SENEGAL

The Early and Middle Stone Age of Senegal, West Africa

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Introduction

Birth of archaeological research in Senegal and West Africa is linked to the implementation of the French colonial system during the 19th century. Mostly practiced by soldiers and civil administrators, archaeology was a leisure activity that deeply affected or compromised the informative potential of many sites and archaeological materials. With the advent of independence and international collaborations, a more "archaeological approach" has been adopted by national researchers, however, their work has been limited by financial factors and most analyses remain strongly influenced by the interpretive and methodological approach prevailing in France.

West Africa occupies a significant biogeographical area due to its position between the Sahara Desert and tropical Africa. It plays a decisive role in our understanding of human and cultural evolution. Current research increasingly reveals a more complex scheme of technological evolution than previously thought. On the other hand, genetic studies and palaeoclimatic models are highlighting a major role for the region in the structure of *Homo sapiens* populations (Scerri *et al.* 2014).

In this paper, we review previous work that summarizes more significant archaeological findings related to the Early and Middle Stone Age of Senegal, place them in the West African context, and finally discuss the questions raised by new data. By West Africa, we refer to the arbitrary, geographical area comprised between latitudes N 5° and 25° and longitudes E 15° and W 18° (Figure 1). The northern boundary is constituted by three countries, Mauritania, Mali and Niger, while the southern part is delineated by Cameroon, and the Atlantic Ocean represents the eastern limits. West Africa's areal extent is about 614000km^2, the region is characterized by low topographic relief with few exceptions (e.g., northern Cameroon and Nigeria), that do not exceed 2000m elevation. Rainfall variation with monsoon fluctuations has created three main ecological zones: arid desert, semi-arid sahel and the tropical area with substantial variability within each area. From Pleistocene to Holocene, palaeoenvironmental data suggest an area mainly covered by tropical, subtropical grassland savanna and shrub land. This general configuration has been interrupted by several arid or humid intervals that induced the expansion or withdrawal of an ecological zone (Miller and Gosling 2014).

The Early Stone Age

Beyond geopolitical instability that characterize this region, the scarcity of Pleistocene deposits (McIntosh and McIntosh 1983) and palaeobiological remains is because they were destroyed by humid and acidic soils (Phillipson 2005), which is the main reason that explains the archaeological neglect of West African prehistory. Cultural remains linked to the first stage of the ESA (Mode 1, Mode 2), are recognized in different areas, but with few exceptions these do not come from stratigraphic contexts. In this trend, the presence of Oldowan industries in Senegal is controversial. The concerned industries in sandstone and quartzite are localized in the extreme east of Senegal at different localities: Kédougou, Semakouta Laminia and Baytilaye (Figure 1) (Barbey and Descamps 1969). First discovered out of context

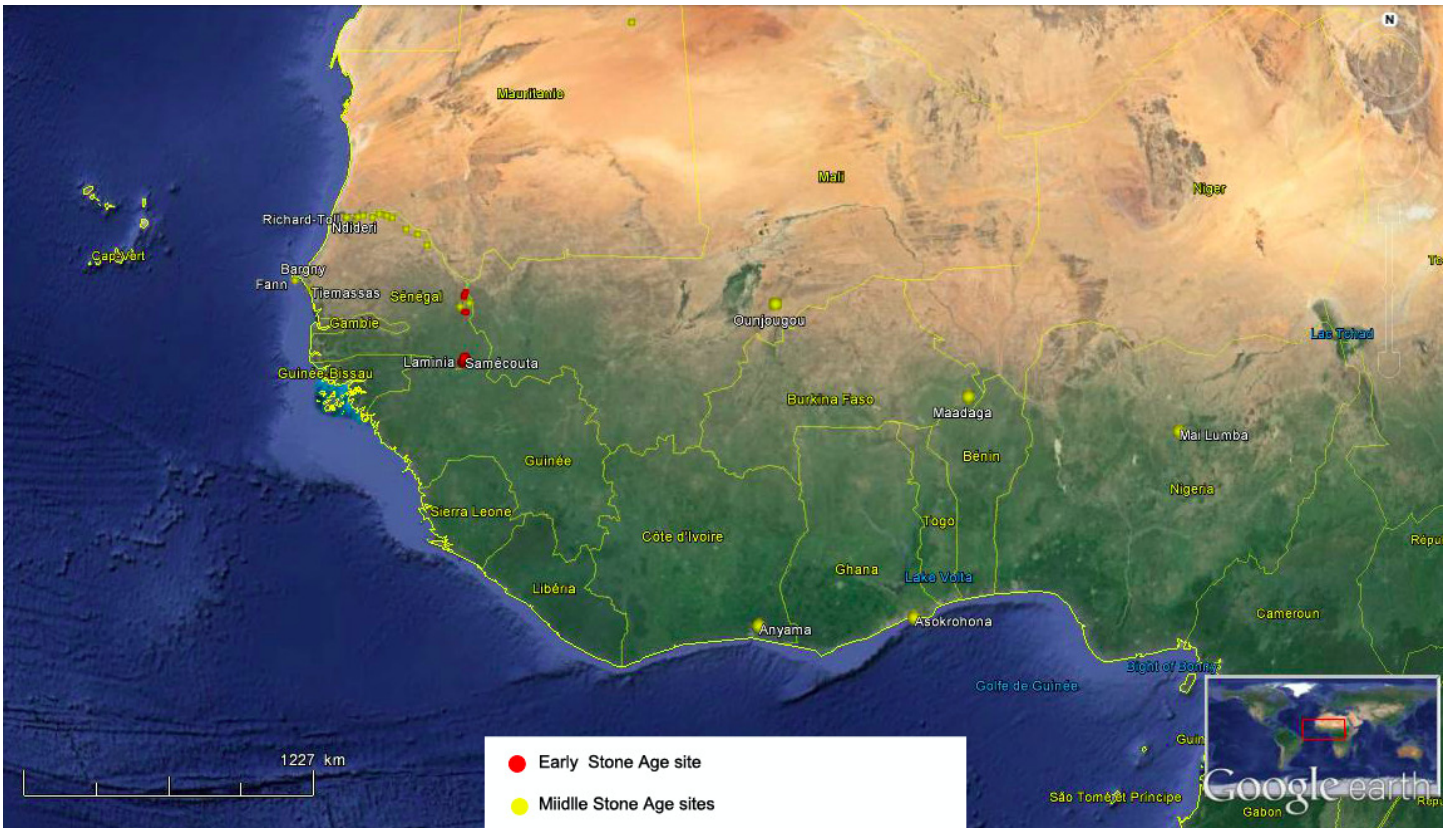

Figure 1: Geographical location West Africa and main sites mentioned in the text .

on a ferruginous crust or *in situ* in a puddingstone, these tools were attributed to an "*unelaborate Neolithic with pebble-tools*" (Mauny 1963), while Hugot considered them as a "*pebble tools civilization"* (Hugot 1967). Finally, some pebble tools found *in situ* at Laminia were considered as industries of a recent Paleolithic that date around 30ka on the basis of geomorphological considerations (Barbey and Descamps 1969). These contradictory chrono-cultural attributions led to a technological revision that revealed that the great majority of the industries in questions are "*pseudo-artefacts*", most of them have been shaped or flaked by natural actions (Niang *in process*).

What authors call pebble-tools are pebbles characterized by flake removal for which any striking point or direction of removal is determinable. On numerous pebbles, it is easy to identify the natural "line of fracturation" that led to the natural removal of *"pseudo"* or natural flakes. Sometimes, removal is localized on flat surfaces without natural convexities (more or less 90°) allowing anthropic flaking (Inizian *et al.* 1995). Another argument corroborating this fact is the geological context (puddingstone and river bank) in which the material has been found. Consequently, at the present time Mode 1 technology is not identified in Senegal. Two hypotheses could explain this situation: the lack of substantial survey of Senegal has not been conducted for the early Pleistocene or Senegal was not occupied during this period. However, in the rest of West Africa, Oldowan morphotechnic items have been discovered in the Adrar region, Mauritania at Oued Akkerdil, El Beyyed (Monod 1975; Naffé *et al.* 2000), but also Burkina Faso (Milogo 2000) Niger (Gado *et al.* 2001), and the Ivory Coast (Guédé 1995) but they lack stratigraphic information. It is only at Ounjougou, Mali that sites yielded polyhedrons, and spheroids in quartzite in undisturbed contexts and where the overlaying sediment dated these industries to 180ka (Huysecom 2014), while the earliest stone tool assemblages from the East African Rift Valley are pushed back to 3.3mya (Harmand *et al.* 2015) or 2.6mya (Semaw 2000). Furthermore, the first items that allowed the identification of Acheulean technol-

Figure 2: Bifacial tools from Sansandé and Djita.

ogy in Senegal (Figure 2) were discovered in 1938 by Monod (1938) in the western part of the country, in the locality of Fann (Figure 1). A total of nine bifacials were found on an eroding level and sometimes these were mixed with material from other time periods, but their few numbers and the confused geological context limit their interpretation. However, the eastern part of the country shows a large concentration of Acheulean sites mostly around Gambia and Falémé valley, from which we hold the main information about mode 2 technology in Senegal (Camara and Duboscq 1983, 1984, 1990). Despite their significant number, only the sites of Sansandé and Djita have been excavated. Geological studies conducted by Michel (1973) on Senegal and Gambia valley identified four levels containing industries with strong Acheulean components: the high alluvial level, the substratum outcrops, the clayey level with mixed rubble, and the middle alluvial level. The 45 lithic artifacts recovered at Sansandé by Camara and Dubosq are the first Acheulean assemblages from an undisturbed context in Senegal. At Djita (about 7km from Sansandé) a very similar industry has been found. Unfortunately, artefacts from these two sites were analyzed with 128 surface findings and the results show a large representation of scrapers, bifacials, end-scrapers and cleavers.

From a technological point of view, thanks to the presence of Levallois strategy, authors consider Sansandé as an "evolved Acheulean with Levallois reduction strategy" dated to 250ka (Camara and Duboscq 1983, 1984). The assemblage from Djita is numerically more important with 274 lithic pieces recovered, but it comprises a large number of unmodified or broken stones. The material is characterized by a small number of pebble-tools, scrapers, notches and bifacial tools that the authors correlate to the final Acheulean on the basis of their stratigraphic position rather than from typological arguments (Camara and Duboscq 1990). Finally, the chronology of Senegalese ESA relies on typological considerations, geomorphological data from the Faleme river and isotopic data from the Atlantic coast of Mauritania. Acheulean industries are found throughout the Sahara. In Saharian Mali in Tilemsi valley (Lagreich, Erar-rar), a lithic industry with Levallois technology composed of bifacials, cleavers, and scrapers that yielded the date of 282±52ka (Diop 2000; Coulibaly 2000). In Mauritania, the site of El Beyyed at Yeslem I, II and III yielded Acheulian industries (bifaces, cleavers, choppers, unmodified flakes, etc.) sometimes mixed with faunal remains (Yeslem II) testifying to humid environments but without chronological precision (de Lumley *et al*. 2007). Also, Acheulean assemblages were identified in a few localities in Ghana and Nigeria (Davies 1967; Soper 1956) but they lack stratigraphic indicators.

The Middle Stone Age

The MSA is a generic term used to qualify specific chronometric, archaeological and geographic associations. The Levallois core technology is a distinctive feature of this cultural stage. Associated with regional technological and cultural adaptation in Africa, its emergence is thought to date between 250 and 300ka and is associated with the appearance of human modern behavior and early *Homo sapiens* (McBrearty and Brooks 2000; Van Peer 1991; Van Peer *et al.* 2003). In Senegal, MSA origins and duration is still uncertain. A relative dating proposed by Camara, bracketed its time span between 200 and 20ka (Camara 2000). Two main technocomplexes that still need a formal definition were identified: the Mousteroide and the Tiemassassian. While the last one has been defined from the coastal area, the Mousteroïde is more widely distributed. In the western part, the main sites are Bargny, Sebikotane, Ravin de Deni Youssouf. At Bargny (Figure 1), the two excavated *loci* yielded an important material characterized by Levallois and discoidal strategy reduction, bifacial and modified flakes, most represented tools are scrapers, end-scrapers, and denticulates (Diop 2000). Unlike Bargny, Sebitkone display a high use of Levallois reduction sequences that authors use as arguments in validating the "*more evolved*" character of this site. At Richard Toll in the northern part of the country, bifacial armatures and pieces of "Aterian shape" predominate the mousteroide assemblages (Diop 2000). New sites recently discovered in the Senegal River valley at Ndiayène Pendao, Madina Cheikh Omar, Djerigaye or Koungani bear MSA ma-

Figure 3: Lithic material from Tiemassas.

terial usually found on the surface (except for Ndiayene Pendao) that is very similar to Bargny's assemblage (Scerri *et al.* 2015).

Furthermore, the Tiemassassian was defined from the eponymous river located around 90km from Dakar on the Atlantic coast. The site distributed in various *loci,* yielded abundant lithic material out of every stratigraphic context. This uncertainty about stratigraphic position and the absence of radiometric dating, draw up to several chrono-cultural attributions. Researchers consider the site to be Middle Stone Age, Late Stone Age or Neolithic (Descamps 1979). The small number of artefacts (351) recovered from the unique controlled excavation conducted by Descamps (1979) did not allow precise determination of the cultural stage of the site. Recent technological studies hypothesize a Middle Stone Age occupation overlain by a short LSA or Neolithic period. Studied artifacts (Figure 3) made from fine grain flint, display some MSA technology characterized by a heavy Levallois, discoid, opportunistic reduction sequence and typological features (scrapers, foliate points, and very few items) (Niang and Ndiaye *in press*). In southeastern Senegal, despite technological similarities with Tiemassasian, lithic industries from Doundé or Diboli are attributed to the LSA period (Camara and Duboscq 1987). In the Falémé, more details are needed for the lithic characterization of a small number of artefact from Fatandi that were previously thought to be MSA but this evaluation was reconsidered after OSL dating (MIS 3, 2 and 1) and the discovery of new items (microliths) that could be related to the emergence of the LSA (Huysecom *et al.* 2015). In Mali, the site complex of Ounjougou revealed MSA sites with a chronology bracketed between 150 and 30ka.

Assemblages made from sandstone and quartz were obtained, thanks to several reduction methods (Levallois, discoid, blade etc.) that occur differently from classic technological successions known in Europe or other African contexts. This particularity is interpreted by researchers as several population introgressions (Robert *et al*. 2003; Soriano *et al*. 2010). Similar assemblages were found at Maadaga in Burkina Faso (Milogo 2000) but also in Mekrou Valley (Vernet 1996). From northern Nigeria, the presence of at least two MSA facies are hypothesized: Mai Lumba facies emphasized the Levallois strategy more than did the Zenabi facies (Allsworth-Jones 1986). The cultural and ecological significance of this Mode 3 variability is difficult to assess given the scarcity of reliable stratigraphy and radiometric dates. At Osokrochona (Ghana) relative dates range between 13 and 20ka (Nygaard and Talbot 1984), at Birimi an OSL date of ~40ka was obtained from sediments containing MSA industries (Quickert *et al*. 2003). Thus the ubiquitous presence of Levallois technology (but differentially represented) and discoidal reduction sequence appear to be the main link between the Sahelian and more northern latitude of West Africa.

In the Sahelian part of West Africa, characteristic tools of the North African MSA (Saharan and Aterian-type tanged points) were found in several localities (Mali, Senegal, Mauritania, Niger), while they are absent in the more southerly areas. The spread of the Aterian techno-complex as the cultural marker of a group was recently criticized and the tanged tools were considered as reflections of a "*generalized approach to hafting different tools common in North African MSA*" (Scerri 2013: 4247). However, evaluating the dispersal of this North African population after the desertification of Sahara is a key issue in our understanding of adaptive strategy and mobility of human populations facing bioclimatic pulsation. Elsewhere in the more southern part of West Africa, two main cultures were identified: Sangoan and the Lupemban respectively defined at Sango Bay (Uganda) and Kalambo Falls (Zambia) (Clark 1971). The Sangoan sometimes identified as a transitional culture between Acheulean and MSA is recognized by the presence of heavy duty and large cutting tools (heavy bifaces, core axes, picks, choppers, etc.), whereas Lupemban features large lanceolate, backed blades, Levallois points, etc. Following their geographical distribution, they have been interpreted as the result of distinct patterns of settlement resulting from adaptive strategies in different ecological zones (Clark 1971; Taylor 2014) but recent discoveries are supporting the idea of a greater expansion (Barham and Mitchell 2008). Several San-

goan sites in disturbed contexts (e.g., Nigeria, Cameroon) have been identified but only Bété I in Ivory Coast yielded the TL date of 254±51ka (Liubin and Guédé 2000). Nevertheless, the accuracy of this date is controversial (Taylor 2014). In any case, it seems that West Africa presents the most recent Stone Age across the continent that raises numerous question about its role in the expansion and the evolution of hominids within Africa.

West Africa and Hominin Dispersions Within and Outside of Africa

West Africa has had a negligible mention in the human biological, evolutionary and cultural evolutionary literature. However, in recent years, genetic models are highlighting the key role of this region in the dispersal and evolution of archaic *Homo sapiens*. Studies based on single locus mitochondrial DNA have shown that West Africa could be a potential area of admixture between archaic populations with different degrees of anatomical modernity (Garrigan *et al.* 2005; Hellenthal *et al.* 2014; Scally and Durbin 2012; Veeramah and Hammer 2014). The most ancient haplogroups (L1, L2, L3) identified in South Africa are also found in West Africa, this genetic diversity of living populations is explained by possible introgression of archaic DNA into *Homo sapiens* (Hammer *at al.* 2011; Mendez *et al.* 2013) suggesting a deep and substantial taxonomic diversity in Africa during the Middle and Late Pleistocene periods (Gunz *et al.* 2009; Scerri *et al.* 2014). In this context, explaining the "shifting" chronology yielded by ESA and MSA sites from West Africa is a key issue for anthropological studies. In fact, the corresponding Oldowan assemblages found at Ounjougou allow for the hypothesis that *Homo sapiens* could be the author of this industry since it has been demonstrated that early tools have long survival times and can be components of recent industrial techno-complexes in Africa. In East Africa, *Homo habilis* and some australopithecines are identified as the potential authors of Oldowan culture, the oldest hominin fossil found in West Africa is successively attributed as australopithecine (Coppens 1961), *Homo habilis* (Coppens 1965) and *Homo erectus* (Coppens 1966). These specimens have not been associated with cultural remains. The expansion of first hominins beyond the Tchad region is not attested.

For more recent periods, theories about modern human origins and dispersal remain contradictory however; palaeoclimatic models show the crucial role played by water systems in the diffusion of hominins in West Africa (Scerri *et al.* 2014). Trajectory of *H. sapiens* from East to northern Africa or from and elsewhere is documented. So, it could be hypothesized that climatic crisis oriented the MIS 5 dispersal of *Homo sapiens* toward West Africa. The model proposed by Scerri *et al*. (2014) shows that West Africa during this period (130 and 75ka) was dominated by three major ecosystems: savannah grassland shrub land, rainforest and broadleaf forest (Scerri *et al.* 2014) while east tropical Africa was facing severe megadroughts (Scholz *et al*. 2007) and North Africa was subject to drier conditions between 115 and 100ka and from 75 to 45ky (Blome *et al.* 2012). Later on, the same phenomenon could have been repeated during the African re-expansion between 80-60ka that repopulated Africa with L2 and L3 mtDNA types (Watson *et al*. 1997). This scenario is consistent with the chronology of the majority of MSA sites at Ounjougou bracketed between 75 and 30ka (Huysecom 2014). It is possible that when movement from East Africa into northern Africa was blocked following Saharan desertification during MIS 4 ~70ka, human populations headed west followed by North African populations retreating southwards using the coastal corridor routes (Tillet 1997). Thus Senegal and West Africa could be climatic *refugia* for dispersing or migrating *Homo sapiens* populations that occupied the area punctually or intermittently supporting the idea that isolated populations occasionally expanded and exchanged genes (Gunz *et al*. 2009; Scally and Durbin 2012; Scerri *et al.* 2014; Veeramah and Hammer 2014). However, palaeobiological remains support the presence of ancient *Homo sapiens* and modern behavior (symbolic behavior, use of ochre, geometric engraving, long distance raw material transportation, etc. see McBrearty and Brooks 2000) accompanying this last species are still lacking in West Africa and the only site of Ounjougou can serve as single reference for

the entire region. The oldest skeletal remains were found in Iwo Eleru (southern Nigeria) and these are dated by uranium series between 11700±1.7ka and ~16.3±0.5ka (Harvati *et al.* 2011). First attributed to recent African groups (Brothwell and Shaw 1971), the skeleton is now linked to Late Pleistocene *Homo sapiens*, despite the recent date and mixed anatomical characteristics (Harvati *et al.* 2011). More detailed research is needed in order to determine the role of West Africa in the dynamics of late Pleistocene hominins.

Conclusion

Compared to the rest of the continent, the Stone Age of West Africa is very poorly investigated and understood because of the scarcity of Pleistocene deposits and political instability. Nevertheless, refining this chrono-cultural stage is crucial in our understanding of Pleistocene human dynamics. Early Stone Age technology is sporadic, but its occurrence in stratigraphic context in Mali raises more questions than it resolves. Middle Stone Age industries are more numerous and show very high techno-typological variability. Similarities between analogous ecological zones have been described. Sahel and the northern latitude of tropical West Africa share more reduced artifacts and a greater emphasis on Levallois and discoidal reduction sequences. Southern latitudes highlight more massive artefacts that sometimes record earlier technologies. The few dated sites increasingly demonstrate the inadequacy of classic tripartite divisions of prehistoric time for West Africa. At the same time, palaeoclimatic models show that the Sahara Desert has never been an overwhelming geographical barrier, and some megadroughts affected East Africa and other African areas. Hydrographic networks, played a key role in group mobility and continuously allowed population movements, however, the chronology and the way of these displacements need to be refined. The palaeoclimate variability combined with the young age of West African MSA could support the idea a refugia area where hominins from other areas met and exchanged genes.

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