identified on the surface of a single rib (Fig. 10); they are shallow, of various lengths and widths, without a defined orientation. Gnaw marks from rodents and carnivores were not present.

Black was the most easily identifiable colour, indicative of burning at the site. Bones showing evidence of burning are relatively few and include specimens such as occipital bone, mandibles, atlas, feet elements, vertebrae bodies, and spinal processes. The vertebrae and one foot bone are the only ones that show a complete black colouration, while the others are only partially burned. Even in cases where skeletal elements were encrusted with sediment, the evidence of fire can be still observed.

Figure 9: Left-sided partial mandible with visible symphysis and visible posterior foramen mentale

Figure 10: Rib with multiple striations

Discussion

Zoo Park is the only known Quaternary archaeological site in Namibia in which elephant remains are the only faunal remains at a site. The exploitation of proboscideans by hominins at most archaeological sites including the Zoo Park remains unclear. The interaction between the Zoo Park LSA hunter-gatherers and elephants is especially unclear as a result of the unknown spatial distribution of the lithic artefacts and elephant bones, which is not well documented.

The faunal remains from Zoo Park are highly fragmented, which limited the skeletal element identification. The elements left at the site are mostly the bulky elements such as mandibles, pelvis, and femur. These elements might have been left behind after the meat was removed or perhaps not all the elements were exploited. It is suspected that a relatively high abundance of ribs suggests that people handled the bones, but this is merely a suggestion. The tusk and the teeth were most probably left at the site because they had no nutritional value, and were not considered for other functions such as bone tools.

The preliminary data indicate the presence of two adult individuals at Zoo Park, although the possibility of a third adult individual is highly likely. While it is difficult to say with absolute certainty, the exploitation of elephants in the Zoo Park was almost certainly opportunistic, in nature similar to exploitation of elephants at Namib IV. Active hunting of elephants at Zoo Park is disputed and it is assumed here that elephants were procured mainly by scavenging. Opportunistic exploitation of the elephants mainly by scavenging is supported by various factors. Firstly, the age of the elephants: one individual is around 36–38 years and the other is probably 22–24 years. In modern African elephants animals at these ages would be very large and could be aggressive when provoked, a factor that would deter a small group of LSA hunter-gatherers from actively hunting them. Secondly, the size of a single adult elephant would have been able to sustain a band of LSA hunter-gatherers for several months and would not necessitate the killing of two adult elephants. Thirdly, the heavy tool element found at the site would not be able to pelt an elephant to death and suggests manufacture of the lithic artefacts in situ to butcher the carcasses. The most probably explanation for the number of elephants discovered at the site is the fluvial context of the site at the time, which resulted in the elephants getting stuck in the spring-fed marsh, eventually resulting in their deaths. Elephant carcasses have been documented around water points in southern African sites, because of accidents such as getting stuck in the mud or drowning (Haynes 1991). The occurrence of a migratory and water-dependent animal such as elephants in Windhoek is indicative of a permanent water source.

Cut marks are rarely documented on elephant bones because thick skin, high levels of body fat, and large muscle tendons and ligaments do not allow contact between the bones and lithic artefacts (Villa et al. 2005; Yravedra et al. 2010; Rabinovich et al. 2012; Haynes

1991; Villa 1990). The absence of cut marks on elephant bones is therefore not an argument against the exploitation of elephant carcasses by hominins. At this stage it cannot be concluded whether the multiple striations observed on the rib are cut marks or were caused by trampling. There is a need to verify these marks using scanning electron microscopy (SEM) in the future. The likelihood of detecting cut marks may have been hampered by the poor preservation state of the assemblage, which is heavily fragmented, and absence of cortical surfaces.

One of the most common marks of hominin exploitation of faunal remains found at archaeological sites is the use of fire. Burnt bones on archaeological sites may result from anthropogenic activities such as cooking, fuel for fires and waste disposal, or naturally occurring fires. Burning was not a major taphonomic factor at Zoo Park, with very few skeletal elements showing signs of burning. The burnt remains presented a black colour compatible with carbonization (Stiner et al. 1995). The low quantity of burned bones and varied burnt skeletal elements strongly indicate that the burning of the bones was not the result of naturally occurring fires. This implies that the remains were intentionally burned, thus supporting the exploitation of the elephant carcasses by LSA people.

Conclusion

A solid conclusion can still not be reached on the interaction between the Later Stone Age (LSA) hunter-gatherers and proboscideans at the Zoo Park, as the archaeological context in which the evidence occurs remains unclear. The quantification and taphonomic analysis carried out in this study has however provided more detailed information of the elephant remains found at the site. The study identified two individuals, although the possibility that three individuals were at the site is possible. The ages of the mandibular teeth and three complete M2s (fifth molars) were also revealed in this study. The exploitation of the Zoo Park elephants by people is supported by the burnt remains. The two individuals as well as their ages suggest that these elephants were most probably trapped in the marsh and people butchered already dead animals.

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About the Author

Qualifications

PhD (University of Tras-os-Montes e Alto Douro, Portugal) 2015

- Thesis title: Analysis of the management of Twyfelfontein World Heritage Site, Namibia.
- Brief synopsis: Very little has been written about the complexities of managing cultural heritage sites in Namibia, especially those of archaeological content. Consequently, my dissertation explored the management of Namibia's first world heritage site, Twyfelfontein. The aim of the dissertation was to present an overview of how the site is being managed and the challenges facing its management. Specifically, the study looked at five areas of management, namely: conservation, visitor management, interpretation, stakeholder involvement, and documentation management. The analysis reveals that the management of Twyfelfontein is mainly an institutional problem. There seem to be no clear criteria guiding the management of the site. The paper also reveals that heritage as a concept on its own is not sustainable, and the management of cultural heritage sites is to a large degree dependent on managing such sites as part of a larger cultural environmental context. The study concluded that the successful management of Twyfelfontein World Heritage Site will depend, to a great extent, on strategic planning, management structures that promote research, and stakeholder involvement.

MSc. (Muséum National d'Histoire Naturelle, France) 2009

- Thesis title: Exploitation of animals during the Holocene in Namibia: Examples of three archaeological sites from the Erongo mountains and central Namibia desert.
- Brief synopsis: The aim of the thesis was to compare the faunal remains found on three different archaeological sites, two sites in the Erongo mountains and one site in the central Namib Desert, dating to the Holocene Epoch. The purpose of comparing the faunal remains from the three sites was to ascertain the animal species found at the site and consequently provide an explanation as to how they accumulated either by natural or human agents. This information is used, not only to provide insight into the way of life in these areas during the Holocene, but also to give insight into the type of natural environment. What is significant in this research was the discovery of two caprine molars, which resulted in my first

scientific publication. Dating of the molars revealed them to be the oldest known remains of domesticated animals in Namibia and throughout southern Africa.

BSc. (Rhodes University, South Africa) 2005

Professional appointments/employment

University of Namibia

- Lecturer (archaeology, heritage, and history) 2019–present
- Research officer (Namibia History Project) 2017–2019

National Museum of Namibia (curator) 2009–2017

Ministry of Fisheries and Marine Resources (technician) 2006–2007

Other professional activities

Member of the Nominations and evaluations committee, National Heritage Council of Namibia. 2021–present.

Coordinator for the Restoration of Spitzkoppe Rock Art Project. National Heritage Council of Namibia, 2014.

Archaeology Summer School Lecturer. National Museum of Namibia, December 2009.

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Imalwa, E. Namibia: The state of Namibian rock art, Published 24 August 2011, New Era Newspaper.

Conference activity/participation

Talks:

- The management of rock art sites. COSMO Art, Omundumba Farm, September 2023.
- The Management of Twyfelfontein World Heritage Site. UNESCO International Conference on African World Heritage as a Driver for Sustainable Development, Arusha, Tanzania*,* June 2016.
- The Management of Twyfelfontein World Heritage Site. International Conference of Arts and Culture Policy. Windhoek, Namibia, May 2015.
- The challenges of managing museum collections. ICOM Workshop for Museum Experts, Livingstone (Zambia), May 2014.
- Underwater heritage in Namibia. Workshop on Underwater Heritage, Robben Island (South Africa), February 2010.
- Namibian rock art. Total Quality Cultural Heritage Management Conference, Polytechnic Institute of Tomar (Portugal), March 2008.

Discussant:

The role of women in the liberation struggle. Namibia History Project. University of Namibia, November 2023.

Attendee:

UNESCO Experts meeting on the Importance of Museum Collections in Paris France, 2015.

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