

Rock Art Between Preservation, Research and Sustainable Development—a Perspective from Southern Ethiopia

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Abstract This paper focuses on southern Ethiopia, along the outer rim of the Rift Valley and not far from the Kenyan border, in an area forming part of a larger region known as a cradle of humankind. However, it also hosts a diverse Holocene rock art heritage, which is still underestimated and underdocumented. Paintings and engravings are widespread in the region, both in rock shelters and open-air sites, often located in remote areas currently inhabited by communities belonging to different ethnic groups. The aim of this paper is to present the first results of a new project in the area around Yabelo, within the broader framework of rock art research in East Africa, integrating archaeological research, preservation and heritage management with a relevant involvement of local communities. The outstanding cultural importance of these contexts offers new prospects for both scholarly research and

sustainable development. The recording and study of the artworks is underway, using digital technologies that guarantee a high standard of accuracy of the documentation and non-invasive recording methods. This provides important insights for reconstructing cultural dynamics in the area between the final Pleistocene and onset of the Holocene. Moreover, the focus on rock art makes it possible to enhance local knowledge, increasing the awareness of local communities, with a significant impact on the preservation of this fragile heritage and the development of local, sustainable tourism projects. Differently from other archaeological features, rock art can have a more immediate attractiveness for contemporary observers, in terms of the apparent immediacy of the images and their emotional impact, raising awareness of cultural heritage and fostering major involvement in its preservation.

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Résumé Cette contribution se concentre sur le sud de l'Éthiopie, le long de la vallée du Rift et non loin de la frontière kenyane. La zone fait partie d'une région plus vaste connue comme l'un des berceaux de l'humanité. Cependant, il abrite également un patrimoine d'art rupestre holocène varié, encore sous-estimé. Les peintures et les gravures sont très répandues dans la région, aussi bien dans les abris rocheux que dans les sites en plein air, souvent situés dans des zones reculées, actuellement habitées par des communautés de différents groupes ethniques. L'objectif de ce document est de présenter les premiers résultats d'un nouveau projet dans la région autour de Yabelo, en le plaçant dans le cadre plus large de la recherche sur l'art rupestre en Afrique de

l'Est, en intégrant la recherche archéologique, la préservation et la gestion du patrimoine, avec une participation active des communautés locales. La valeur culturelle exceptionnelle de ces contextes peut ouvrir un nouveau scénario, tant en termes de recherche scientifique que de développement durable. L'enregistrement et l'étude des œuvres d'art sont en cours grâce à l'utilisation de technologies numériques qui garantissent une précision de la documentation et des méthodes d'enregistrement non invasives. Ces données offrent un éclairage important pour reconstruire la dynamique culturelle qui s'est produite dans la région entre le Pléistocène final et l'Holocène. De plus, l'accent mis sur l'art rupestre peut permettre de valoriser les savoirs locaux, en sensibilisant les communautés locales, avec des effets significatifs dans la préservation de ce patrimoine fragile et dans le développement de projets locaux de tourisme durable. Contrairement à d'autres contextes archéologiques, l'art rupestre peut avoir une attractivité plus immédiate sur les observateurs contemporains, en termes d'immédiateté apparente des images et d'impact émotionnel, ce qui aide à capter l'attention, à favoriser la prise de conscience du patrimoine culturel et à créer une implication majeure dans sa préservation.

Keywords East Africa · Southern Ethiopia · Rock art · Holocene · 2D-3D recording · Local engagement

Introduction

Prehistoric rock art is a fascinating and widespread cultural manifestation of humankind, a unique and important visual archive of past societies. Tangible aspects tied to its material nature (the rock surface, raw and transformed materials) and intangible aspects relating to technical knowledge, the symbolic sphere of beliefs and ideological dynamics of past societies, as well as the emotional impact on past and present observers, are deeply intertwined. The study of rock art therefore presents a significant opportunity to increase our knowledge of the past, as well as for the implications of its impact and perception. Its study is hampered by the difficulty of dating rock art and the frequent lack of documentation necessary for a systematic analysis of the vast number of motifs depicted. At the same time, the main focus has generally been on the definition of chronocultural sequences, often in isolation from archaeological contexts. As a result, in many regions,

rock art research has been marginalised from mainstream archaeological and anthropological debates. This is also true of East Africa where, though rock art has been one of the principal focuses of research since the first half of the twentieth century, the questions posed by scholars have only recently attempted to go beyond chronological and stylistic questions. A first attempt by Brandt and Carder (1987) at the end of the 1980s tried to transcend the cultural-historical approach by focusing on the meaning and behavioural significance of pastoral rock art, through a cultural ecological model. A recent plea by Mire (2008) points instead to the need for more in-depth investigations into the symbolism of rock art. Rock art has to be seen as a significant component of a ritual landscape that should be studied by adopting a multidisciplinary approach in which archaeology, anthropology, historical linguistics and ethnography effectively interact to help reconstruct past and present cultural and symbolic dynamics.

Our project in Yabelo (Borana Zone, Oromia, southern Ethiopia) belongs to this recent line of research. The area is home to a dense and diverse array of paintings that have been largely ignored by scholars, local communities and local authorities in charge of cultural heritage management, and are at high risk of damage or even disappearance due to natural processes and human threats. The preliminary results of the first two seasons of research offer new prospects for the future developments of the project, both as regards the scholarly importance of the rock art evidence and for the impact that these sites might have locally, potentially including sustainable tourism and economic projects. As we think that it is appropriate to orient our study towards local engagement and management, this paper will examine the rock art in its environmental, archaeological, socio-cultural and economic context and discuss the potential for an integrated project, through an effective collaboration with the local community aiming at an inclusive archaeological environment, rooted in a postcolonial approach (e.g., Connah 2013).

Rock Art in Southern Ethiopia

Background

Rock art studies started in Ethiopia in the first half of the last century, with the work of the Abbé Breuil in 1934 at the sites of Porc-Epic Cave and Genda Biftou, located in

the Harar area (Fig. 1). Since then, rock art research has continued in different areas but has remained focused on a few major sites and on a rather static definition of artistic chronologies and regional comparisons. As a result, it has until recently played a marginal role in archaeological research in Ethiopia and in the Horn of Africa more generally. Indeed, the principal concentrations of sites are closely tied to the intensity of research in a few selected areas: they can be grouped into three main hotspots, ranked here by the intensity of research (Fig. 1):

- The Harar area, where the northern escarpment of the southeastern Ethiopian Plateau is dotted with dozens of caves and rock shelters particularly rich in pastoral paintings (Fig. 1a). The area, investigated since the 1930s, includes some of the best-known Ethiopian rock art sites such as Porc-Epic Cave and Laga Oda (e.g., Assefa et al. 2014; Breuil 1934; Breuil et al. 1951; Červiček 1971; Graziosi 1964);
- The area located in southwestern Ethiopia known in the literature as the Sidamo area. It includes

different zones of the Southern Nation Nationalities and Peoples Region (Wolaiata, Gedeo, Sidama and Kambata) and the Guji Zone of Oromia Region (Fig. 1b). It is characterised by the presence of engravings, mainly consisting of carved cattle bas reliefs, located on open-air walls (e.g., Anfray 1967, 1976; Bachechi 1995; Bouakaze-Khan 2002; Jousaume 1981; Jousaume et al. 1994; Le Quellec and Abegaz 2001). The key site, first investigated by Anfray (1967), is Chabbé.

- Some other scattered sites have been discovered in the northern Tigray region, though these are poorly documented (Fig. 1c). They mainly comprise paintings with a few engravings (Agazi 1997; Gigar 2000; Graziosi 1964; Finneran and Phillips 2003; Hagos 2011; Phillipson 2000).

A few other sites have been discovered in the western region of Benishangul-Gumuz (Fig. 1d), where ancient schematic paintings play a significant role in modern

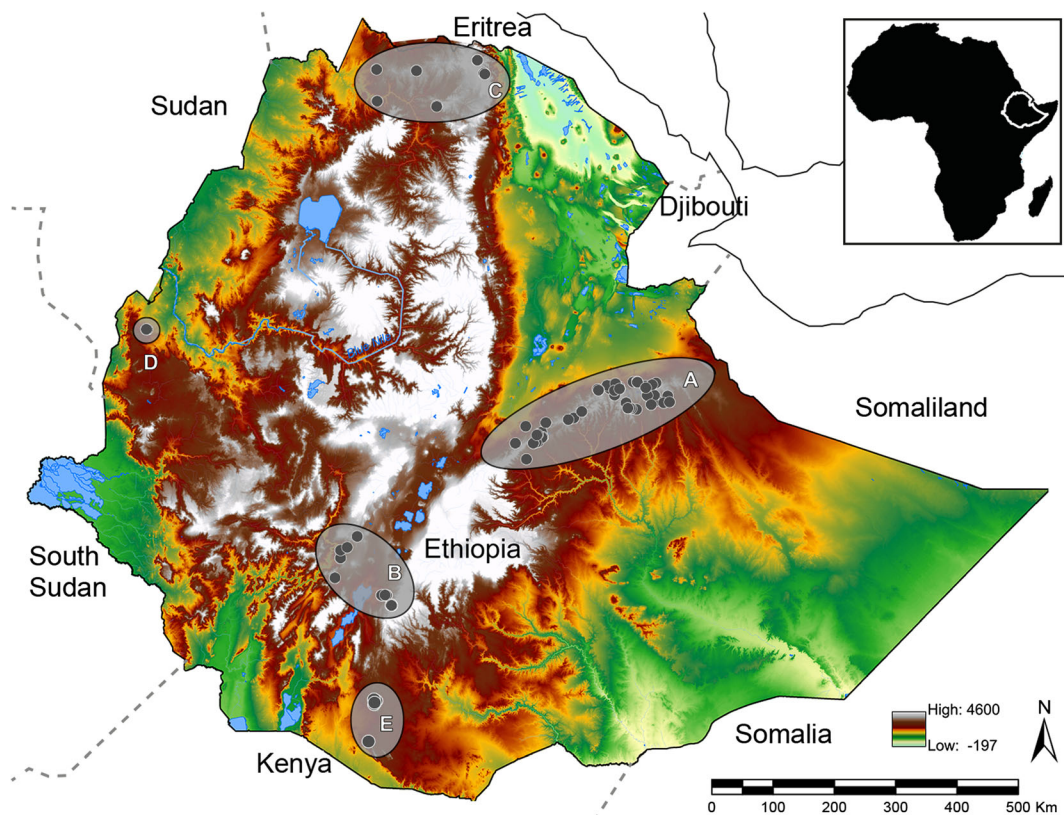


Fig. 1 Map of Ethiopia with the main concentrations of rock art sites: Harar region (A), Sidamo area (B), Tigray region (C), Benishangul-Gumuz region (D), and Borana Zone (E). (GIS elaboration: M. Gallinaro) (images in full colour online)

ritual activities, building a bridge between past and present (Fernández 2011; Fernández and Fraguas 2007).

The existing overviews of rock art in Ethiopia and the surrounding areas known as the Horn of Africa still date to the past century. The sequences proposed by Červíček (1971, 1979) and Joussaume (1995) are the principal reference points. It is worth making two main points here: (1) this rock art is strongly characterised by the representation of domestic cattle and (2) its date seems to be relatively recent compared to other African rock art contexts, around the fourth-third millennia BCE. Therefore, rock art studies are closely connected to research on the emergence of pastoralism in the area. In recent years, new approaches with a strong emphasis on the landscape, contextual archaeological analysis and systematic recording of the rock art, have been developed in order to isolate and define the relationships between physical environment, archaeological contexts and rock art features. The results are still unpublished, but the preliminary reports indicate a critical mass of data, sufficient to radically modify the traditional proposals and suggest new interpretation of local and inter-regional cultural connections (e.g., Assefa et al. 2014).

We still do not know precisely from where and when one of Africa's main pastoral countries derived the first domesticates and how these spread throughout the area. Different possible paths for domesticates have been proposed by authors (e.g., Lesur et al. 2014, and references within), mainly on the basis of cultural affinities: from Sudan to the north, from Yemen to the east, and from the Turkana area to the south-west. This debate has not yet come to a consensus.

Yabelo and the Borana Zone

Environment and Climate

The study area is located in the Yabelo woreda, part of the Borana Zone of the Oromia Region, about 600 km south of Addis Ababa and 120 km north of the border between Ethiopia and Kenya (Figs. 1e and 2). It lies in an arid and semi-arid ecological zone, with a bi-modal rainfall pattern exhibiting an average annual range of 400–700 mm and a mean annual temperature of c. 19 °C (minimum c. 9 °C and maximum c. 27°), presenting high seasonal variability due in part to the altitude, 450 to 2500 m above sea level (Coppock 1994; Sutter 1995). The past few decades have been characterised by erratic

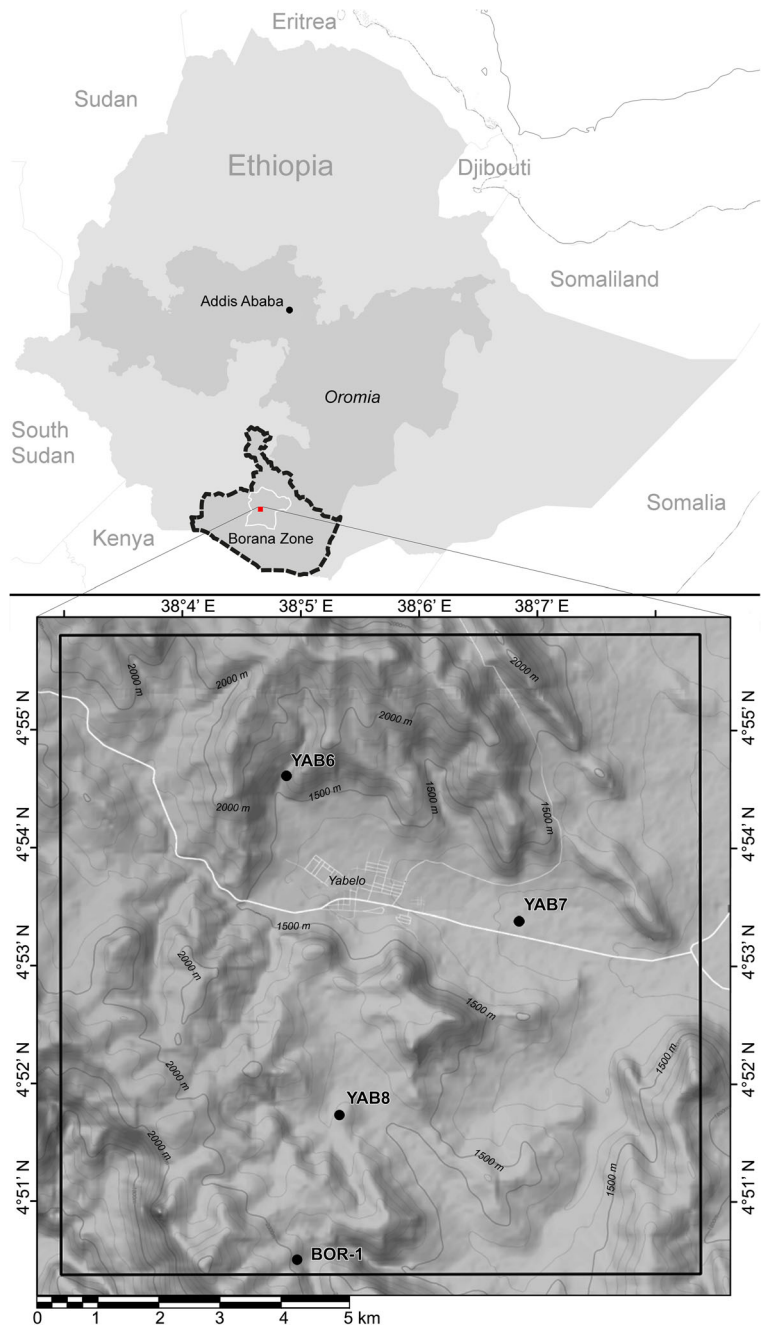
patterns of rainfall and drought, with a strong impact on the availability of natural resources. In the neighbourhood of Yabelo, the geological bedrock consists of granite intrusions and granitic gneiss, the product of low-grade metamorphism (Clark 1945; Williams 2016) belonging to the Adola Belt formations. As a consequence of intense tropical weathering, the local landscape alternates among inselbergs, piles of boulders, tors and large isolated boulders of granite/metagranite. Many rock shelters open along the rocky slopes and at the foot of tors; on investigation, some of these revealed the presence of a human occupation dating from at least the Middle Stone Age (MSA).

Archaeological Background

Until recently, southern Ethiopia has been little studied, with a few exceptions (e.g., Brandt 1996; Chavaillon and Chavaillon 1985; Clark 1945; Finneran 2007; Huntingford 1955; Joussaume 1995; Wallerstein 1974). The timing and palaeoenvironmental and cultural dynamics of the emergence of herding in eastern Africa are still poorly understood. Over the past decade, fresh data have suggested new perspectives for research, mainly regarding the transition between the Late Pleistocene and Holocene (e.g., Assefa et al. 2014; Brandt et al. 2017, and references; Tribolo et al. 2017), as well as early food production (e.g., Gutherz et al. 2002; Hildebrand et al. 2010; Lesur et al. 2014), and the correlation between palaeoenvironmental and climatic variation and human responses (Foerster et al. 2015).

The Yabelo area is known specifically in the archaeological literature for the discoveries made by Clark (1945) in the 1940s. During a short visit to the area, he surveyed several rock shelters located not far from the town, bringing to light archaeological sequences spanning the Late Pleistocene to Holocene, together with schematic pastoral rock paintings. About 50 years later, a PhD student, Hundie Girma, selected this area for a research project focusing on the emergence of pastoralism in southern Ethiopia. Girma (2001) confirmed the presence of scatters of archaeological materials belonging to both the Late Pleistocene and Holocene, of stratigraphic sequences preserved in rock shelters with lithic artefacts, pottery and archaeozoological remains of domestic animals (cattle, sheep/goat), and rock art paintings. However, detailed archaeological, chronostratigraphic and palaeoclimatic reports are lacking, and more precise dating requires further research.

Fig. 2 Map of the research area with the rock art sites recorded around Yabelo during 2016–2017 fieldwork (map elaboration M. Gallinaro)



Against this background, our research project started in 2016 with the aim of verifying the area's archaeological potential and extending the study to the surrounding area (Spinapolice et al. 2017). The first two field seasons (2016–2017) confirmed the area's potential concerning the last millennia of occupation. Preserved stratigraphic sequences, lithic artefacts, pottery and a rich and variegated corpus of rock art

paintings will be further investigated, adopting an interdisciplinary approach and a multi-scale combination of remote sensing, field survey, test excavations and laboratory analyses. The aim is to explore the emergence and development of herding in a region where the cultural intersections between hunters and gatherers, farmers and herders have persisted until modern times.

Rock Art in the Yabelo Area and Surroundings

As previously noted, the first information about the presence of rock art in the area was published by Clark (1945), who discovered several red and white paintings with schematic drawings, albeit severely faded, including representations of humpless bovids and humped cattle. Girma (2001) identified another four sites, one in Yabelo and three in other localities further south, with the rough recording of some paintings and a few annotations indicating their poor state of preservation. Though it is not always well preserved, rock art emerges as one of the most encouraging results of our first two fieldwork seasons and will form the focus of future research. We surveyed the sites previously identified, except for the southernmost locality named Daeka Taefi, and were able to record two new sites in the Yabelo area (Fig. 2). The sites present an impressive density of paintings and variety of subjects and styles; however, they are severely damaged by natural or anthropic factors and risk rapid disappearance, which would represent a serious cultural loss.

Named YAB6 by Girma and known by the local name of Dhaka Kura (Crow's Rock) is a rock shelter located ca. 2 km NW of the town centre of Yabelo, close to a spring and related well, which was constructed in the last century and is still in use. It is the largest of a series of rock shelters that open into an alignment of (meta)granite hills, cut by a deep river valley (Fig. 3). It was partially excavated and recorded by Girma (2001), but part of the archaeological deposit is still preserved and will be further investigated in subsequent seasons.

Some paintings, partly vanished, were described and roughly recorded, but we could easily identify the presence of a palimpsest of paintings, more complex and significant than previously thought. We identified at least five main panels on the wall and on part of the shelter's ceiling, depicting a variety of subjects. The panels include representations of humpless and humped cattle, wild animals (e.g., gazelle and warthog) and other subjects that require careful interpretation, alongside geometric patterns of different colours, sizes and styles (Fig. 4). In particular, a large panel on the ceiling shows a series of black cattle, not formerly reported, with stylistic features hitherto unknown in the region, superimposed with subjects of different style and colour that will help to establish a relative chronology and changes in style (Fig. 5). The detailed recording and tracing of each painting, combined with the analysis of pigments and rock-surface samples currently in progress, will make it possible to reconstruct the palimpsest of paintings in terms of the shape, size and style of the subjects represented, to identify the pigments used and to propose a chronological framework, thus contributing to the study of the cultural and symbolic trajectories of herders in the area. The potential to match data from archaeological stratigraphy is highly promising.

The unexpected quantity, quality and cultural significance of the paintings, as well as the location of the site and the positive response of local authorities in charge of cultural heritage, led us to re-orientate our original research project towards a broader and more inclusive approach. The site is, in fact, located very close to an important source of water, crucial for the local

Fig. 3 View of rock shelter YAB6 from the SW (photos: Italian Archaeological Mission in Southern Ethiopia)



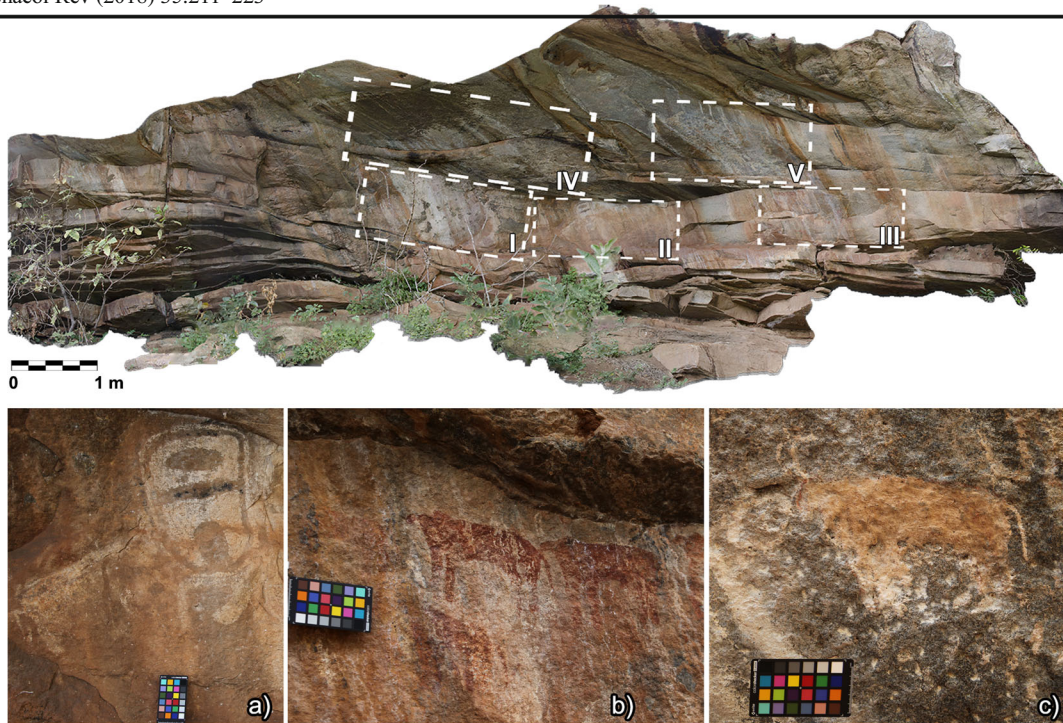


Fig. 4 YAB6 (Dhaka Kura) rock shelter: preliminary 3D model of the painted surface and details of the main rock art panels. **a** Detail of panel II with a cow and geometric signs in white colour. **b** Detail

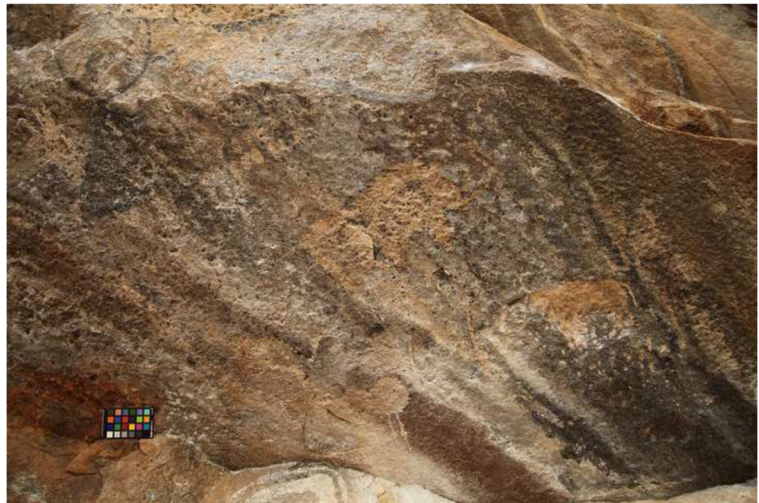
of panel III with red humped cows. **c** Detail of panel IV with a whitish cow (3D model M. Gallinaro, photos: Italian Archaeological Mission in Southern Ethiopia)

population in a pastoral area deeply afflicted by cyclical and severe droughts. Our presence on the site immediately caught the attention of the local community, which had ignored the presence of rock art and used the area and rock shelter to graze their livestock. It was immediately clear that raising the awareness of the cultural and historical value of the paintings should have been the first step to preserve this fragile heritage.

Digital Recording

The first intervention on the site has been focused on the identification and recording of the paintings with the support of a range of digital resources that are becoming standard tools in rock art studies. These are photogrammetry using digital cameras and dedicated software (e.g., Agisoft PhotoScan) and colour enhancement

Fig. 5 YAB6 (Dhaka Kura) rock shelter: lower part of panel IV with superimpositions of subjects in different styles. Wild and domestic animals in a yellowish colour superimposed on a black naturalistic cow (photo: Italian Archaeological Mission in Southern Ethiopia)



methods employing specific software such as D-Stretch (Harman 2008). These tools allow us to obtain a detailed recording without the need for practices that could potentially damage or alter the artworks such as contact drawing, which was the most commonly used method in the past. In fact, specifically for paintings, the results that can be obtained with digital colour enhancement are certainly richer in detail than any direct human observation; this is particularly important in cases such as YAB6, where some of the paintings are very faded. Furthermore, the on-site use of a tablet with the D-Stretch software installed allowed us to identify traces of paintings that had almost vanished—invisible to the naked eye—ensuring full recording of the site. At YAB6, we combined photogrammetry with a site survey using a total station, fixing the main reference points to create a local topographic grid for further archaeological investigations, as well as to map the main damage recorded.

To facilitate collaboration with the local community, and in particular with the authorities in charge of cultural heritage, we decided to adopt low-cost methods of 3D and 2D recording. In this way, we implemented a protocol of actions and established a set of standard tools with low impact in terms of cost, time, specialised personnel and equipment. Recent developments in digital technology allow documenting rock art sites with a low-cost camera with GPS positioning, and free software for storage and management of data, even by unspecialised personnel with little knowledge of digital technologies. The definition of a sequence of actions to survey and document a site, including the creation of a simplified database to record basic site information with controlled vocabularies (e.g., coordinates, type of context, type of artwork, state of conservation), and basic rules on photographic recording of the site and paintings, will be defined together with local authorities and the staff of the Authority for Research and Conservation of Cultural Heritage (ARCCH). Local personnel will be trained directly in the field, and one of the authors of this paper, a member of the ARCCH, is already improving his documentation skills. This shared approach will make it possible to increase the number of recorded rock art sites in the area and the efficiency and rapidity of survey even at remote sites, enhancing the knowledge of this heritage and acting as a foundation for specific actions in different areas, including archaeological and anthropological research, conservation, management and dissemination of results.

State of Preservation

The paintings and rock surface of YAB6 (Dhaka Kura) are severely affected by biodeterioration and biochemical processes causing the fading and vanishing of pigments, large patches of exfoliation, the formation of different crusts and deep rock cracks. The overall state of preservation of the paintings is critical such that short- and medium-term actions to reduce the impact of degradation processes are needed. The analysis of rock surfaces and painting samples we collected during the last season will help us to determine accurately the natural processes affecting the paintings. A map of the major forms of damage and the identification of each physical, chemical and biological process will form the basis for a conservation plan of the site.

At Dhaka Kura, we did not identify any direct anthropic damage, although the site is used by local herders to graze cows and goats, whereas in other rock art sites, many paintings have been covered by modern graffiti made with charcoal or chalk (Fig. 6). A specific programme of awareness-raising activities (see below) on the value of the rock art and the need to protect this fragile heritage will be the first tangible action to reduce the impact of degradation.

Community Awareness and Potential

From our first visit to the sites, it became clear that the local community and local authorities essentially ignore rock art, though some are aware that it exists. People living in the vicinity, including the herders who still use the rock shelters, seem indifferent to the presence of the paintings and were able to identify few of the depictions. When we interviewed some of them about the age and meaning of the artworks depicted on the wall of YAB6-Dhaka Kura shelter, they reported a variety of stories and legends, including the use of rock shelters during the Italian military occupation of the area from 1936 to 1941. According to this story, the paintings were made by the Italians to mark the places where they had hidden a treasure.

There is no awareness of the importance of rock art, nor is its cultural, social, symbolic or aesthetic value recognised. This appears to be a common attitude in places where different ethnic groups coexist, as a result of complex political and socio-economic factors (e.g., Bassi 2010), and where there is no direct cultural connection between the ancient communities who created

Fig. 6 YAB6 (Dhaka Kura) rock shelter: modern graffiti on ancient paintings (photo: Italian Archaeological Mission in Southern Ethiopia)



the rock art and the people living in the area today. At the same time, many people expressed an interest in the potential importance of the artworks, including officials and members of the public, both in terms of heritage and tourism. The issue is the extent to which a straightforwardly economic perspective might negatively influence attitudes towards rock art, leading to theft and vandalism, restrictions to access, etc. We therefore decided to re-orient our research towards a wider project aimed at increasing awareness of the value of rock art more broadly and to begin a shared journey with local communities and authorities, following the positive example of the participatory approaches that have multiplied in different regions of Africa, including a wide range of archaeological contexts (e.g., Chirikure and Pwiti 2008; Posnansky 2017; Schmidt 2014; Schmidt and Pikirayi 2016). These approaches are particularly necessary for the conservation and management of rock art sites, as demonstrated by several projects carried out in different African regions, in particular in southern Africa (e.g., Borona and Ndiema 2014; Little and Borona 2014; Mazel 1982; Ndlovu 2016; Ndoró 2006). Two decades of actions, workshops and collaboration between rock art specialists, managers and local communities within the framework of the Southern African Rock Art Project (SARAP—Agnew et al. 2015) represent a particularly significant instance. Public and political awareness, and community involvement and benefits, are two of the four pillars of the rock art

conservation policy and practice proposed by the planning document summarising the SARAP experience and its follow-up (Agnew et al. 2015), and constitute the framework for our actions.

As a first step, we decided to improve our understanding of the current socio-economic and cultural context of the rock art sites of the Borana Zone. As concerns the economic context, Yabelo is the administrative centre of the Borana Zone, one of the poorest in the country (e.g., Riché et al. 2009). The area is severely afflicted by erratic patterns of rainfall and drought that impact natural, economic and socio-cultural resources, causing environmental degradation, population pressure, the decline of traditional social institutions, as well as intra- and inter-ethnic conflict, also involving the culturally defined leading economic resource, such as pastoralists vs. agriculturalists (e.g., Bassi 2010; Riché et al. 2009). In Yabelo and in the whole Borana Zone, a wide range of ethnic groups with different livelihoods coexist, with a prevalence of different forms of pastoralism (semi-settled, nomadic and agro-pastoral—Tache and Irwin 2003), but agricultural pressure is strong, particularly at the border. The Borana are the dominant ethnic group, inhabiting the lowlands and extending across the border into northern Kenya. They were and partly still are traditional cattle pastoralists, recognised in the past as having the most successful production system in the arid lands of eastern Africa, thanks to the existence of robust social management institutions (the

Gadaa system), capable of adapting to changes in pastoral resources. Though recent droughts have led to a decline in pastoral resources, causing crisis and a gradual weakening of traditional institutions, the Borana still have an operative system of indigenous governance that regulates the community's political, economic, social and religious activities. They manage an extensive landscape, recently termed the “Borana conserved landscape” (Bassi et al. 2008; Bassi and Tache 2011) that includes diverse ecological zones and a variety of key natural and human-modified resources (e.g., widespread systems of traditional wells), as well as a range of both domesticated and wild biodiversity of international relevance (e.g., the Yabelo wildlife sanctuary).

During the past season, we laid the foundations for the future development of the project, establishing contacts and planning some short- and medium-term actions with local authorities, in particular the Borana Zone Culture and Tourism Office, anthropologists working in the area, NGOs active in the field as well as with the Borana community (see below). We were received by the Borana community during the celebrations for the new leader (locally known as *abbaa gadaa*) who was elected in March 2017 and will remain in charge for 8 years. We were able to interview the new *abba gadaa* and his predecessor, establishing contacts for active cooperation.

Future Development

On the basis of the results of these initial seasons in the Yabelo area, we outlined a series of short- and medium-

term actions to be undertaken in cooperation with the different stakeholders involved. As short-term actions, we plan

(i) To develop a programme of awareness-raising activities, including visits to primary schools, meetings with elders of the different ethnic groups as well as planning meetings with local authorities, NGOs and local experts. Furthermore, key information on the value of rock art and the need to protect this fragile heritage will be disseminated through flyers, posters, media releases and public events.

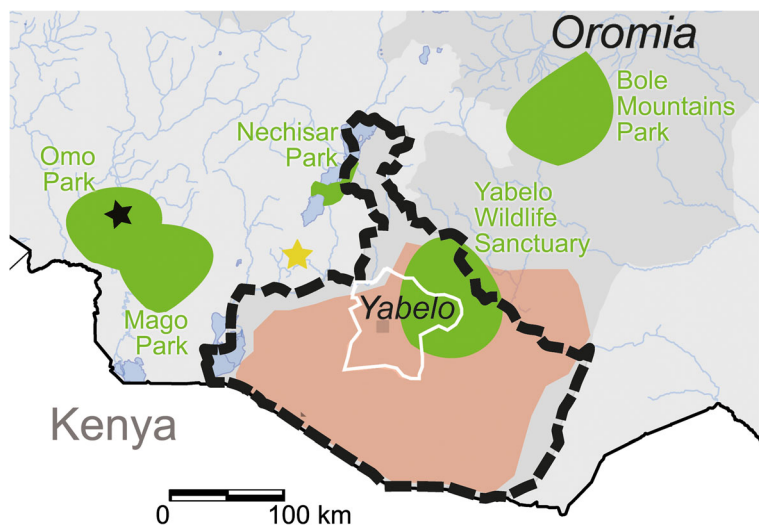
(ii) To create a conservation plan for the main sites, involving people living in the area, local authorities, NGOs and local experts.

(iii) To continue the mapping and recording of rock art sites, actively involving local culture and tourism experts.

(iv) To create a local archive with reports, photos and scholarly results.

A varied set of digital technologies will be used for the different actions, though in the short- and medium-term phases, their use will face significant limitations given the country's essentially pre-digital status, particularly in this remote area. This is a factor that we should not underestimate, and we must therefore select appropriate tools for a broader local community engagement. Indeed, the scarce availability of hardware and software resources, compounded by low web accessibility, severely limits access to large digital depositories and the development of any personal and local autonomous processing of digital images, 3D models and the complex digital management of data. In other words, we

Fig. 7 Map of southern Ethiopia with tourism hotspots. The Borana Zone (black dotted line). Natural national parks (green areas). *Borana conserved landscape* (pink area). Lower Valley of the Omo UNESCO WH site (black star). Konso Cultural Landscape UNESCO WH site (yellow star). (map: M. Gallinaro)



cannot assume that local people and visitors will have easy access on their personal devices to the digital resources made available, or be able to download and use specific apps for the digital processing of the paintings and thus personally explore the world of rock art. However, some first steps can easily be taken for the recording and management of rock art, and for dissemination and awareness. The adoption of a recording protocol using low-cost methods and the creation of simplified databases and local digital archives will directly engage local authorities, also favouring the collaboration with the ARCCCH. Furthermore, the creation of short videos with 3D models of the main sites, and of simple video animations with the D-Stretch analysis of now-vanished rock art panels, will provide materials to be shown in schools or in dedicated didactic exhibitions in local administration buildings. Guided tours to rock art sites can also use digital tools and reduce the distance between local communities and rock art, even encouraging personal acquisition of the necessary devices. Therefore, digital technologies will be of substantial assistance, but their scope is limited and defined by a series of factors. The result is a more traditional, top-down approach that can be overturned only through a carefully planned strategy.

The planned actions do not form a simple, linear sequence, but overlap; in particular, awareness and conservation and protection should proceed side by side to avoid the risk of damage driven by increased knowledge, and potentially by short-term economic aspirations or cultural issues due to the co-presence of different ethnic groups.

These actions will lay the foundations for the development of a basic medium-term action aimed at building upon the necessary awareness and preservation for a community adoption of this heritage, the premise that may also pave the way for sustainable tourism projects focused on rock art heritage. The Yabelo area is located in a strategic position with respect to some tourism hotspots in southern Ethiopia (Fig. 7). It is on one of the access routes to two UNESCO World Heritage Sites: the Konso Cultural Landscape (on the WH List since 2011) and the Lower Valley of Omo (inserted on the list in 1980). Furthermore, it is part of the Borana conserved landscape, comprising national parks and natural and cultural resources belonging to a long-lasting pastoral heritage. Though the Borana does not recognise pastoral rock art as a direct part of their heritage, the interest in ancient expressions of pastoralism is easy to see. The

recent inscription in the UNESCO Intangible Cultural Heritage list of the Gadaa System (e.g., Legesse 1973, 2006), of which the Borana Gadaa is the most intact example (e.g., Bassi 2005), is a further stimulus for investigating the symbolic value of archaeological remains relating to the first evidence of herding in the region in depth.

Conclusions

Our project in the Yabelo and Borana Zone originated as a research programme aimed at (i) investigating subsistence strategies in the area between the IV and I mill. BCE, (ii) exploring the origin of domesticates in the area, and (iii) defining the cultural and symbolic trajectories of the first herders, tracing the connections between pastoral rock art and the emergence of herding in eastern Africa.

The unexpected richness and variability of the rock art, contrasted with its poor state of preservation and the lack of concern (and awareness) on the part of the local community, led us to re-orient our project towards an integrated and inclusive approach that combines research with preservation and sustainable development. The culturally rich Borana society, with its Gadaa system and pastoral livelihood, is, rather surprisingly, unaware of the pastoral rock art of the territory they presently share. In any case, the interest that may arise in this unique heritage poses questions of knowledge, identity and above all direct economic engagement, in an almost pre-digital social environment. We believe that responsible research on local rock art should carefully consider all these issues.

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Author Contributions MG designed the research, directed the fieldwork in the Yabelo area and wrote the paper; AZ is in charge of the geomorphological study, described and sampled the rock surfaces and contributed to the paper; TS collaborated on the survey and documentation of rock art, acted as interpreter and contributed to the paper; EES designed and leads the (H)ORIGIN Project and contributed to the paper.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

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