



Determination of the geographical origin of leather shields from Zanzibar using ancient DNA tools



Fabiola Bastian^{a,*}, Cécile Jacot-des-Combes^{a,b,1}, Catherine Hänni^{a,2}, Marie Perrier^c

^a CNRS/ENS de Lyon, French National Platform of Paleogenetics, PALGENE, Ecole Normale Supérieure de Lyon, 46 allée d'Italie, 69364 Lyon Cedex 07, France

^b École Supérieure de Biologie - Biochimie - Biotechnologies (ESTBB), 10 place des Archives, 69002 Lyon, France

^c Musée des Confluences, 86 quai Perrache, 69002, Lyon, France

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ABSTRACT

Zanzibar shields are documented in several books and preserved in many European, African and Omani museums. They are relatively small and decorated; therefore, we can assume that they served to not only to protect the hand during sword combat but also to attract the attention of the attacker. As with all shields, they are also an object of prestige and armorial bearing to identify the owner's army corps. Within the incredible cultural and ethnic mosaic of this part of the Indian Ocean, the shield enables alliances, protection systems and allegiance to be specified and clarified.

This study is a step towards understanding the nature of the relationships between Oman and the various communities living on the western coast of the Indian Ocean based on their material culture, especially their shields. Identifying the animal species used to make the shields was crucial in establishing both the manufacturers and the consumers of these objects. DNA analyses indicated that the leather used for the studied Zanzibar shields is rhinoceros (*Diceros bicornis michaeli*); a subspecies historically only present on the coast of East Africa. Our results also indicate that the shields, used mainly in Oman, Zanzibar and other regions with a strong relationship with Oman power, were made in Zanzibar and the Arabian Peninsula.

1. Introduction

Like many European museums, the musée des Confluences, Lyon, houses a large collection of weapons, including several shields from around the world. As the African shields have been selected for the museum's permanent exhibition, in-depth research into their history, their method of collection, their manufacture, their uses and their material constitution were necessary. Among the conserved shields, two are from Zanzibar, an island just off the coast of Tanzania (Fig. 1). They are small (about 25 cm in diameter) with a protruding cone (*umbo*), suggesting they were probably used as a buckler during hand-to-hand combat. They are also equipped with a maintenance handle (enarme) comprised of two cruciform metal pieces (Fig. 2), and a suspension ring. In Europe, since Antiquity, bucklers were used as hand protection in sword combat and as a defensive weapon. They also had, as with all shields and weaponry, a non-utilitarian significance (Spring, 1993) as social markers and emblems of status.

To obtain the dome shape, the leather was probably molded before

being shaped on a lathe and decorated with regular concentric rings. Shields made from the skin of animals have been manufactured through innumerable processes. The fresh skin or the soaked leather is flexible enough to adopt any form, and once cured it is stiff enough to deflect a spear or sword while still remaining lightweight. One widespread method used in Africa was to peg hides to the ground: stones and pegs were arranged on the ground underneath the wet hides to form hand hollows or burls and bulges (Pitt Rivers Museum, 1997). In East Africa, as in Asia, the use of molded and hardened leather is still a common practice (Sarban and Dupin, 1989: 35). Ethiopian Ahmara and Amarro craftsmen make convex shields by mounting the hide on a wooden mound or another type of concave surface (Benitez-Johannot, 1998: page 96 and 102). However, if searching for a solution to obtain a convex form is common, using a lathe to decorate a shield is not habitual in sub-African regions.

The museum inventory register stipulates that the two shields entered the collection on 31st August 1880 under the denomination of "rhinoceros horn shields". The journal entry states that they were

* Corresponding author at: Université Claude Bernard Lyon 1, Bât. Gregor Mendel, 43, Bd. du 11 Novembre 1918, 69622 Villeurbanne Cedex, France.

E-mail addresses: fabiola.bastian@univ-lyon1.fr (F. Bastian), catherine.hanni@univ-grenoble-alpes.fr (C. Hänni), marie.perrier@museedesconfluences.fr (M. Perrier).

URL: <http://www.museedesconfluences.fr/> (M. Perrier).

¹ Université Claude Bernard Lyon 1, Bât. Gregor Mendel, 43, Bd. du 11 Novembre 1918, 69,622 Villeurbanne Cedex, France.

² Present address: Laboratoire d'Ecologie Alpine, bâtiment D, 2233 rue de la Piscine, 38610 Gières, France.



Fig. 1. Shields, Zanzibar (Tanzania), collected before 1880. D. 25 cm × H. 15 cm. musée des Confluences, Lyon, France. Registration number 60005752 and 60005753. Image: musée des Confluences, Lyon, France.

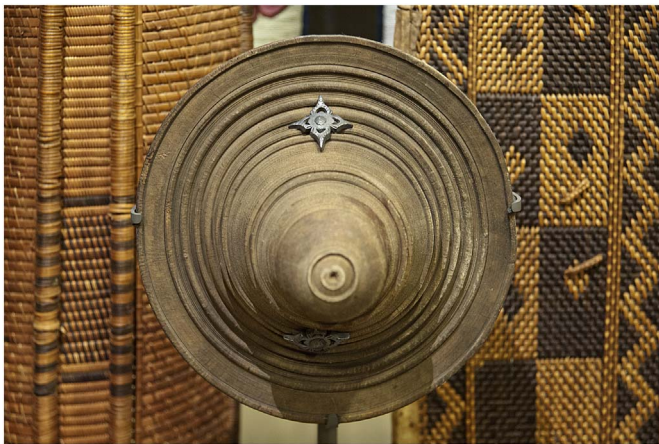


Fig. 2. One of the two shields in the permanent exhibition of the musée des Confluences, Lyon, France.

Note the decor of circular incisions made using a lathe after the skin had been molded. Image: Olivier Garcin, musée des Confluences, Lyon, France.

bought in Zanzibar (Tanzania) and donated by the Association of Friends of Natural Science. Unfortunately, there is nothing to specifying their method of collection, and since Zanzibar was an area of intense trade between the African continent, Europe, the Arabian Peninsula and Asia in the 19th century (Le Le Guennec-Coppens and Mery, 2002–2003; Sheriff, 2010; Beaujard, 2012; Nicolini, 2012; Boivin et al., 2014), doubt surrounds the manufacturers and consumers of these shields. The museum's research methodology to document these two objects included studying the existing documentation on shields of this type, analyzing the inventory of shields preserved by several European institutions and determining the specific skin used for their manufacture.

1.1. Molecular biology studies

In the last few decades, tremendous advances in molecular methods have enabled the identification of several species from a large diversity of organic substrate, even from highly degraded, decayed or low content endogenous DNA (Green and Speller, 2017; Key et al., 2017). Within the field of organic remains, recent publications have revealed the importance of archaeobotany and zooarchaeology, including routine DNA extraction (Meganathan et al., 2009, as an example). This has created a field of new research opportunities with which to answer certain interdisciplinary questions, using molecular based tools alongside direct observation. The use of molecular analyzes, when studying

archaeological objects and structures, has become habitual in the field of archaeology, enabling the artefacts geographical attribution (Zivaljevic et al., 2017) its manufacturing material or technique and its mode of use (Campana et al., 2010; Schlumbaum et al., 2010; Merheb et al., 2014; Seelenfreund et al., 2016) to be established. However, the study of leather is complex because the manufacturing treatments (boiling and tanning with pigments for example) can degrade and chemically modify the DNA; but, its study is still possible, especially when mitochondrial DNA is used to determine the skin or leather origin (Vuissoz et al., 2007; Pangallo et al., 2010; Schlumbaum et al., 2010; Teasdale et al., 2017).

To date, there are no studies using molecular biology to determine the origin of the leather used to make these kinds of shields. Potentially, the skin could have come from either a hippopotamus or a rhinoceros, as suggested by the ethnographic data. We opted for the latter, due to the previous morphological determination of J. Cuisin. Once the species was selected, in an attempt to confirm the species and determinate the subspecies, we used molecular biology techniques and aDNA extraction, information which will be useful to precise the geographical provenance of the shields. The molecular analysis of the skin was performed at PalGene, a platform dedicated exclusively to ancient DNA analysis, in order to determine the species and/or subspecies of the mammal used, their exact geographical origin and, therefore, a better understanding of the distribution networks.

1.2. Historical background

As objects of power and social markers, shields have stylistic peculiarities, as well as their material and technical characteristics, which are often the imprint of a particular group. It is therefore usual practice to determine their original location through comparison with other shields of the same type, whose geographical origin is already clearly established. In this case, an identical shield was referenced in *Afrikanische Schilde* and attributed by the authors to the Oromo, who mainly live in Ethiopia, Kenya and Somalia,³ and the peoples of Somalia (Plaschke and Zirngibl, 1992).

However, inventory registers from a variety of institutions (Musée d'Ethnographie of Genève; Musée du quai Branly – Jacques Chirac, Paris; Musée Royal de l'Afrique Centrale, Brussels; British Museum, London, and the Pitt Rivers Museum, Oxford) have already evidenced that though some shields did come from the Oromo territories (Ethiopia, Kenya, Somalia), others came from a much larger area,

³ Oromo people are the main linguistic group of Ethiopia. They live mainly in the Oromia region, but also in the north of Kenya and Somalia and were formerly called Galla by Europeans.

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