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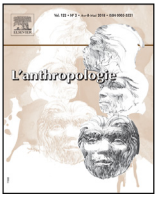

Original article

The Middle Stone Age of Atlantic Africa: A critical review

Le Middle Stone Age de l'Afrique atlantique : une revue critique

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ABSTRACT

Evidence of early *Homo sapiens* populations at the Atlantic coast of Africa remains relatively poorly known in relation to other regions of the continent. Nevertheless, available data across the continent provides a good starting point for current and future research investigations. The many sites known, documented and studied contribute in an increasingly way to the global understanding of

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Middle Stone Age
Archaeological visibility

the human emergence, including evidence of human evolutionary and technological advances, specific adaptations to diverse environments, the diffusion of *Homo* species and how humans interacted with each other from the "Early Stone Age (ESA)" through to the Middle Stone Age (MSA) from northern and southern Africa to the West. The differences of knowledge between the Atlantic coast in regard to other regions might be attributed to a number of reasons including but not limited to the history of scientific interest, site formation processes or economic, institutional and political constraints. However, the region received a renewed attention and funds that, combined with new methods and techniques, has been allowing an increased training of new researchers and the acquisition of high-resolution archaeological, paleoenvironmental and chronological data. Together, these inputs will reduce the differences of knowledge between the Atlantic coast and the Northern, Southern and Eastern Africa regions. The African Atlantic Coast represents more than 40% of the continent's perimeter, covering all Africa's climate zones, the hot arid environments, mountainous regions, and tropical rainforest could become relevant barriers for human mobility, but the shallow continental platform, and the great number of river basins allowed mobility between north and south coastal biomes into the continental interiors. These may have provided predictable patchy clusters of resources allowing human populations to thrive, enabling greater mobility and consequent diffusion of cultural traits, resources, and DNA. In this paper we review the record about the prehistory, paleoenvironments and paleoanthropological visibility and potentiality of Atlantic Africa.

Mots clés :
Afrique
Côte Atlantique
Âge de la Pierre Moyen
Visibilité archéologique

R É S U M É

Les traces des premières populations d'*Homo sapiens* sur la côte atlantique de l'Afrique restent relativement peu connues par rapport aux autres régions du continent. Néanmoins, les données disponibles sur l'ensemble du continent constituent un bon point de départ pour les recherches actuelles et futures. Parmi les nombreux sites connus, documentés et étudiés, très peu contribuent de manière significative à la compréhension globale de l'émergence de l'Homme, y compris les preuves de l'évolution humaine et des avancées technologiques, les adaptations spécifiques à divers environnements, la diffusion des espèces d'*Homo* et la manière dont les humains ont interagi les uns avec les autres depuis le début jusqu'à l'âge de Pierre Moyen (MSA) en Afrique du Nord et du Sud, jusqu'à l'Ouest. Cette situation peut être attribuée à un certain nombre de raisons, comme par exemple, la rareté des dépôts stratifiés de l'ESA et du MSA, les perturbations naturelles et anthropiques des dépôts, la mauvaise préservation des matériaux organiques (os ou charbon de bois), ou elle peut être le résultat d'une recherche insuffisante et/ou non exhaustive en raison de contraintes économiques, institutionnelles et politiques. Par conséquent, ces défis continueront à persister, en particulier dans la plupart des régions d'Afrique, ce qui est encore exacerbé par les coûts élevés de ce type d'études scientifiques, le manque d'archéologues, le manque de laboratoires équipés pour les analyses, le manque de fonds de recherche disponibles et le nombre limité de formations universitaires en archéologie et dans les sciences connexes. L'interprétation des données sur l'évolution humaine et les théories de dispersion de l'Afrique du Nord, du Sud et de l'Est continue, dans de nombreux cas, à être interprétée et contextualisée à partir de paradigmes occidentaux. La côte atlantique africaine représente plus de 40 % du périmètre du continent et couvre toutes les zones climatiques de l'Afrique. Les environnements chauds et arides, les régions montagneuses et la forêt tropicale humide ont pu être des obstacles importants à la mobilité humaine, mais la plate-forme continentale peu profonde et le grand nombre de bassins fluviaux permettaient la mobilité entre les biomes côtiers du nord et du sud vers l'intérieur du continent. Il est possible que ces éléments aient fourni des groupes de ressources disparates prévisibles permettant aux populations humaines de prospérer, ce qui a favorisé une plus grande mobilité et la diffusion conséquente des traits culturels, des ressources et de l'ADN. Dans cet article, nous passons en revue les données relatives à la préhistoire, aux paléoenvironnements, à la visibilité paléoanthropologique et au potentiel de l'Afrique atlantique.

1. Introduction

The African Middle Stone Age (MSA) is a key period in human prehistory for understanding biological and cultural development of *Homo sapiens*. Studies about the MSA have been mostly, but not only, focused on three major lines of research: (1) The emergence of *H. sapiens* and its replacement of all other species of the genus *Homo*, with their consequent extinction (Hublin et al., 2017; Rito et al., 2019; Scerri et al., 2019, 2018); (2) The emergence of Modern Human Behavior, which apparently stemmed from the particular characteristics of *H. sapiens* and coastal adaptation (Bailey and Milner, 2002; Bouzouggar et al., 2007; Brenner et al., 2020; Brown et al., 2012, 2009; Erlandson, 2001; Hallett et al., 2021; Henshilwood and Marean, 2003; Henshilwood et al., 2001; Jerardino and Marean, 2010; Loftus et al., 2019; Marean, 2016, 2014, 2007; Marean et al., 2007; Mcbrearty and Brooks, 2000; Mellars and Stringer, 1989; Powell et al., 2009; Scerri and Will, 2023; Texier et al., 2010; Wilkins et al., 2021, 2012; Will et al., 2019); and (3), and the Out of Africa II (Armitage et al., 2011; Groucutt et al., 2015; Haber et al., 2019; Harvati et al., 2019; Rose et al., 2011; Smith et al., 2007).

Presently, the largest number of publications about well dated African MSA contexts still comes from the Southern and Northern strips. These include geoarchaeology (Dibble et al., 2012; Goldberg et al., 2009; Haaland et al., 2017; Karkanas and Goldberg, 2010; Marean et al., 2010), archaeobotany (Esteban et al., 2020; Stevens et al., 2023), zooarchaeology (Armstrong, 2016; Campmas et al., 2016; Clark, 2017; Discamps and Henshilwood, 2015; Hallett et al., 2018; Marean et al., 2000; Stoetzel et al., 2011), human remains (Grun et al., 1996; Richter et al., 2017), and artefact made of stone (Breunig, 2003; De La Peña, 2015; Dibble et al., 2013; Discamps and Henshilwood, 2015; Douze et al., 2020; Hallett et al., 2021; Kinahan, 2011; Mccall et al., 2011; Read, 2017; Richter, 1991; Sandelowsky and Viereck, 1969; Schmidt, 2011; Shackley, 1980; Soriano et al., 2015, 2007; Way et al., 2022; Wendt, 1972; Wilkins et al., 2017; Wurz, 2013) bone (Bouzouggar et al., 2018; Hallett et al., 2021; Turner et al., 2020), shell (Henshilwood et al., 2004; Sehasseh et al., 2021; Texier et al., 2010; Vanhaeren et al., 2019), ochre (Bernatchez, 2008; Erico et al., 2012; Haaland et al., 2021; Henshilwood et al., 2011; Hodgskiss, 2014; Lombard, 2007; Wadley, 2005). Recently, increasingly contributions have also come from the eastern coast (Basell, 2008; Blinkhorn and Grove, 2018; Shipton et al., 2018; Timbrell et al., 2022; Tryon and Tyler Faith, 2013; Wurz, 2020), including from the basin of the Nile (Beyin, 2013; Leplongeon et al., 2020; Osypińska and Osypiński, 2016; River, 2018).

In the last few decades, multidisciplinary projects and archaeological research developed in these territories focused on palaeoanthropological, paleoenvironmental and palaeoecological reconstruc-

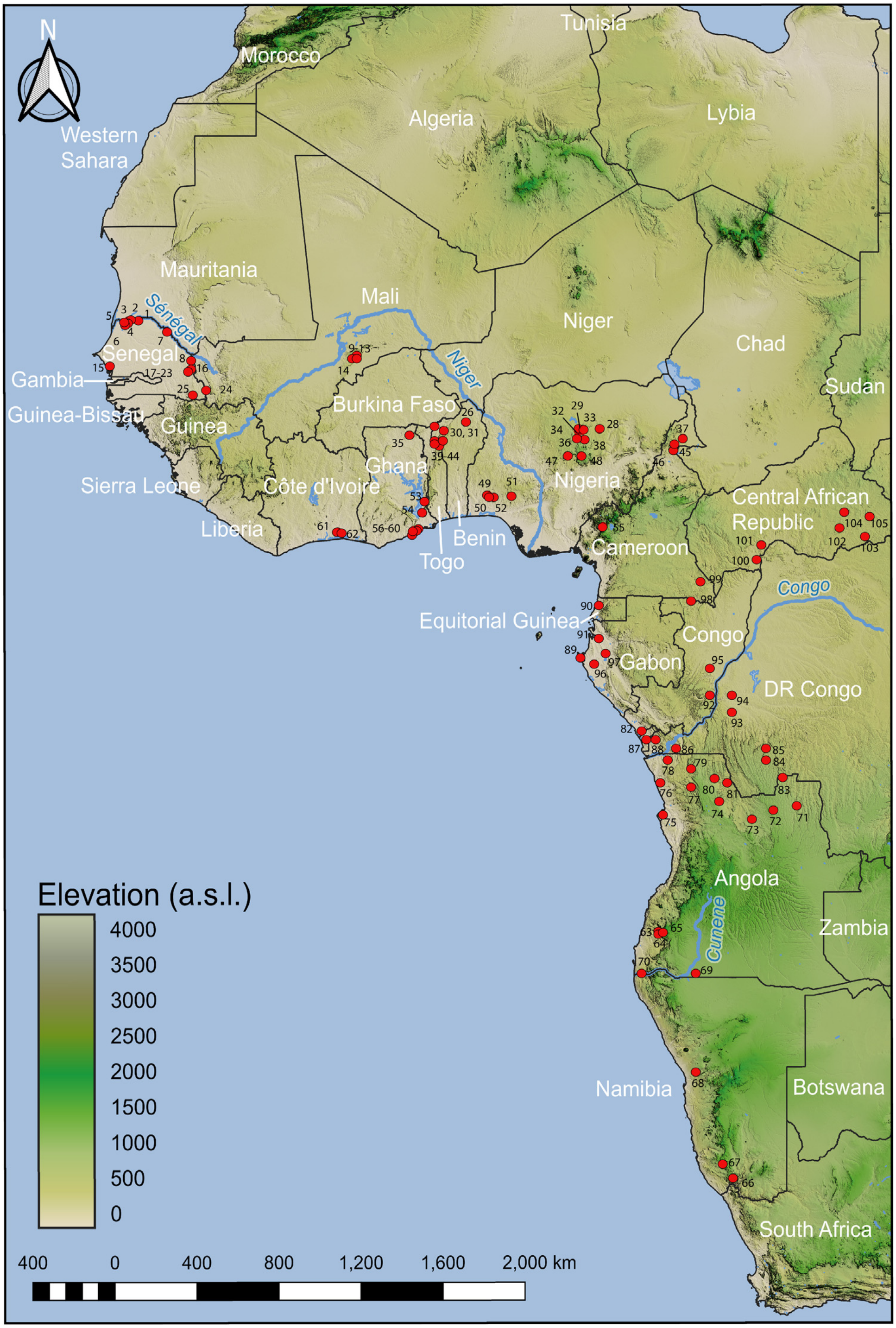

Fig. 1. Map of Atlantic Africa with the archaeological sites considered as MSA based on the lithic assemblages and/or absolute dates. 1) Djiérigayè; 2) Ndiayéne Pendao; 3) Njideri; 4) Madina Cheikh Omar; 5) Ngnith; 6) Mbane; 7) Dabià Quarry; 8) Nayé; 9)

tions, as well as hunter-gatherer economy and settlement patterns (Blinkhorn and Grove, 2018; Hublin and Shannon, 2012; Marom and Hovers, 2017; Stewart and Jones, 2016).

By opposition, less attention was given to the western strip, despite many teams finding archaeological sites and providing important clues about this period for decades (Fig. 1). We will detail this information further ahead in this paper. Such a stance may be related with research investment, preservation, political instability, and language. In fact, while the publications about the Southern Eastern and Northern regions are mostly in English and with a wide distribution, just recently this pattern is becoming frequent in the west. Consequently, the contribution from Atlantic Africa for the overall understanding of Africa's MSA is still limited, which stands out more in general continental overviews (Jones and Stewart, 2016).

The goal of this paper is to give an overview of the MSA of Atlantic Africa, presenting its geographic definition, paleoanthropological background, the archaeological background, a comprehensive interpretation of the available data highlighting what we believe to be its importance and potential, and a proposal for future research.

2. Defining Atlantic Africa

For the scope of this work, Atlantic Africa encompasses the territories between Morocco and South Africa. Today, this vast territory is marked by a progressive transition from hot arid deserts to tropical rainforest and encompasses desert, semi-desert, dry and moist savannah, deciduous woodland, tropical rainforest, and temperate grassland biomes, along with arid desert, arid steppe, tropical (rainforest, monsoon, and savannah) and temperate (dry hot summer; dry winter-hot, warm, and cold summer) climate (Fig. 2) (Beck et al., 2018; Burgess et al., 2006; Chen and Chen, 2013). Although parts of the dense tropical rainforest, of the hot dry deserts and of the highest mountains may have acted as barriers for mobility (Blinkhorn et al., 2022; Blome et al., 2012; Fitzhugh and Habu, 2002; Mirazón Lahr and Foley, 1998; Scerri et al., 2018; Schaebitz et al., 2021; Timbrell et al., 2022), these environments may have provided contiguous clusters of resources, allowing human mobility, diffusion of cultural traits, and of DNA (Blinkhorn et al., 2022; Callaway, 2012; Cerasoni et al., 2022;

Dandoli 1; 10) Dandoli 2; 11) Kokolo 2; 12) Kokolo 3 C3; 3) Oumounaama; 14) Ounjougou; 15) Tiemassas; 16) Ravin Blanc 1; 17) Djita; 18) Ravin des Guêpiers; 19) Toumboura II; 20) Toumboura III; 21) Ravin de Missira; 22) Fatandi V; 23) Toumboura I; 24) Saxomunya; 25) Laminia; 26) Alibori (or Alibori Bridge); 27) Pendjari-II; 28) Yada Gungume; 29) Tibchi; 30) Paloli; 31) Tanongou Cave; 32) Yelwa; 33) Mai Lumba; 34) Zenabi; 35) Birimi; 36) Saminaka; 37) Dent de Mindif; 38) Pingell; 39) Sawètè; 40) Kumaaku; 41) KorontiËre-I; 42) Bersingou; 43) Koukouan-I; 44) Koussokouangou; 45) Figuil Louti; 46) Mayo Louti; 47) Nok; 48) Rop; 49) Olude-Araromi; 50) Ajibode; 51) Iho Eleru; 52) Asejire; 53) Hohoe; 54) Chawenu; 55) Shum Laka; 56) Tema II; 57) Legon Botanical Garden; 58) Asokrochona; 61) Bingerville Highway; 60) Labadi; 59) Manprobi; 62) Anyama; 63) Capangombe Velho; 64) Capangombe - Santo António; 65) Leba Cave; 66) Apollo 11; 67) Pockenbank Rockshelter; 68) Erb Tanks; 69) Cunene; 70) Cufema Reach; 71) Lunda Province (13 sites); 72) Capama; 73) Marimba; 74) Nsongolo; 75) Catete; 76) Ambriz; 77) Tumba; 78) Lubudi; 79) Dimba; 80) Middle Kwango; 81) Mavoio; 82) Pointe-Noire; 83) Lupemba; 84) Makaw I; 85) Kinko; 86) Gombe Point; 87) Hinda Plateau; 88) Boko Songho; 89) Okala; 90) Mosumu; 91) Kango; 92) Bout de Plateau; 93) Nsontin; 94) Mushie; 95) Boundji; 96) Moulandou Foala; 97) Ndjole; 98) Baboungue 2; 99) Ngoere Ngolo; 100) Bomboli; 101) Boukako; 102) Mbali; 103) Nzako; 104) Boungou; 105) Ngouloukwa).

Carte de l'Afrique atlantique avec les sites archéologiques considérés comme MSA sur la base des assemblages lithiques et/ou des datations absolues. 1) Djiérigayè ; 2) Ndiayéne Pendao ; 3) Njideri ; 4) Madina Cheikh Omar ; 5) Ngnith ; 6) Mbane ; 7) Dabiâ Quarry ; 8) Nayé ; 9) Dandoli 1 ; 10) Dandoli 2 ; 11) Kokolo 2 ; 12) Kokolo 3 C3 ; 3) Oumounaama ; 14) Ounjougou ; 15) Tiemassas ; 16) Ravin Blanc 1 ; 17) Djita ; 18) Ravin des Guêpiers ; 19) Toumboura II ; 20) Toumboura III ; 21) Ravin de Missira ; 22) Fatandi V ; 23) Toumboura I ; 24) Saxomunya ; 25) Laminia ; 26) Alibori (ou Alibori Bridge) ; 27) Pendjari-II ; 28) Yada Gungume ; 29) Tibchi ; 30) Paloli ; 31) Tanongou Cave ; 32) Yelwa ; 33) Mai Lumba ; 34) Zenabi ; 35) Birimi ; 36) Saminaka ; 37) Dent de Mindif ; 38) Pingell ; 39) Sawètè ; 40) Kumaaku ; 41) KorontiËre-I ; 42) Bersingou ; 43) Koukouan-I ; 44) Koussokouangou ; 45) Figuil Louti ; 46) Mayo Louti ; 47) Nok ; 48) Rop ; 49) Olude-Araromi ; 50) Ajibode ; 51) Iho Eleru ; 52) Asejire ; 53) Hohoe ; 54) Chawenu ; 55) Shum Laka ; 56) Tema II ; 57) Legon Botanical Garden ; 58) Asokrochona ; 61) Bingerville Highway ; 60) Labadi ; 59) Manprobi ; 62) Anyama ; 63) Capangombe Velho ; 64) Capangombe - Santo António ; 65) Leba Cave ; 66) Apollo 11 ; 67) Pockenbank Rockshelter ; 68) Erb Tanks ; 69) Cunene ; 70) Cufema Reach ; 71) Lunda Province (13 sites) ; 72) Capama ; 73) Marimba ; 74) Nsongolo ; 75) Catete ; 76) Ambriz ; 77) Tumba ; 78) Lubudi ; 79) Dimba ; 80) Middle Kwango ; 81) Mavoio ; 82) Pointe-Noire ; 83) Lupemba ; 84) Makaw I ; 85) Kinko ; 86) Gombe Point ; 87) Hinda Plateau ; 88) Boko Songho ; 89) Okala ; 90) Mosumu ; 91) Kango ; 92) Bout de Plateau ; 93) Nsontin ; 94) Mushie ; 95) Boundji ; 96) Moulandou Foala ; 97) Ndjole ; 98) Baboungue 2 ; 99) Ngoere Ngolo ; 100) Bomboli ; 101) Boukako ; 102) Mbali ; 103) Nzako ; 104) Boungou ; 105) Ngouloukwa).

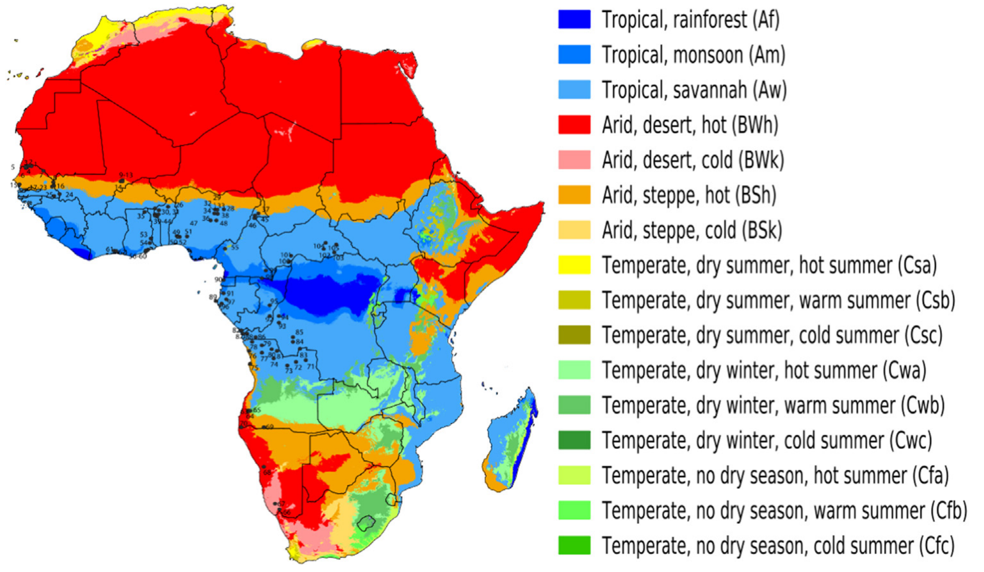

Fig. 2. Köppen-Geiger climate classification map (Burgess et al., 2006) (adapted) with the archaeological sites considered as MSA based on the lithic assemblages and/or absolute dates.
Carte de classification climatique de Köppen-Geiger (Burgess et al., 2006) (adaptée) avec les sites archéologiques considérés comme MSA sur la base des assemblages lithiques et/ou des datations absolues.

Chan et al., 2019; Chen et al., 2000; Gonder et al., 2007; Hammer et al., 2011; Lachance et al., 2012; Niang et al., 2018; Scerri et al., 2018, 2019).

It is worth mentioning that such geographical features and environmental structure are completely different from than those from the Indian coast, where changes are much more gradual between coast and inland and particularly across the latitude. The same can be said about the northern and southern coasts. Consequently, it can be expected (significant) differences in human ecodynamic that, in turn, can affect a vis-à-vis comparison between the archaeological and even paleoanthropological record between such territories.

The Atlantic coast of Africa has a shallow continental platform, which was exposed throughout most of the Pleistocene and may have allowed it to avoid these obstacles (Fig. 3). The other is the large number of long and vast hydrographic systems such as the Draa, Senegal, Konkouré, Mano, Comoe, Volta, Ogooué, Congo, Niger, Kwanza, Cunene, Orange, and many others that run between them. They link the coast to the inland plateaus and connect the great lakes, escarpments and plains of the interior areas of the continent, allowing continuous corridors across different ecotones and zones of refugia (Roberts et al., 2020).

Palaeoecological investigations indicate that the paleo El Niño Southern Oscillation (Kaboth-Bahr et al., 2021) and the Bengela Current (Baumann and Freitag, 2004; Jahn et al., 2003; Rosell-Melé et al., 2014) were some of the most significant factors in the ecodynamics, often following the Milankovitch cycles with the low-latitude climate gradually responding to the high latitude orbital forcing. A dramatic cooling change seems to have occurred ca. 600 ka in which the northern hemisphere glacial cycles forced shifts on the tropical and sub-tropical circulation systems, followed by a humid phase between 525–279 ka, an arid phase between 279–128 ka and another humid phase between 128–0 ka. Within the later, a significant expansion of humid flora occurred during the 140–118 ka, 105–96 ka, 92–73 ka, 52–44 ka, and across the entire Holocene wet periods, with respective contraction during the dryer phases in-between (Lézine, 1991). Such investigations also confirm that the oscillations had direct influence on the expansion, contraction, opening, closing and shift in latitude and longitude of each biome, and consequently on the evolution and distribution of flora and fauna (Kaboth-Bahr et al., 2021; Lézine, 1991).

Although there is not a clear cultural framework for the Atlantic Africa's MSA, such instability may have had a significant impact in behavior, and cultural evolution, driven by necessary local and

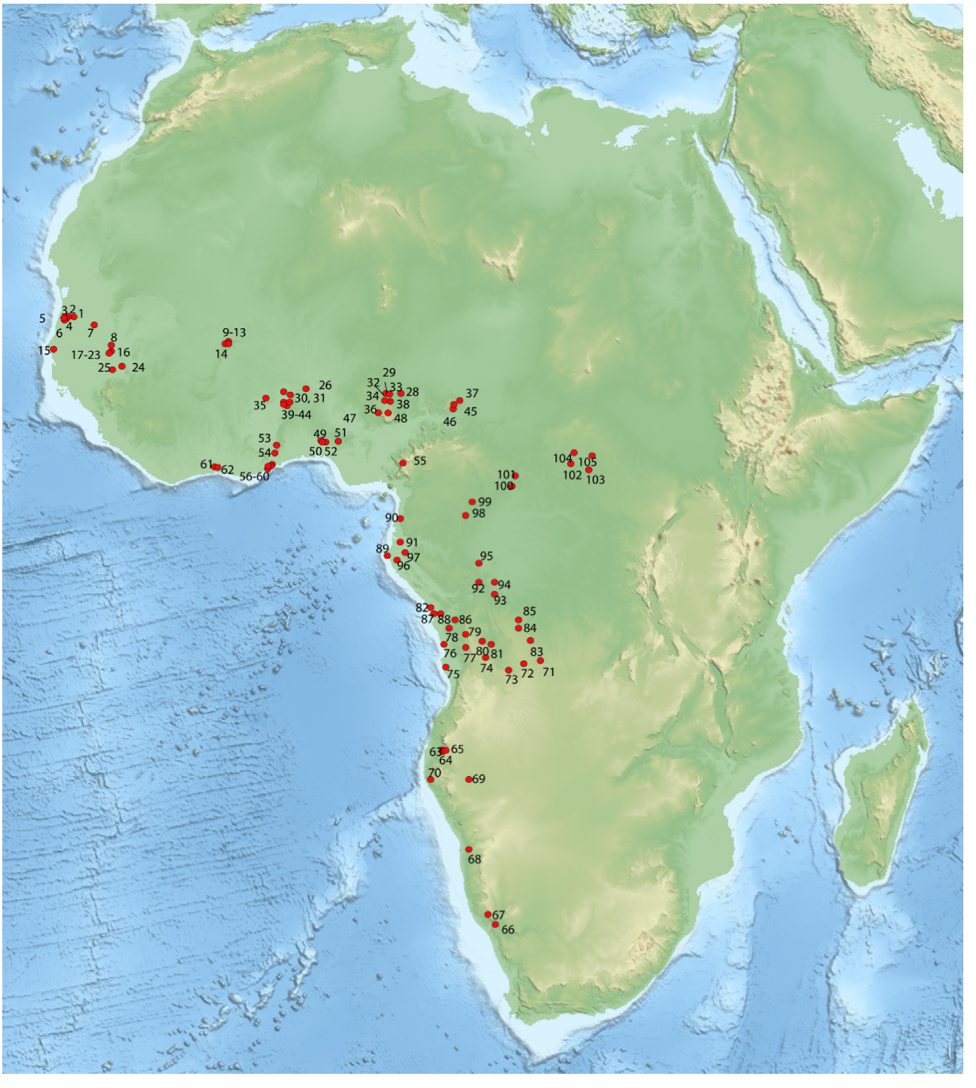

Fig. 3. Map of Africa showing the Atlantic low dry coastland (light green) and the adjacent continental platform (light blue) that was partially dry land during the great majority of the Pleistocene with the archaeological sites considered as MSA based on the lithic assemblages and/or absolute dates.
Carte de l'Afrique montrant la côte atlantique basse et sèche (vert clair) et la plate-forme continentale adjacente (bleu clair) qui était partiellement sèche pendant la grande majorité du Pléistocène avec les sites archéologiques considérés comme MSA sur la base des assemblages lithiques et/ou des datations absolues.

regional human adaptation (Niang et al., 2023). Further details about these phenomena are expected soon, as several projects across this region are underway.

3. The paleoanthropological background

The models proposed across decades for the process of early human evolution were strongly based, first, on the "Western Rift Hypothesis" (Kortlandt, 1972) and second on the "East Side Story" (Coppens, 1994, 1991, 1983). These models showed relatively easy fit of some fossils, even if few (Grün et al., 2020; Vidal et al., 2022), but there are difficulties in fitting others even when abundant (Berger et al., 2015). Recently, the multi-regionalism model gained strength based on the increasing information about morphological diversity and geographic distribution of the fossils, and DNA data (Klein, 2019; Scerri et al., 2018; Stringer, 2016).

Human roots across Atlantic Africa remain obscure (Scerri and Will, 2023). Reasons for this may be, among others, a possible low preservation of bones; topography of coastal areas with consequences on exposed vs flooded territories during cold and warm periods, respectively; colonial issues (various colonial countries, great variety of scientific practices and way of administering colonial possessions; decolonization, with collections fragmented between many institutions scattered in several African and ex-colonial countries; or the long political instability of most territories after the decolonization) (Mesfin et al., 2020b; Poloni, 2012). Nevertheless, it must be said that Atlantic Africa has not been completely void of data or information about human evolution. In fact, it has been a fundamental region for modelling key moments and trajectories of the earliest stages of hominin evolution such as bipedalism (Carvalho et al., 2012) or stone-tool technology (Boesch et al., 1994; Carvalho et al., 2009; Joulian, 1996, 1994) through the systematic study of the behavior of primates, particularly chimpanzees and bonobos as *proxy*, despite the fact that field archaeological research on these specific issues were never consistently developed.

It is broadly accepted that *H. sapiens* evolved in Africa. However, it is harder to state with confidence exactly where and when. Ethnolinguistic and genetic studies hypothesize that earliest migrations occurred from populations around the Kaokoland between northern Namibia and southwest Angola (Mitchell, 2017; Tishkoff and Williams, 2002) or from populations around the Makgadikgadi–Okavango wetland in Botswana, around 200 ka (Chan et al., 2019), that is, in the end of Marine Isotope Stange (MIS) 7, which is corroborated by fossil data from Omo (Ethiopia) that shows that *H. sapiens* anatomy was already established around 230 ka (Vidal et al., 2022). However, the fossils found in Jebel Irhoud (Morocco) dated from 315 ka (Richter et al., 2017) and in Florisbad (South Africa) dated from 260 ± 35 ka (Grun et al., 1996) suggest that evolutionary processes towards the emergence of *H. sapiens* were already in progress during the MIS9. In this way, populations with *H. sapiens* anatomy were dispersed from Northern to Southern Africa or, alternatively, suggest a Pan-African emergence.

This can be explained by the rapid proliferation of anatomic *H. sapiens* traits across the continent or by the possibility that this phenomenon was not linear. In this case, it could have resulted from the local adaptation to local conditions, including those produced by specific local conditions, and the impact of environmental changes. If so, then it may have led to the subdivision of the population according to ecological regions (Blome et al., 2012; Scerri et al., 2018), perhaps with limited and intermittent gene flow (Mazet et al., 2016; Skoglund et al., 2017) and interbreeding between groups with higher genetic difference (Hammer et al., 2011).

This could be the case of the Iwo Eleru skull lineage from Nigeria, dated from 16 to 12 ka but carrying very archaic anatomical features, that is closer to the Tanzanian Ngaloba LH 18 skull, dated between 490 ka and 130 ka, and outside the variability of *H. sapiens* skulls (Allsworth-Jones et al., 2010; Harvati et al., 2011; Stojanowski, 2014; Waddell, 2014). Considering the different conditions of Atlantic Africa, Iwo Eleru may represent a lineage that persisted here until the Pleistocene/Holocene transition (Harvati et al., 2011). Eventually, they may have been the result of admixture between long-separated lineages of human groups, in this case, the latest archaic groups and the earliest *H. sapiens*, that were already not present during the Northgrippian (previously named as mid-Holocene – 8276 BP to 4200 BP) (Schlebusch and Jakobsson, 2018).

Genetic data suggests an unclear and probable complex scenario for the rise of West African *H. sapiens*. This may include a much earlier divergence of San between 350 ka and 260 ka, with DNA inputs from other populations each one with numerous divergent records and also isolation of the western population from those of the east, north and south (Durvasula and Sankararaman, 2020; Schlebusch et al., 2017; Skoglund et al., 2017).

Atlantic Africa is one of the regions of the world with higher biological distinctiveness (Beck et al., 2018) in land (Fig. 4) and Net Primary Production in the sea (Boyd et al., 2014) (Fig. 5). This makes it even more plausible to suppose that something of significant importance to human evolution may

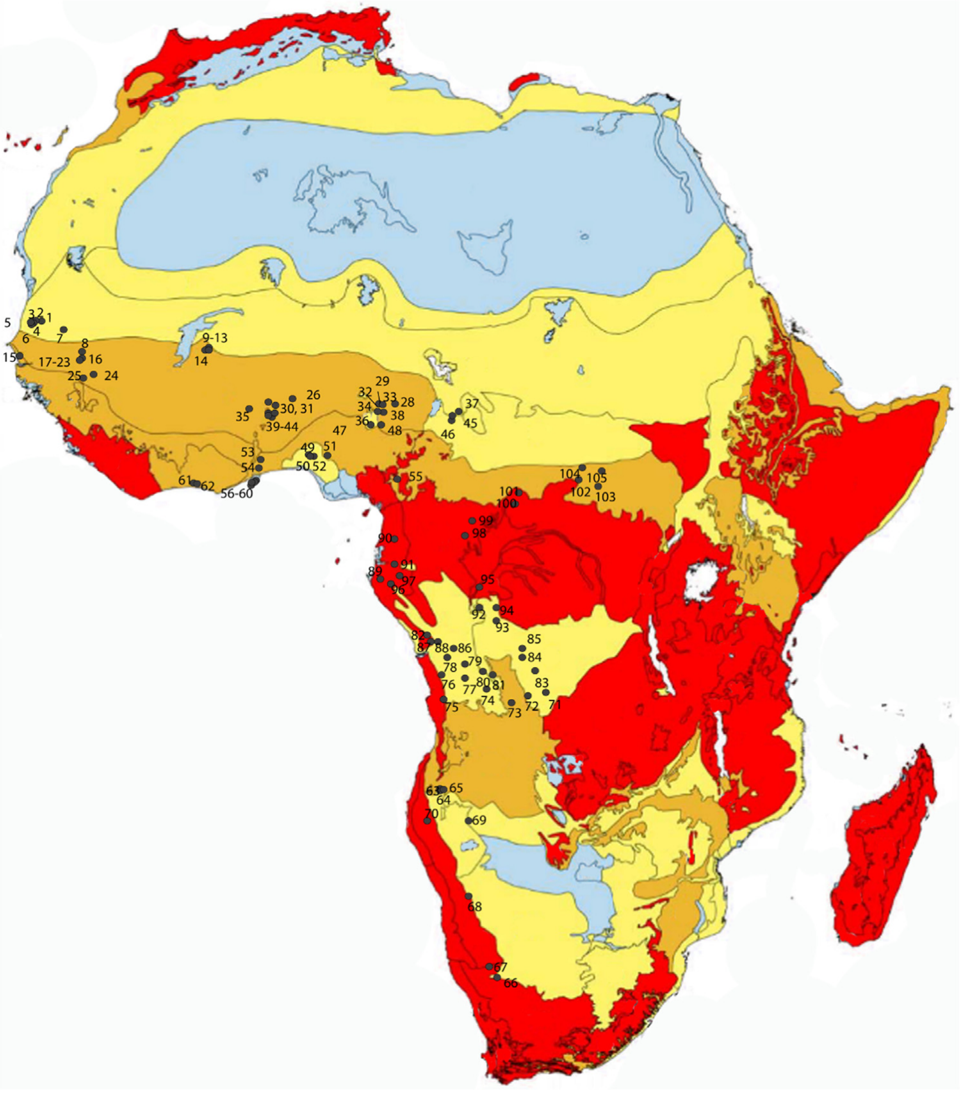

Fig. 4. Map of the Biological Distinctiveness Index of Africa according to (Beck et al., 2018) (adapted) with the archaeological sites considered as MSA based on the lithic assemblages and/or absolute dates.
Carte de l'Indice de Distinction Biologique de l'Afrique selon (Beck et al., 2018) (adapté) avec les sites archéologiques considérés comme MSA sur la base des assemblages lithiques et/ou des dates absolues.

have happened here, somewhere at some point, whether anatomically, behaviorally, or cognitively (Cabrera, 2023).

4. Archaeological framework

Right from the beginning of the archaeological investigation in Africa, the interpretation of its data had a strong influence from the European record. Among other things, this included the Goodwin claim of a Mousterian tradition between the ESA and the MSA (which, in the Atlantic Africa, included

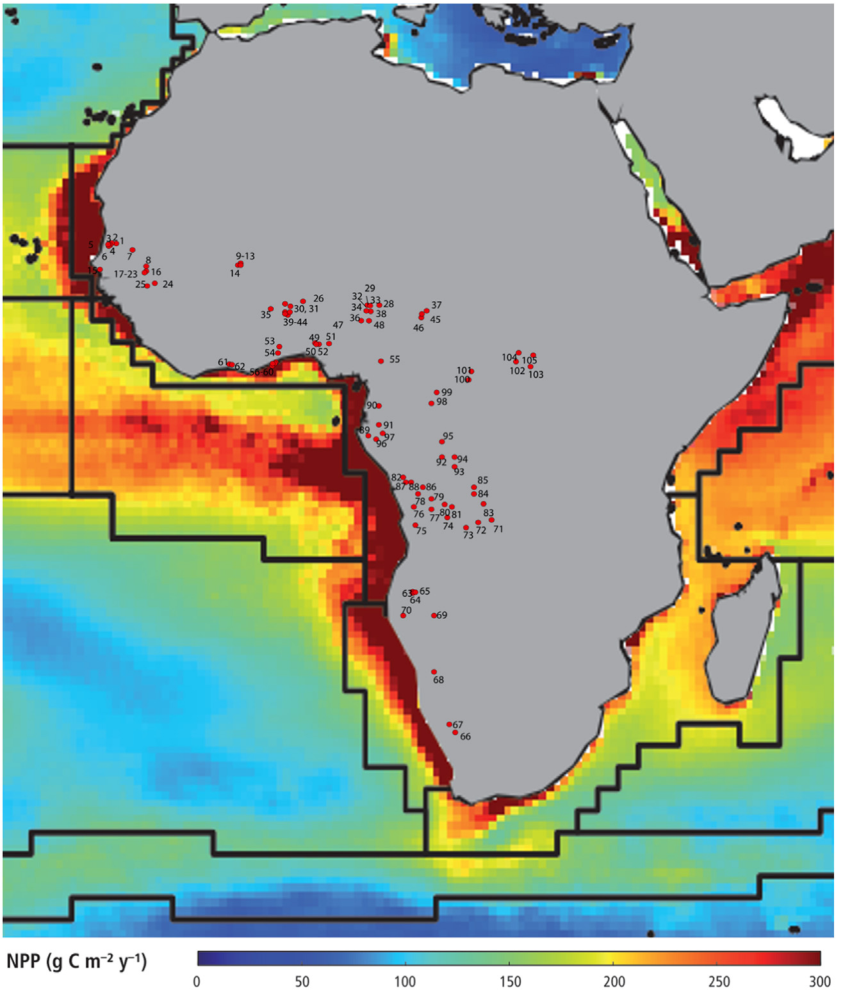

Fig. 5. Map of Africa and surrounding oceans showing the Net Primary Production according to (Boyd et al., 2014) (adapted), with the archaeological sites considered as MSA based on the lithic assemblages and/or absolute dates. Scale at the right goes from Dark blue to Dark Red. Dark Red indicates higher Net Primary Production while Dark Blue indicates lower Net Primary Production. Black lines represent the different ocean biogeographical provinces.

Carte de l'Afrique et des océans environnants montrant la production primaire nette selon (Boyd et al., 2014) (adaptée) avec les sites archéologiques considérés comme MSA sur la base des assemblages lithiques et/ou des dates absolues. L'échelle à droite va du bleu foncé au rouge foncé. Le rouge foncé indique une production primaire nette plus élevée, tandis que le bleu foncé indique une production primaire nette plus faible. Les lignes noires représentent les différentes provinces biogéographiques océaniques.

the Fauresmith and Sangoan), and a Mesolithic tradition between the MSA and the LSA, (which included the Magosian and the Howieson's Poort) (Goodwin, 1926; Goodwin and Van Riet Lowe, 1929).

Later, the subdivision of African Stone Age was agreed during the 1st Pan-African Congress of Prehistory, in 1947, when African Prehistory started to become autonomous from the European record. Nevertheless, the Eurocentric perspective about Africa's Stone Age, the rise of *H. sapiens* and the emergence of modern human behavior lasted until the end of the 20th century (Marean, 2007; Mcbrearty and Brooks, 2000; Mellars and Stringer, 1989). But, the artefact/cultural diversity observed in the archaeological record, precisely in the composition of the toolkit across time and space, suggested that it was during the MSA that regional identities emerged (Clark, 1988), being one of the most defining traits of modern human behavior (Mcbrearty and Brooks, 2000).

Significant work started in the mid-20th century (Clark, 1959; Clark and Cole, 1955; White and Clark, 1965). Over the decades, there were several projects involving survey, testing, excavations, and revision of MSA assemblages in Atlantic Africa, either as a site-specific endeavor or as a review in a regional perspective (Alabi, 2016; Allsworth-Jones, 2019, 1987, 1981; Andah, 1979; Bagodo, 2004; Basell, 2010; Breunig, 2003; Casey, 2003; Kinahan, 2011; Mccall et al., 2011; McIntosh and McIntosh, 1983; Richter, 1991; Sandelowsky and Viereck, 1969; Schmidt, 2011; Soriano et al., 2010; Wai-Ogosu, 1973; Wendt, 1972).

In the last decades, the region received an increased attention, enriching the available dataset, updating previous information, and boosting the research competition in this region. Today the map of MSA sites consists of open-air, rock shelter and cave sites in Senegal, Mali (Chevrier et al., 2016; Douze et al., 2021; Lebrun et al., 2016; Lespez et al., 2011; Niang et al., 2020, 2018; Rasse et al., 2020, 2012, 2004; Schmid et al., 2022; Soriano, 2003; Soriano et al., 2010), Guinea (Davies, 1964), Sierra Leone, Ivory Coast, Burkina Faso (Allsworth-Jones, 2019; Frank et al., 2001; Kote, 2019), Ghana (Andah, 1979; Balhu, 2017), Niger, Benin (Allsworth-Jones, 2019; Bagodo, 2004; N'Dah, 2009), Nigeria (Allsworth-Jones, 2019; Bagodo, 2004), Cameroon (Mercader and Martí, 2003), Equatorial Guinea (Cruz-y-Cruz et al., 2022; Mercader and Martí, 2003; Rosas et al., 2022), Gabon (Mesfin et al., 2021), Congo basin (Mesfin et al., 2020a, 2020b; Taylor, 2016), Angola (de Matos et al., 2020; de Matos and Pereira, 2020; de Matos, 2022a; Ervedosa, 1980; Mesfin, 2018), and Namibia (Nicoll, 2009; Shackley, 1986).

The available radiometric dates for the MSA from Atlantic Africa are still few considering its immense space and complexity, also when compared with other regions. Still, the available information points for its maximum extension to be between the 254 ka (with a large standard deviation: 51 ka) (Allsworth-Jones, 2019; Liuin and Guédé, 2001) or at least 128 ka (Douze et al., 2021) and 11 ka (Scerri et al., 2021), that is, between the MIS8a or MIS5e to the MIS1. This is a very different situation than that from the northern and southern coast where the MSA has a much shorter time span. If this is a matter of continuation or a matter of refinement of the regional archaeological record is yet to be established.

In general, the sites known are characterized by MSA diagnostic traits: assemblages based on prepared cores (e.g. discoidal, Levallois) and the production of regular flake, blades, and points, with different degrees of shaping and retouching. Stone tools such as notches, denticulates, sidescrapers, endscrapers, along with choppers, configured cleavers/cleaver-like tools, picks, core-axes tools, anvils and hammerstones are also part of these repertoires. Still, some have artefacts that can be culturally correlated to any phase of prehistory (Doyendze, 2021; Kote, 2019; N'Dah, 2009). Overall, it can be seen the recurrent use of a diversity of raw materials, varying between fine-grain, coarse grain, and quartz.

Across the bibliography above it is possible to see that the great majority of the sites is composed of artefacts clustered or scattered at the surface, with few studies including geoarchaeological, archaeobotanical analysis, and radiometric dates (Douze et al., 2021). Comparatively, caves and rockshelters with stratified deposits and fossil remains are more rare (Cerasoni et al., 2022; de Matos et al., 2021b; Pickford and Senut, 2010) although Later Stone Age rock art sites and correlated LSA horizons may have potential MSA layers (Fernandes, 2014; Gomes et al., 2013; Guilhem et al., 2021; Nankela, 2020; Rosina et al., 2018). In Senegal, Mali, Ghana, and Burkina Faso, long standing research programs have made possible to carry out in-depth investigations on several sites, providing detailed knowledge of the material cultures and paleoenvironments of these areas (Chevrier et al., 2016; Douze et al., 2021; Lebrun et al., 2016; Lespez et al., 2011; Niang et al., 2020, 2018; Rasse et al., 2020, 2012, 2004; Schmid et al., 2022; Soriano, 2003; Soriano et al., 2010). Here, some particularities emerge.

The Senegal's MIS5e Ravin Blanc I site presents affinities with the Acheulean or Sangoan, showing low frequency of Levallois implements (Douze et al., 2021), while the MIS3 Toumboura III has predominance of unidirectional single platform and prismatic technology with absence of discoidal and Levallois methods, along bifacial tool, including well-crafted by pressure technique bifacial points (Schmid et al., 2022). Tanged points occur at Tiémassas in the coast of Senegal (Niang and Ndiaye, 2016), bifacial shaping, bifacial points and retouched blades occur at sites such as Birimi at Northern

Ghana but are absent at Maadaga south of the Gobnangou Chain of Burkina Faso (Balhu, 2017; Frank et al., 2001), while Bassumpra, Pendjari and Pentenga Burkina Faso sites show the presence of microliths (Frank et al., 2001; N'Dah, 2009; Watson, 2017). The Orosobo site seems to establish a good timeframe for the presence of Levallois at ca. 30 ka and of the combination of discoidal, centripetal and recurrent Levallois around 40 ka (Robert et al., 1999; Schmid et al., 2022). This clearly demonstrates a clear change across time, and a diversity of techno-cultural facies between the MIS4 to the MIS2, strongly suggesting complex human dynamics (Chevrier et al., 2018, 2016; Niang et al., 2020, 2018; Scerri et al., 2017, 2016; Schmid et al., 2022).

In the south facing coast the information is more dispersed. Among the better published sites are Anyama, a quarry site at Ivory Coast that was of most relevance to question the attribution of the Sangoan to a specialization to forest environments (Allsworth-Jones, 2019; Liuin and Guédé, 2001), and Asokrochona, the Ghana Nautical College and Tema (Chevrier et al., 2018), still with debate about their chronological attribution.

In Nigeria the sites such as Ajibode and others in the Yamoje River basin, with choppers, cleavers/cleaver-like tools, points, scrapers and hammerstones, among others made of quartz, quartzite, and granite were discovered in exposed lateritic deposits. At the northern part of the country, sites such as Mai Lumba, Zenabi, Banke, Tibchi, Pingell and Saminaka have similar assemblages with Levallois flakes, blades, and points, as well as scrapers of various forms (Alabi, 2016; Allsworth-Jones, 2019, 1987; Bagodo, 2004).

In Gabon, Central African Republic, Republic of Congo several sites were found during the first half of the 20th century with highlights to Kango, Kafélé and in the Lopé National Park in Gabon (Bayle des Hermens et al., 1987; Clist, 1989; Matoumba, 2013; Mesfin et al., 2021; Oslisly, 1993; Oslisly et al., 2006; Righou, 1996), NZako in Central African Republic (Angue Zogo, 2020), and Pointe-Noire, du Pool Malebo, M'Pila, M'Piaka, La Plaine, Bacongo or La Poste in Republic of Congo, many of them destroyed by urban expansion. Along with these, there is also a large quantity of potential sites classified as Middle Stone Age (Lanfranchi and Schwarz, 1990) but most with unclear provenance, displaced by many institutions across the world or lost due to unstable circumstances and lootings (Cruz-y-Cruz et al., 2022; Demayumba, 2021; Mesfin, 2018; Mesfin et al., 2020b, 2020a).

Across this vast area, industries such as the Lupemban and the Sangoan show common features combined with slight differences with potential regional and chronological meaning, yet to be refined by future investigations (Taylor, 2022a, 2022b, 2021, 2014a).

Angola marks the passage from the rainforests at the north to the desert at the south. The country was researched by numerous teams over the past century. High concentrations of MSA artifacts were observed, particularly across the southwest, most of them open-air sites (Carvalho, 1955; Corvinus, 1983; de Matos et al., 2020, 2021b; de Matos, 2022b; Giresse, 2008; Klein, 1994; Pickford et al., 1992). Assemblages were associated to different Stone Age cultures recognized in Central and Southern Africa such as the Acheulean, Fauresmith, Still Bay, Smithfield and Wilton (Clark, 1966; de Matos et al., 2021a; Ervedosa, 1980; Gibson and Yellen, 1978; Ramos, 1982). Numerous locations have atypical tools, mixed traits frequently associated to "transitional industries" (Allchin, 1964; Breuil and Almeida, 1964; Ramos, 1974), and mixed traits or overlapping tool typologies characteristic of both ESA and MSA classified as "Sangoan" or "Fauresmith" (Ramos, 1982, 1974, 1970). Earlier phase of Capangombe Velho (Ramos, 1982) and Leba Cave (Camarate-França, 1964) were interpreted as early MSA or MSA of Acheulean tradition, followed by a phase without large cutting tools and dominated by "generic" or "undifferentiated MSA" blanks (Clark, 1966; Gibson and Yellen, 1978) with low frequency of retouched pieces (de Matos, 2013; de Matos and Pereira, 2020). These patterns have been observed in regions of northern South Africa as early as 500 ka (Porat et al., 2010; Wilkins et al., 2012), and at the border between Namibia and Angola dated to 200 ka (Nicoll, 2018, 2010). Preliminary age measurements using Uranium Thorium series on herbivore tooth associated to the generic MSA assemblages retrieved a minimum age of 75 ka (de Matos et al., 2014).

In Namibia, the identification of MSA sites is much restricted along the coast. For instance, the earliest evidence of the Middle Stone Age sequences has been discovered in the lower Khuiseb River where bone fragments of an extinct elephant and stone tools associated with Acheulean Industry at Namib IV (Shackley, 1980). According to (Nankela, 2017), other Pleistocene evidences has been those yielded further inland for instance from the Middle Stone Age (MSA) sequences at Erb Tanks (Mccall

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et al., 2011) and Messum 1 E near Brandberg Mountain (Richter, 1991, 1984; Scherz and Scherz, 1974; Viereck, 1961; Wendt, 1972); MSA sites from the Erongo Mountains including those excavated by W.E. Wendt, the Fackelträger E in Omandumba West, farm Etemba14 E, Davib-Ost farm and in the Cymot shelters of Ameib farm (Wendt, 1972; Richter, 1991; Schmidt, 2011; Sandelowsky and Viereck, 1969) while Otjongoro farm site excavated by W. Sydow, which remained unpublished (Richter, 1991). In the Brandberg Mountain, the two excavated MSA sequences include Amis 10 and Amis 11, but have provided little information on technological and chrono-cultural issues (see Breunig, 2003: 65–111, 112–140 cf. Schmidt, 2011). The technological industry of the MSA assemblage at these sites is predominantly made up of handaxes, pointed flakes (pseudo-Levallois points), unretouched flakes, cleavers, blades etc., recovered from various excavated archaeological layers and surface collections attributed to Levallois technology. Such assemblages show great similarities with those from western South Africa and southern Angola (Mccall et al., 2011; Nicoll, 2018, 2010, 2009; Schmidt, 2011; Shackley, 1986), rising questions on a continuum between these regions.

5. Discussion

5.1. The cultures and their space

At its northern limit, the region here has artefacts resembling the Mediterranean coast MSA, namely the Aterian. On the other hand, at its southern limit, it has evidence that seems to fit relatively well with the South African sequence. Together, this seems to suggest a wide geographic distribution of the Northern African techno-cultures towards south and of Southern African techno-cultures towards north. Such technological options may also correspond to regional specificities and related with open landscapes.

In a different situation, the crude Sangoan seems to be concentrated in tropical areas and related with the Early/Middle Stone Age transition in Senegal (Douze et al., 2021), arguably extending until Angola, although the term lost traction (e.g. Taylor, 2022b). In Angola so-called Sangoan tools overlap the well-crafted Lupemban (Clark, 1968) and, at least in central Africa, to be followed by microlithic quartz industries (Cornelissen, 2002).

The Lupemban was, for some time, considered to have a possible relation to the first *H. sapiens* in the rainforest and persisted for a long time in literature about the prehistory of the Congo basin. However, this is now discussed because it was also found outside the forest belt (Goodwin and Van Riet Lowe, 1929; Roberts and Petraglia, 2015; Taylor, 2016), shifting to the Lupembo-Tshitolian after 25 ka (Taylor, 2014b). Further south, in the savanna bordering the Namib desert, where no Lupemban tools occur, sites classified as Fauresmith or "generic MSA" have been associated with southern Africa lithic taxonomies (Wurz, 2013).

However, most of these lithic industries are not characterized in detail in what concerns their technological and typological traits which is why they were also reported in central and even eastern territories within vast and rather coarse timeframes (Mesfin et al., 2020a). All these industries seem to be related with the early stages of the MSA and suddenly, against any logic, are replaced by the Later Stone Age (Mercader and Martí, 2003). This makes it difficult to produce robust cultural sequences for the Atlantic MSA at the Equatorial zone, despite the continuous efforts to find the best way to build a chronological framework based on absolute age measurements (Chevrier et al., 2016; Delagnes et al., 2012; Douze et al., 2021; Lebrun et al., 2016; Rasse et al., 2012, 2004; Soriano et al., 2010; Tribolo et al., 2015). In this sense, finding stratified layers with stone-tools and improving microstratigraphic controls is of most importance to reconstruct human lifeways in Africa during the MSA.

5.2. The human fossils

The presence of fauna in some regions also potentiates the finding of human fossils. the Jebel Irhoud fossil carries archaic and *H. sapiens* traits, leaving open the possibility of a gradual anatomic transition from archaic to modern anatomy (Hublin et al., 2017; Richter et al., 2017) with relevance, along with other specimens, to the emergence of modern morphology in Northern Africa (Bergmann et al., 2022) and widespread across Africa.

However, the parallels between the young but still very archaic Nigerian Iwo Eleru skull and the Tanzanian Ngaloba LH 18 skull (Allsworth-Jones et al., 2010; Harvati et al., 2011; Stojanowski, 2014; Waddell, 2014), appear to lead to the opposite scenario. Such closeness suggests the potential of east-west corridors running through what is now the Sahel, which was drier or leafier depending on global climatic conditions, Central Africa, and the entire Oubanguian zone. The earliest archaic *H. sapiens* may have moved between the Atlantic and Indian coastlines over this wide terrain of savanna and steppe.

In turn, the characteristics of the Florisbad skull (Bruner and Lombard, 2020; Grun et al., 1996; Keith, 1938; Richter et al., 2017) followed by the persistence of the archaic features of Iwo Eleru (Allsworth-Jones et al., 2010; Harvati et al., 2011; Stojanowski, 2014) skeletal remains or the "Sangoan" tools (or "MSA of Acheulean tradition"), when modern technologies and anatomical human traits are already in place in other regions, may suggest there are alternative adaptations to the western African conditions, particularly the forest. This would be in line with current perspectives on the role human plasticity in niche construction, defining Pleistocene humans as "generalist-specialists" (Roberts and Stewart, 2018).

Paleoanthropologists have long debated the impact of environmental conditions on paleodemography (Blome et al., 2012; Stewart and Jones, 2016) or possible regions from where the *H. sapiens* first dispersed (Chan et al., 2019; Klein, 2019; Mitchell, 2017) with no possible consensus (Scerri and Will, 2023; Schlebusch et al., 2021). The contribution of human fossils from Atlantic Africa (a speculative future given how few have been discovered previously, but why not?) would be critical for a complete understanding of human evolution.

5.3. The modern human behavior

Another related issue to which Atlantic Africa may considerably contribute is the understanding about the coastal exploitation and coastal adaptation during the MSA. Although the evidence of coastal sites and of exploitation of coastal resources that may be considered as a slow process of adaptation to this landscape and environment (Mesfin et al., 2023), such adaptation with impact to *H. sapiens* culture and economy seems to be only after the MIS6.

In the last decades, several disciplines have shown that aquatic resources, including coastal, are rich in fatty acids, which, in turn, are important to the *H. sapiens* health and brain development (Broadhurst et al., 2002; Carlson and Kingston, 2007; Crawford et al., 2008; Cunnane et al., 2007; Langdon, 2006; Parkington, 2010; Will et al., 2016). The recurrent presence of shellfish remains at MSA sites suggest an intentional supply of nutrients that are harder to obtain from terrestrial food.

It is after the appearance of these remains (and the inferred input of these nutrients) that appear in the archaeological record traits such as the use of ochre (Marean et al., 2007), heat-treatment (Brown et al., 2009), hafted tools (Wilkins et al., 2012), bone tools (Hallett et al., 2021; Henshilwood et al., 2001), composite tools (Brown et al., 2012), shell beads (Bouzouggar et al., 2007) and engraved ostrich eggshell (Texier et al., 2010). Together this suggest an recurrent and scheduled behavior rather than opportunistic situations (Brenner et al., 2020; Jerardino and Marean, 2010; Loftus et al., 2019).

Coastal exploitation and coastal adaptation are not the same. Coastal exploitation corresponds to the exploitation of seasonal or occasional resources integrated within a vast landscape where other resources are available in patches, scattered across or moving around. Coastal adaptation corresponds to a more complex reality in which Pleistocene hunter-gatherers concentrated in a much smaller area with predictable and dense resources, usually located near aquatic environments. Often, this change implied that people concentrated in larger groups in small areas, with significantly less mobility, but with large range network of exchange of goods, more complex technologies, higher demographic rates, tending to escalate into more complex organization, social inequality and inter-group conflicts (Bailey and Milner, 2002; Erlandson, 2001; Marean, 2016, 2014).

The change of the hunter-gatherer lifeway combined with the increased input of fatty acids from aquatic resources may have steamed important and innovative mechanisms in the brain of *H. sapiens* (Archer and Braun, 2013; Bailey and Milner, 2002; Campmas et al., 2016; Erlandson, 2001; Erlandson and Fitzpatrick, 2006; Jones and Stewart, 2016; Marean, 2016, 2014; Will et al., 2019, 2016). As a consequence, major impact on its cognitive abilities with utmost significance to human evolution occurred, but not representing significant anatomical changes or being coeval of the *H. sapiens* anatomic evolution (Will et al., 2019). This impact is reflected in the archaeological record by a set of evidence that, together, compose Modern Human Behavior (Bouzouggar et al., 2007; Brown et al., 2012, 2009; Charrié-Duhaut et al., 2013; Deschamps et al., 2022; Hallett et al., 2021; Henshilwood et al., 2003; Jerardino and Marean, 2010; Lombard, 2005; Mcbrearty and Brooks, 2000; Mellars, 2005; Schoville et al., 2017; Texier et al., 2010).

Several authors argue that Modern Human Behavior appeared in southwestern coast of South Africa during the MIS6 (Brenner et al., 2020; Jacobs, 2010; Jacobs et al., 2008; Jacobs and Roberts, 2017) and in the northwestern coast of Morocco during the MIS5 (Dibble et al., 2012; Hublin and Shannon, 2012; Jacobs et al., 2012, 2011). The first is influenced by the Atlantic's Benguela Current Upwelling System (Kämpf and Chapman, 2016) and the Agulhas Current (Brenner et al., 2020; Jerardino and Marean, 2010), while the second is influenced by the Atlantic's Canary/Iberia Current Upwelling System (Kämpf et al., 2016) and by the Mediterranean Outflow (Ben Arous et al., 2022; Chakroun et al., 2017). However, none of these cases have remains that suggest a significant and consistent change in human behavior (Mcbrearty and Brooks, 2000). Therefore, what the archaeological record seems to suggest is a slow introduction of Modern Human Behavior traits such as ochre (Henshilwood et al., 2011), perforated shell beads (Bouzouggar et al., 2007), heat-treatment (Brown et al., 2009) or backed stone-tools (Brown et al., 2012).

Interestingly, such traits have not been identified at the western Africa between these regions during the MIS4 (Niang et al., 2020, 2018), and were completely absent until the Holocene, except for the Pleistocene case of harpoons in Central-Eastern Africa (Yellen et al., 1995) or some opportunistic situations during the ESA at Baia Farta (Angola) (Gutierrez et al., 2010). So, pertinent questions can be raised concerning this vast region that is, in fact, where the Net Primary Production (NPP) is much higher (Boyd et al., 2014). For instance, if marine exploitation was intense in the coasts where NPP is very high but very narrow, how was it in the territories where NPP is very high and very wide? That is, where the conditions allow a greater capacity of production. Another question that can be raised is that if, for some reason, the trigger was a combination of a high-narrow NPP area along a rocky coast with caves where cold and warm currents meet, then would it not be acceptable to have a cluster in the coast of Nigeria (probably one of the most attractive considering the above), specifically in Calabar area where there are limestone caves? Or the lack of such clusters can be related with the fact that much of the Nigerian coast, at least its southernmost sector, is dominated by sandy barrier beach ridges and not rocky beach ridges with caves? Of course, caves are by definition an erosive feature of the bedrock. Across the world, there are hundreds of examples of how their exposure to climate and erosion shapes their morphology, internal and external dynamics, collapse and obliteration, including the impact on the archaeological (Gunn, 2006).

Nevertheless, probably one of the most important reasons may have been the harmful and toxic algae produced by the Bengela upwelling that causes mass mortalities of almost all animals, (shellfish, fish, mammals and birds), besides Paralytic Shellfish Poisoning, Diarrhetic Shellfish Poisoning and death when humans eat these resources contaminated those algae (Pitcher and Calder, 2000).

Finally, ethnographic data indicate that 40% of groups living in tropical and equatorial areas extensively use the highly and easily available aquatic resources (Bicho and Esteves, 2022; Binford, 2001). Such continuous use on a scenario of longer standing and increased population can lead to the depletion of these resources and consequent human mobility (Mannino and Thomas, 2002), particularly in moments of climatic and resource crisis. The absence of year-round collection of shellfish across the MSA and LSA of South Africa seems to imply complex patterns of mobility, harvesting, and seasonal subsistence patterns based on coastal resources (Loftus et al., 2019). So, why does nothing of this seem to not have happened anywhere between Morocco and South Africa?

6. Final remarks

Presently, models for the emergence of the *H. sapiens* in the fossil record, and our understanding of behavioral and cognitive development towards Modern Human Behavior traits relies on two clusters separated by more than 10,000 km. Atlantic Africa MSA sites are known in each modern biome, with a higher number in the savannas and a lower number in tropical forest and mangrove lowlands

(Cerasoni et al., 2022). Recently, several projects from Senegal to Namibia, combining fieldwork with state-of-the-art multidisciplinary analysis, are bringing new high-resolution and high-impact results and ideas at an unprecedented pass.

The available asymmetrical data suggests a stage with three main scenarios. One, at the south, in continuity with the southern African record and probably related to a temperate environment and open landscape (Wilkins et al., 2017); the other at the north, in continuity with the northern African record and perhaps related with a Mediterranean environment and also open landscape (Hublin and Shannon, 2012). A third, in-between, of which the continuity, discontinuity and borders with the other two are unknown but where traits such as the Sangoan-like core-axes are systematically found, probably related to tropical and sub-tropical environments and closed landscape (Mercader and Martí, 2003; Taylor, 2016).

Nevertheless, three main questions are still wide open to be investigated.

First, Mobility: was the Atlantic coast of Africa a western corridor linking the north with the south or other inland regions during the MSA, with implicit transit of people, ideas and DNA, or essentially a closed environment due to being surrounded by ocean, deserts and forests?

Second, Adaptation: did those populations develop means of coastal adaptation and, if so, which were they and to what extent can they be compared with those occurring in the north and south of Africa? What were the behavioral patterns developed in this region and how did they relate to the shifts in the position of the coastline during the glacial cycles?

Increasing investment and systematic research projects can provide new sites, paleoenvironmental data and absolute dates that, together, may allow for an understanding of the sequence of the Atlantic African MSA. This includes: (a) understanding the emergence, evolution and success of *H. sapiens* among other hominids; (b) understanding its relationship with the regional conditions and adaptive patterns, including coastal; and, (c) reconstructing *H. sapiens* population movements across the Atlantic coast of Africa during the MSA.

With this, it will be finally possible to produce a stronger framework to compare the Atlantic Africa MSA with the other African MSA sequences and infer the existence, intensity, and timing of relationships with Northern, Central, Eastern and Southern Africa. It is highly plausible that future archaeological and paleoanthropological information may come from Atlantic Africa's carbonate formations and, therefore, such areas should be the subject of more in-depth surveys within an obviously multidisciplinary research framework.

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