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ORIGINAL ARTICLE

First Archaeological Excavations Along the Atlantic Ocean Coastline of the Democratic Republic of Congo: The Iron Age Sites at Muanda

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Abstract This article reports on new archaeological data obtained in 2018 from the coastal region of the Kongo Central province of the Democratic Republic of Congo (DRC). The area's ancient history is virtually unknown but is potentially of paramount importance in the context of the development of early village communities in Central Africa. The article focuses on the Muanda 6 site, dated to ~ 1400 BP, and offers a multidisciplinary analysis of the finds uncovered there. The site's pottery is associated with shell and stone beads, ironworking remains, a stone quern, and biological remains testifying to a mixed subsistence system that took advantage of the region's ecological diversity. The Early Iron Age occupants of Muanda 6 practiced ocean and mangrove fishing, gathered beach and mangrove gastropods and bivalves, hunted, and exploited oil palms. The article also discusses the Muanda 13 site, which is more recent (~ 1100 BP), and the results of the profile sampling at the Katala village. Both Muanda 6 and Muanda 13 yielded different ceramic types. Other pottery styles, surface collected between the Congo River and the Angolan province of Cabinda and probably of more recent date, are briefly described. The results provide new perspectives about the Iron Age in the DRC, providing further evidence of the cultural diversity in the Lower Congo region and an outline of the cultural sequence along the Atlantic Ocean coast.

Résumé Cet article rend compte de nouvelles données archéologiques obtenues en 2018 dans la région côtière de la Province du Kongo-Central en

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République démocratique du Congo. L'histoire ancienne de cette région est pratiquement inconnue, mais elle est potentiellement d'une importance capitale dans le contexte de l'installation des premiers villages en Afrique centrale. Les travaux se concentrent sur le site de Muanda 6, daté vers 1400 BP, dont les trouvailles sont étudiées dans une perspective multidisciplinaire. La poterie de ce site est associée à des perles de coquillages et de pierre, à des traces de travail du fer, et à une meule en pierre ainsi qu'à des restes biologiques témoignant d'un système de subsistance mixte reposant sur divers écotones. Les occupants de l'Age du Fer Ancien de Muanda 6 pratiquaient la pêche en mer et dans la mangrove, la collecte de gastéropodes et de bivalves sur la plage et dans la mangrove, la chasse et l'exploitation des palmiers à huile. Le site plus récent de Muanda 13 (vers 1100 BP), ainsi qu'une collecte stratigraphique dans la berge du village de Katala, ont permis de découvrir un autre type de céramique. L'article décrit un dernier style de poterie probablement plus récent et découvert en surface entre le fleuve Congo et la frontière de la province angolaise de Cabinda. Les résultats présentés ici offrent de nouvelles perspectives à l'Age du Fer sur la diversité culturelle dans la région du Bas-Congo et propose l'esquisse d'une séquence culturelle au long de la côte de l'Océan Atlantique.

Keywords Democratic Republic of the Congo · Early Iron Age · Late Iron Age · Muanda group · Kitona group · Archaeozoology · Archaeobotany

Introduction

The Late Holocene, after ca. 4000 BP (Walker et al., 2019), witnessed the establishment of the first pottery-producing people in Central Africa, initially in the northwest of the region, in Cameroon, around the Sanaga River ca. 3200 cal BP. From there, they slowly expanded southward to reach the Congo River ca. 2300 cal BP (de Maret, 2013, 2018). Later, after acquiring iron metallurgy, communities expanded into eastern and southern Africa (Huffman, 2007; Mitchell, 2002; Phillipson, 2005). As P. de Maret put it (2013, p. 636–627):

> … complex populations movements starting north of Central Africa resulted in the progressive colonization of a vast area further south and multiple interactions and admixture with its previous inhabitants. While they did not come as a single "Bantu package," over time several parallel and interacting changes took place with the development of food production, the diffusion of iron metallurgy, and the spread of various crops. These interrelated processes expanded over multiple ecological systems resulting in a mosaic of interconnected situations that kept evolving.

Recent research in human genetics confirms that there were population movements and suggests admixture with indigenous populations at various scales depending on local realities (Choudhury et al., 2021; Gelabert et al., 2019; Gonzalez-Santos et al., 2022; Patin et al., 2017; Rowold et al., 2016; Schlebusch, 2019; Schlebusch & Jakobsson, 2018; Sengupta et al., 2021; Vicente & Schlebusch, 2021; Wang et al., 2020). Overall, this is compatible with a dynamic expansion of a semi-sedentary village lifestyle.

The main expansion of the pottery-producing communities, maybe Bantu-speakers, seems to have moved south along the Atlantic coast through forest and savannas, bypassing the core of the rainforest (Blench, 2012; Clist, 2021; Clist, Denbow, et al., 2023; de Maret, 2018; Lanfranchi & Clist 1991; Nlend 2014; Oslisly, 2006; Vansina, 1990). While some settled the coast of Congo by ca. 2500 cal BP (Denbow, 2014), others moved upstream along the Ogooué River to the Lopé savannas in the center of Gabon (Assoko Ndong, 2001, 2002) and the savannas at the border between Gabon and Congo (Clist, 2021; de Maret, 2018). By ca. 2300 cal BP, others had already reached the savannas or wooded savannas in the border area between the DRC and Angola (Bostoen et al., 2015; Clist, 2006, 2021; Clist, de Maret et al. 2018a; de Maret, 2013, 2018; de Saulieu et al., 2021; Denbow, 2012, 2014; Oslisly et al., 2013; Seidensticker et al., 2021).

Our research questions are fivefold:

1. Are the first villages on the Atlantic Ocean coastline the result of an expansion that occurred during the third millennium BP and started in Cameroon?
2. What were the relationships between autochthonous hunter-gatherers and the earliest village communities?

3. What were the subsistence strategies of the earliest village communities both before and after the advent of iron metallurgy?
4. What was the natural environment at the time of the first settlements, and what types of interaction existed between people and their environment?
5. Was there a rise in social complexity in the area during the Early Iron Age (henceforth EIA), as indicated in southern Cameroon and Equatorial Guinea, where small cemeteries indicate the existence of restricted social classes?

These research questions tie in with the broader research objectives of the BantuFirst project led by K. Bostoen, a cross-disciplinary research program (2018–2023) funded by the European Research Council (ERC) (see https://www.bantufirst.ugent.be/ for further information).

The Coastal Area of the Kongo Central Province

This province is one of the archaeologically better-known areas of Central Africa, but it still offers an incomplete picture (Clist, de Maret et al. 2018a; de Maret & Clist, 2018). Although the first excavations by J. Colette were conducted as early as 1925 at the Pointe de Kalina in Kinshasa (Bequaert, 1938), the list of later research focusing on the first villages and pottery-making people and with ^{14}C dates is very short (de Maret & Clist, 2018, Fig. 1).

West of the Mayumbe range and the town of Matadi, as well as in other parts of the DRC, Stone Age artifacts have been occasionally collected on the surface since the late nineteenth century (Stainier, 1899, p. 10). Surveys begun by Dartevelle (1934a) were continued by G. Mortelmans in 1957 in preparation for the 1958 Panafrican Congress of Prehistory held in Kinshasa (personal communication, P. de Maret). This produced hundreds of stone tools now curated at the Royal Museum for Central Africa in Tervuren (Belgium). The first author has briefly studied these. Although potsherds are mentioned by Dartevelle (1950, p. 18, 20) in association with shell middens along the Congo River, pottery was found only later in archaeological surveys and test excavations near Boma in 1980 (de Maret, 1981) and Muanda in 1986 (Kanimba Misago, 1987). Two kilometers upstream from Boma, de Maret (1981, p. 35) identified a possible EIA settlement with "a high concentration of atypical potsherds," which was later dated to ca. 1758 cal BP (de Maret, 1985, p. 138; Table 1).

Kanimba Misago (1987, p. 21) mainly reports historical sites, most dated to the nineteenth century, except for two possible EIA sites, i.e., Ngoyo, which yielded the lower half of a flat-bottomed pot and potsherds at 150 cm depth. These sherds are distinct from those recovered in more recent layers at Kivela, where a layer 30 cm above the water level contained iron slag, numerous pottery pieces, and one intact pot. Unfortunately, these materials were never dated and could not be relocated for further study at the Institute of National Museums of the Congo (IMNC) in Kinshasa. The only dated pottery finds from near Boma have been recently reported by Matonda et al. (2021) with two ^{14}C dates, i.e., ca. 1374 and ca. 1539 cal BP (Table 1). On the southern bank of the Congo River in Soyo (Angola), the only test excavations so far reported have yielded Late Iron Age data (henceforth LIA) related to the Kongo Kingdom (Abranches, 1991, p. 168–175).

The need for better documentation of the earliest villages between the coast and the Mayumbe range is of major importance. This zone is geographically intermediate between two areas where early settlement histories are better documented, the Atlantic Coast of Congo (Denbow, 1990a, b, 2012, 2014) and the central part of the Kongo Central province of the DRC, 300 km apart (Clist, 1982; Clist, Hubau, et al., 2019; Clist, Kaumba, et al., 2019; de Maret, 1986; Gosselain, 1988). In the cultural sequence of these two areas, a pre-EIA settlement phase, dated to ca. 2500 cal BP in Congo (Denbow, 2014) and ca. 2300 cal BP in the DRC (Clist, de Maret et al., 2018a; de Maret, 1986), is followed by an EIA phase, each with one or more distinctive pottery groups, dated to ca. 2060 cal BP in Congo and to ca. 1900 cal BP in the DRC (Clist, de Maret, et al., 2018a, b; Clist, Hubau, et al., 2019; Clist, Kaumba, et al., 2019; de Maret, 1990, 2013; Denbow, 2014).

New Research in the Kongo Central Province

In October–November 2018, surveys and excavations were carried out as part of a larger archaeological campaign in the Kongo Central province of the DRC. This vast area covers 53,920 km^2 between the

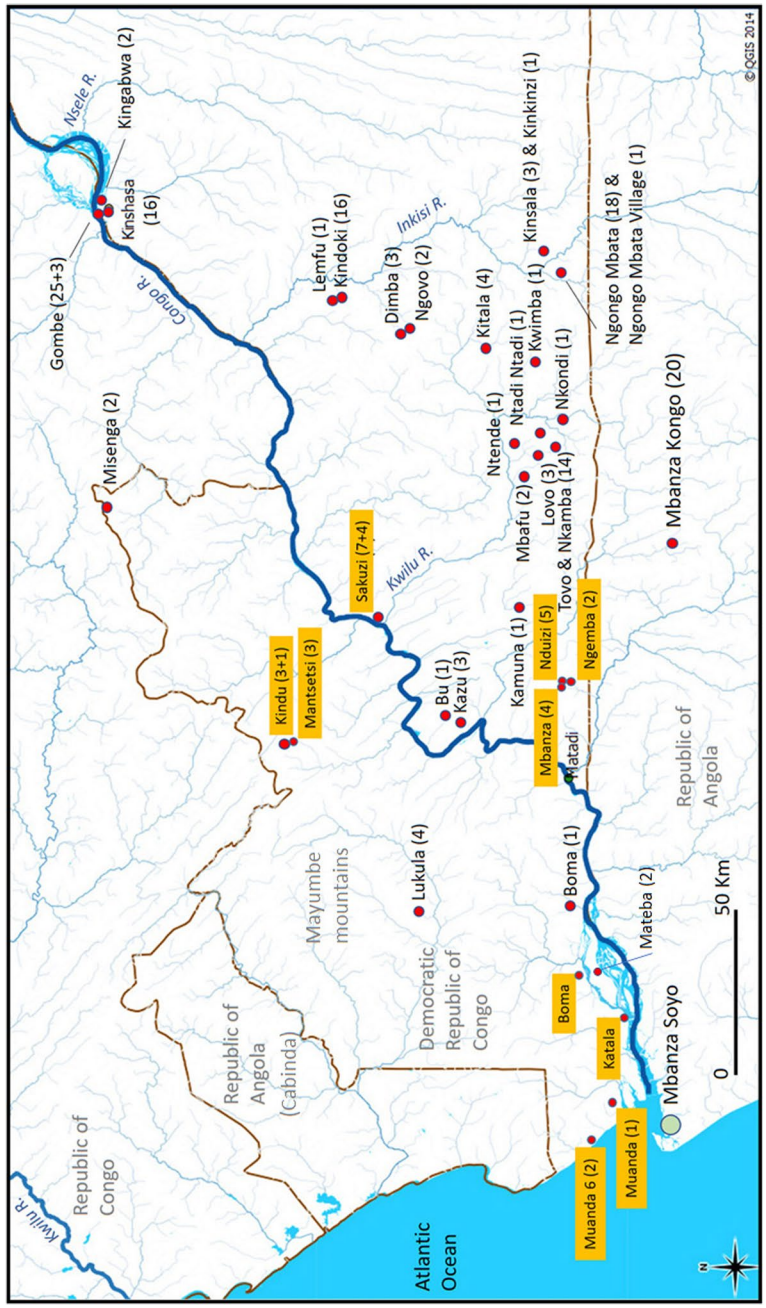

Fig. 1 Excavated and dated Stone Age and Iron Age sites in the Kongo Central and Kinshasa provinces and northern Angola [The number of ^{14}C dates obtained for each site is indicated in parenthesis. Sites studied in 2018 are highlighted in yellow.]

Table 1 Archaeological radiocarbon dates from the coastal area sites: Boma, Mateba island, Muanda 6, and Muanda 13

Site	Lab. ID	Date bp and 1 *o* error	cal BP 95.4% and probability	$\delta^{13}C$	Material
Boma	Hv-10834	1870 + / − 105	1530–2003, 100%	?	Charcoal (Ch)
Mateba Island	Poz-84609	1680 + / − 30	1426–1445, 6% 1448–1589, 92.5% 1600–1607, 1.5%	?	Charred kernels of Elaeis guineensis (En)
Muanda 6	RICH-26746	1605 + / − 26	1375–1391, 7.3% 1403–1529, 92.7%	− 19.9	En
Mateba Island	Poz-84657	1540 + / − 30	1309–1428, 97.3% 1441–1453, 1.4% 1460–1471, 1.2%	?	En
Muanda 6	RICH-26741	1525 + / − 26	1311–1409, 100%	− 21.8	En
Muanda 13	RICH-26752	1262 + / − 25	1063–1178, 93.3% 1214–1229, 3.4% 1248–1260, 3.3%	− 25.9	Ch

country's capital Kinshasa and the Atlantic Ocean. The province can be subdivided into lands to the west and east of the Mayumbe mountains or west and east of the town of Boma (Fig. 1). We specifically focus here on the region to the west of the Mayumbe to present the Iron Age assemblage from the Muanda 6 site and its associated ceramics, archaeozoological materials, and wood charcoal, while also presenting the results of our test excavation at Muanda 13. We then attempt a first reconstruction of the cultural history of the wider Muanda area, drawing together excavated and surface-collected pottery to present a preliminary chrono-cultural sequence.

The fieldwork is one of the six archaeological expeditions the BantuFirst project has organized since 2018 to fill gaps in the archaeological record of the Lower Congo and adjacent regions. The five others were devoted to the lands east of the Congo River (Coutros et al., 2022; Matonda & Bostoen 2022; Matonda et al., 2019; Seidensticker et al., 2018).

Coastal Setting

Geology

The schistose-crystalline soils of the Mayumbe Mountains transect the Lower Congo region from north to south (Fig. 1). Toward the Atlantic Ocean in the West, the schistose-crystalline rocks of the Pinda Group are covered first with banks of red sandstone (Mayumbe sandstone), then with a flaky sandstone sometimes containing limestone that probably dates back to the Cretaceous and is related to bituminous and asphalt-bearing strata. Further north, along the Cabinda coast, cliffs displaying well-layered, fossil-rich Eocene or Miocene soils are found. Many igneous rocks, such as granite, diorite, or diabase, protrude through the old grounds (Baudet et al., 2013a, b, c). The coastal area is covered by loamy sands (Fig. 2). They are considered to be Cenozoic, sandy deposits of continental origin which at the coast make up marine terraces of sandy texture (Dartevelle, 1934b; Van Meirvenne et al., 1994, p. 74, 79). Alluvial soils are predominant in the Congo Plain toward Boma, outside the present study area (Baert, 1995, p. 14).

Geography

The coastline of the DRC is about 37 km long and is oriented south-southeast to north-northwest. It is subdivided into three cliffs by two estuaries and one sandy coastal belt. The northernmost cliff stretches from the Cabinda border to the Kubinamini River, and the central one between the Kubinamini and Tonde Rivers. The southernmost, the Muanda cliff, starts at the Tonde River and stops abruptly south of Muanda. A sandy belt stretches for another 10 km from there to Banana and the Congo River. The coast is subdivided into a coastal plain ca. 8 km in width with a maximum altitude of 50 m where Muanda 6 is located. This is interrupted to the east by a plateau that sometimes rises to above 100 m where Muanda 13 is located (Fig. 2). Both locations are similar to

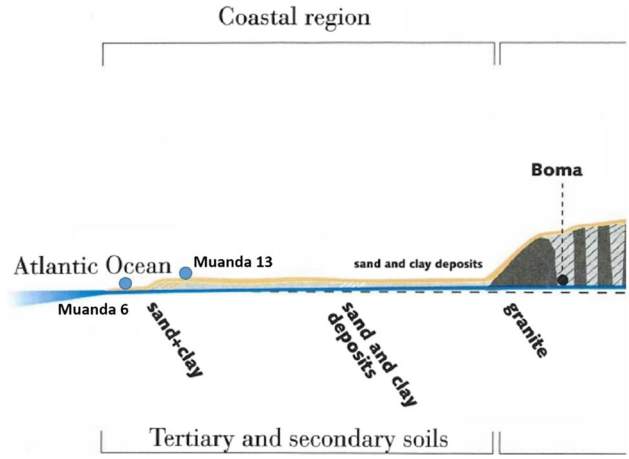

Fig. 2 Geological profile of the DRC coastal region and position of the excavated Muanda 6 and 13 sites. The high ground to the east and Boma corresponds to the start of the Bangu range (adapted from Felix et al. 2003, p. 38, "Geologic section along the Congo River")

ones found by James Denbow on the coast of the Republic of Congo (Denbow, 2014, p. 71–75).

Climate and Vegetation

Current mean rainfall is less than 900 mm/year, but less than 800 mm around Muanda, the lowest for the Kongo Central province (Baert, 1995, p. 7). The overall vegetation is a grass savanna (Fig. 3) mainly composed of *Ctenium newtonii Hyparrhenia diplandra*, *Panicum congoense*, *Digitaria milanjiana*, *Andropogon gayanus*, and *Andropogon africanus*. Shrub savanna supports *Annona arenaria*, *Vitex madiensis*, and *Hymenocardia acida* (Baert, 1995, p. 25). Wide gallery forests exist along the rivers; some large patches of forests can also be found in restricted parts of both the coastal plain and the plateau. Forests become dominant as one moves further inland toward the Bangu range, which limits the coastal sands. Clayey deposits with forested savannas give way to forests further east (Dartevelle, 1950). A survey of the entire stretch of land from the ocean to the inland plateau between the northern Angolan border and the Congo River found no major geographical constraint that would have limited prehistoric contacts between communities. The only possible dividing line was a steep slope of about 80 m that separates the coastal plain with its savannas, gallery forests, and mangroves from the higher plateau covered with savannas, gallery forests, and forests.

Modern Land Use

The modern economy relies on slash-and-burn agriculture. Families exploit about 1 hectare per household. Cassava (*Manihot esculenta*), peanuts (*Arachis*

Fig. 3 View of the savanna on sandy material at the Muanda 6 site with excavation of unit 1 in progress

hypogaea), sweet potato (*Ipomoea batatas*), banana (*Musa* L. AAA), plantain (*Musa* L. AAB), and beans (*Phaseolus vulgaris*) are grown. Vegetable crops include eggplant (*Solanum melongena*), tomato (*Lycopersicon esculentum*), chili pepper (*Capsicum* sp.), cabbage (*Brassica* sp.), and amaranth (*Amaranthus cruentus*). Fruit trees like avocado (*Persea americana*), safou (*Dacryodes edulis*), and oil palm (*Elaeis guineensis*) are planted, along with several varieties of citrus (*Citrus sinensis*, *Citrus reticulata*, *Citrus limon*; Baert, 1995, p. 26–27; Vambi N'tambu et al., 2018, p. 23). Fishing is a major activity that has developed around the modern town of Muanda. In 2008, fewer than 10 engine-powered boats existed, which in 2018 had grown to over 300 used by 10,000 registered fishermen. Traditional use of the waterways (ocean, rivers, and mangroves) is also attested, and about 2000 dugouts have been documented (Vambi N'tambu et al., 2018, p. 24).

Muanda 6 Site and the Muanda Style Group

Following our systematic strategy of interviewing local inhabitants encountered in the foot surveys to help locate sites, we encountered a farm hand who led us to a pottery concentration with white shells isolated in the savanna, i.e., the Muanda 6 site. It is located north of Muanda town in an open grass and shrub savanna with few trees (S. 5° 53′ 20″; E. 12° 17′ 52″, Fig. 3). It lies approximately 16 m above sea level, 350–500 m from the coastal cliff. The ceramics turned out to be of a type never reported in the archaeological literature. The shells were identified as *Tympanotonos fuscatus*, a brackish water invertebrate living in mangrove rivers and mud bottoms. Identical shells were found in Oveng (Gabon) and dated to c. 1800 cal BP (Clist, 2005, p. 541–588; Van Neer & Clist, 1991). A shell midden is always associated with good conservation of animal and fish bones due to its high pH value (for example, 8.3–8.5 pH at Oveng). This good preservation of organic materials helps to understand the local subsistence pattern. Locating and excavating such a site is thus of prime importance.

The areal extent of the shell deposit at Muanda 6 was estimated to be around 64 m^2. Three 1 m^2 test-pit units were opened to confirm this and to verify whether a preserved archaeological layer was present. Each had its topsoil scraped to a maximum of 5 cm and its vegetation removed (Fig. 3). Unit 1 was situated in the middle of the shell concentration, unit 2 was placed 10 m to the south of unit 1, and unit 3 at 10 m to the north. Midden remains were only found in unit 1, with a thickness of about 50 cm. An archaeological horizon extending from the midden was also found in units 2 and 3 at −40/−50 cm, the same depth as the base of the unit 1 midden. We performed flotation on soil samples taken from unit 1 to recover macro-botanical remains, but no archaeological organic materials were found. Systematic on-site dry sieving with 6-mm, 2.5-mm, and 1-mm meshes produced artifacts and ecofacts in all three units.

The distance between the cliff and the EIA settlement must have been originally greater than today. With coastal erosion, the cliff is now retreating at an estimated rate of 1 m per year (Mwamba Nyembo, 2007, p. 19). A similar rate of erosion has been reported to the north along the coastline of Congo-Brazzaville, between Pointe-Noire and the mouth of the Kouilou River (Malounguila-Nganga et al., 2017), where prehistoric coastal shell middens are thought to have been washed away (Denbow, 2014, p. 34). At Diosso, Sitou et al. (1996, p. 188) estimate that 1.4 m of coastline was lost yearly to the ocean, a figure similar to that found in the DRC. Such rapid coastal erosion was already noted in colonial times (Devroey & Vanderlinden, 1933, p. 115), and an abandoned hotel restaurant, built in the 1950s in the small town of Vista north of the Muanda 6 site, today has its front terrace hanging over the cliff (observation by BC in 2018). Considering the age of the archaeological site, if a similar erosion rate had occurred in the past, Muanda 6 would have been at least 2 km away from the coast/coastal cliff when the site was occupied. It was not then, in a proper sense, a coastal site.

Stratigraphy and Archaeological Site Formation

The Muanda 6 settlement was buried in the sand of the coastal plain from a depth of 40 to 50 cm below the present surface, as shown by the vertical distribution of potsherds in units 1 to 3 (Fig. 4). The summit of the prehistoric midden visible on the modern surface, with its seashells from the mangrove, fish, mammalian remains, shell and stone beads, and a quern, suggests the midden was at least half a meter thick. No internal stratification was visible in the midden layer, suggesting it grew at a fairly constant rate over

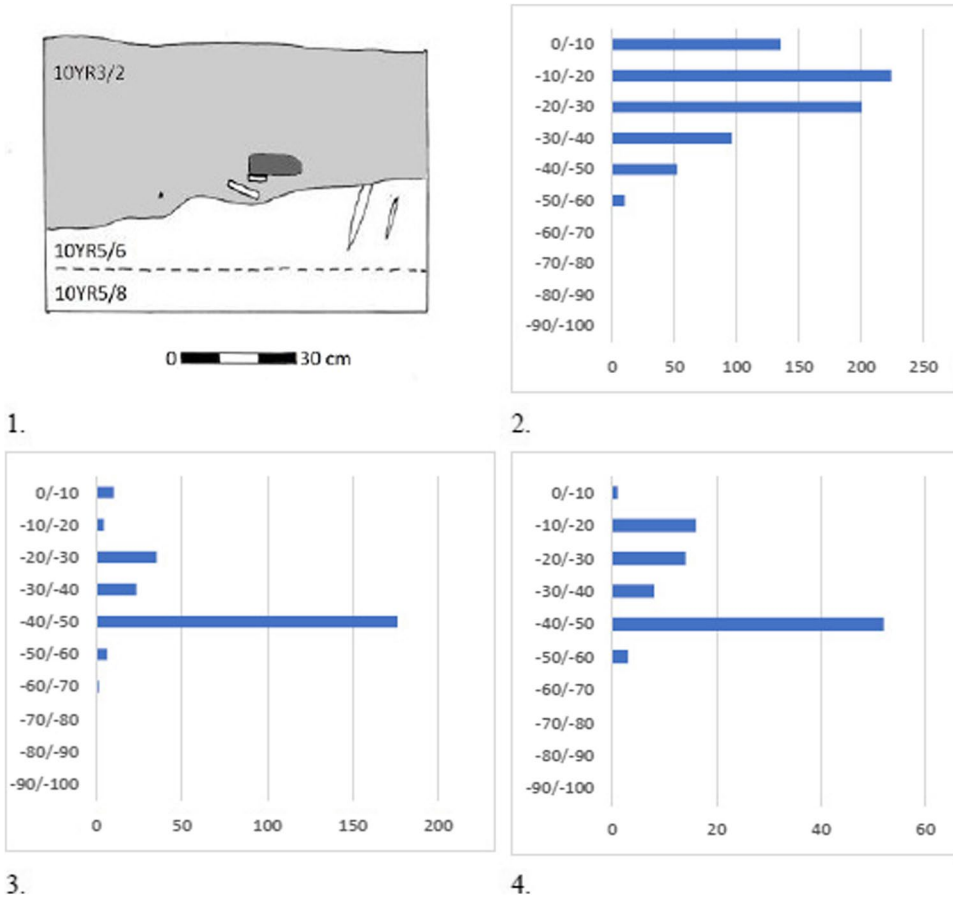

Fig. 4 South profile of unit 1 (**1**); potsherd vertical distribution and numbers from unit 1 (**2**); potsherd vertical distribution and numbers from unit 2 (**3**); and potsherd vertical distribution and numbers from unit 3 (**4**)

time (Fig. 4. 1). But potsherds were not evenly spread across the site, and there is differential intra-site artifact density both vertically (within unit 1) and horizontally between units 2 to 3 (Fig. 4).

The three units excavated show that the seashells were dumped at a specific location in the settlement, in and around unit 1. The high pH value of this area explains why fish and mammal bones were well preserved in unit 1 but not in units 2 and 3, where no seashells were deposited. The pottery from the three units is very homogeneous (see OSM 1). The absence of clear internal stratification in the midden, the several refittings of sherds found from top to bottom of the midden in unit 1, and the consistent style of the pottery assemblage point to a single occupation, perhaps extending for some time before the villagers rotated their settlement. The two units lying outside the midden show a concentration of artifacts at 40/50 cm depth (units 2 and 3). The few potsherds collected in the 50/60 cm spit underneath the settlement layer originated from trampling by the inhabitants. Also, well-known post-depositional movements in similar coastal sandy soils—especially due to termite action—explain the location of pottery between the archaeological layer and the modern surface (in Congo, see Denbow, 2014, p. 192–212). Some of the potsherds were probably extracted from their original position by regular hoeing by later villagers and slowly brought to the surface. This has been shown to be likely for a major Kongo Kingdom settlement (Clist, Bigoe, et al., 2018; Clist, Cranshof, et al, 2018; Clist, de Maret, et al., 2018a, b; Clist, Nikis, et al., 2018). Further excavations will probably clarify this issue in the future.

Chronology

All the archaeological ^{14}C dates from Muanda 6 and Muanda 13 (see Table 1) were calibrated at 2 sigmas using the Calib 8.2 software (http://calib.org/calib/) and the SHCal20 Southern Hemisphere correction tables (Hogg et al., 2020). All the calibrated dates are presented at 2-sigma, and their probable time range is provided. At Muanda 6, two AMS radiocarbon dates were obtained from carbonized endocarps of *Elaeis guineensis* (Table 1). Sample RICH-26746 was obtained near the base of the midden in unit 1 at − 30/ − 40 cm, while in unit 2, the dated endocarp of RICH-26741 comes from − 40/ − 50 cm (Fig. 4. 3). The two Muanda 6 calibrated dates on palm nuts are understood as indicative of short-term material deposits. If Muanda 6 is a single deposit, we should have RICH-26746 (shallower) younger than RICH-26741 (deepest), which is not the case. We must not forget (i) the deposits are in sandy soil where vertical displacements of material are possible, and (ii) the excavation was carried out using 10-cm-thick spits where *Elaeis* fragments from unit 1 could have lain at 40 cm depth the same as those from unit 2. At 2-sigma, there is a slight overlap of the calibrated dates at 1403–1409 cal BP, and the median calibrated dates of 1457 and 1359 cal BP are 100 years apart. Looking at the results without considering the probabilities, from unit 1 we find a 1375–1529 cal BP range and from unit 2 we get a 1311–1409 cal BP range; the chronological overlap is extended. The present data, which need to be strengthened by further excavations, clearly point to an extended occupation (ca. 1375–1410 cal BP) which possibly lasted several generations (ca. 1360 to 1460 cal BP) as suggested by the stable pottery style found throughout the deposit and the potsherd conjoins of the midden. Table 1 shows Muanda 6 falls between the two dated layers of the Mateba island site, and is much later than the Boma date. We will address this in our final discussion.

Pottery

For the ceramic analysis, we followed the protocol proposed by Orton et al. (1993) for temper sorting, density, and roundness. For other typological aspects, we relied on the protocol developed at Brussels University (Belgium) for the study of Central African pottery as refined by a series of PhD theses in Cameroon, the DRC, and Gabon (Assoko Ndong, 2001, 2002; Clist, 2005; de Maret, 1978; Gouem Gouem, 2011; Livingstone-Smith, 2001; Mbida Minzie, 1996; Nlend Nlend, 2014) and more recently by papers and books about the Kongo Central EIA and LIA pottery (e.g., Clist, Bigoe, et al., 2018; Clist, Hubau, et al, 2019; Clist, de Maret, et al., 2018a, b). The use of a similar methodology by most scholars allows for easier comparisons between ceramic assemblages across the region and beyond as these typologies are also comparable to the ones used in Southern Africa (e.g., Huffman, 2007, 2017) and the neighboring Congo (Denbow, 2014). The specific protocol followed here is available online (Clist, 2005, p. 89–142). At Muanda, a preliminary sampling of potsherds for petrographic analysis and later detailed laboratory study was also conducted for comparison with work done on Kongo Kingdom terracottas (Saelens, 2016; Tsoupra, 2017; Tsoupra et al., 2022).

In OSM 1, we describe the operational sequence of pottery manufacture similar to that used in ethnographical studies (Gosselain, 2010; Livingstone-Smith, 2010). We examined the clay fabrics, hardness, and clay colors in order to get an insight into shaping and firing procedures. Thickness, shape, and evidence of roughing-out techniques were outlined to determine shaping traditions. The decoration was described using a systemic approach that combined catalogs of decorative elements and units and the way these are organized on pottery surfaces to develop an overall pattern or tradition. Lastly, recording degrees of fragmentation and clay weathering helps us understand possible post-depositional processes (Cailleux, 1981; Clist, 2005, 2012, p. 175–177; Druc, 2015; Huffman, 2017; Livingstone-Smith, 2001; Orton et al., 1993). The site yielded 1028 potsherds that were unevenly distributed across the three units (OSM 1, Tables S1–S3). The shell midden alone contained 686 potsherds spread over 60 cm in depth. Here we highlight the main characteristics of the pottery found at Muanda 6.

The high fragmentation of the pottery (98% ≤ 7 × 7 cm) and the small number of conjoins limit the reconstruction of the vessel's overall shapes. Regarding the pots' profiles, the bottoms are convex, and the mostly undecorated bodies are convex, with necks that are often concave or straight, suggesting a

spherical or ellipsoid shape. General shapes could be determined on 77 vessels (Fig. 5, nos. 1–9: jars, nos. 10 and 11: bowls). The mean wall thickness was 8–9 mm. Several coil breaks were identified, showing that at least the upper part of the vessels, the body/neck, were made by coiling. The thickened lips of the jars were probably made from a single final coil. Five convex-shaped bottoms have distinct lump-like thickening. The bowls' lips are convex in shape, while the jars are characterized by thickened lips with limited variation around the basic design. The extended lip is often flat, though it may sometimes be convex (Fig. 5, nos. 4 and 9).

The decoration is limited to the lip, neck, and the area immediately below it on the upper part of the vessel. Decorations are organized into peripheral bands, usually as a single band (Figs. 5 and 6) or, rarely, two (Fig. 6, C5). The lower part of the neck and the body are left undecorated, as reflected in the small number of decorated sherds in the assemblage (31%). Horizontal single-point stick tracings or incisions dominate decoration motifs on the vessel's surface (Fig. 5, nos. 3, 6, 7, and 9; Fig. 6, B2, B3, B6–B7, C3, C6, and C8), with single-point stab impressions or incisions organized in a single horizontal or diagonal line at the base of the lip (Fig. 5, nos. 7 and 9; Fig. 6, A2–A3, A10), to border decoration bands (Fig. 5, nos. 8 and 10; Fig. 6, C5), or less often as a double row or punctates on the neck (Fig. 6, B5). The use of a horizontally traced comb stamp is well attested (Fig. 5, nos. 2 and 5; Fig. 6, B1, B8, C1). Diagonal bands of comb stamping are rare but sometimes occur on the lips (Fig. 5, no. 3–4) or the neck (Fig. 6, B4, C7). Handles or lugs, appliqué decoration, internal decoration, half single-point stick impressions, geometrical designs, and flat bottoms are unknown. The detailed pottery analysis of the Muanda 6 assemblage is in OSM 1, accompanied by Figs. S1–S5 and Tables S1–S3.

In terms of geographical distribution, similar pottery assemblages were found during the 2018 surveys at Katala along the Congo River (Fig. 7, nos. 1 and 2), at Muanda 8 near the Cabinda border (Fig. 7, nos. 3–8), and two other oil platform sites near Muanda 13. We believe surveys around Boma and in Cabinda (Angola) west of the Mayumbe mountains would lead to discovering more sites with Muanda ware. Due to its distinctive characteristics and observed geographical extension, we define the pottery at Muanda 6 as the "Muanda style" or "Muanda Group."

Shell, Stone, and Metal Artifacts

Apart from pottery, the site yielded five beads (Fig. 8), one stone quern, one "pierre à cupules," and three pieces of iron slag. The five beads were found in unit 1 between − 20 and − 50 cm; they are c. 3 × 3 mm to 6 × 6 mm across and 1 mm thick on average, with perforations of about 1.5 mm in diameter (Table 2).

Four beads (Fig. 8, nos. 1–4) were made from marine shells. This was determined based on their thickness, concavity (Fig. 8, no. 4), and presence of ornamental ribs (Fig. 8, no. 1), which have wavelet shapes when abraded (Fig. 8, nos. 1a and 1b). The original surface of all beads is quite altered, sometimes revealing the structure of the marine shell (Fig. 8, nos. 1 and 3). Given these attributes, we can be sure that none were made of ostrich eggshells or a land snail (*Achatina*) shell (Miller et al., 2018). The original polish is sometimes partially present (Fig. 8, no. 2b). Three of the beads are circular (Fig. 8, nos. 2–4), while one is irregular in shape (Fig. 8, no. 1). The fifth bead is made of stone that has not yet been identified (Fig. 8, no. 5). The original shape of the stone bead is difficult to determine, but the interior hole seems to have been drilled from both sides with a tapered-tip tool different from that used for the shell beads.

The Muanda 6 sandstone quern was discovered in the midden near the base of the archaeological layer (Fig. 4, no. 1). It is 18.7 cm wide, 22.7 cm long, and 6.07 cm thick. Its upper side has five cups, three of which are well developed, probably due to its frequent use for crushing nuts (possibly of *Elaeis* sp.). Its lower side has two semi-circular parallel traces 8.3 cm apart (Fig. 9). The fragment of a cup stone (< 30 mm) was recovered from unit 1 at − 10 cm. Three pieces of iron slag were found in units 1 (at − 30/ − 40 cm, sizes > 70 mm and < 30 mm) and 2 (at − 30/ − 40 cm, size > 30 mm).

Charcoal

No wood-derived charcoal was recovered from Muanda 6. However, numerous fragments of oil palm endocarps (*Elaeis guineensis*) occurred at − 40/ − 60 cm in units 2 and 3 and throughout the midden in unit 1. This indicates oil palm trees were growing nearby ca. 1375–1410 cal BP. Today oil palm groves occur no closer than 2–7 km away.

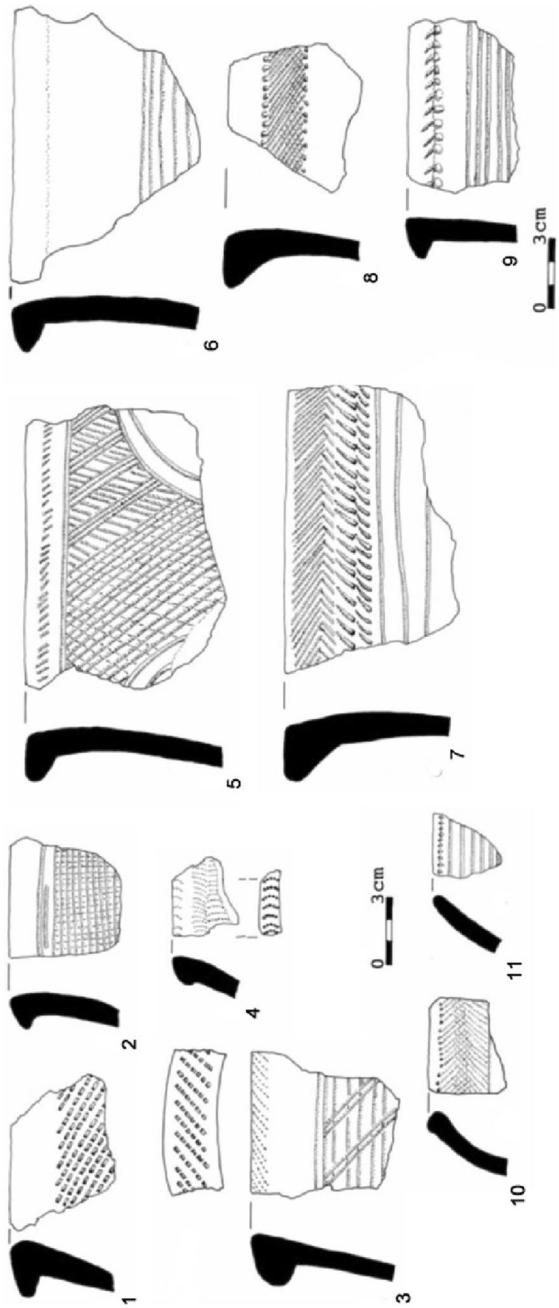

Fig. 5 Muanda group pottery (shapes and examples of decoration) from Muanda 6 (cf. Appendix 1 for others)

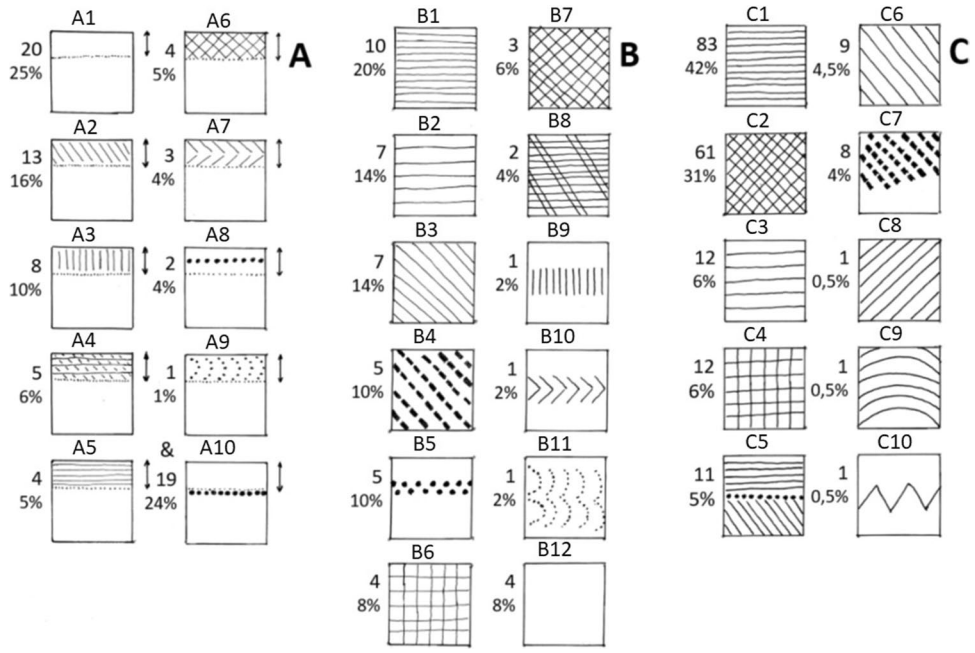

Fig. 6 Muanda 6, decoration catalog of the lips (**A**), necks (**B**), and shoulders (**C**) of the vessels with their numbers and relative percentage

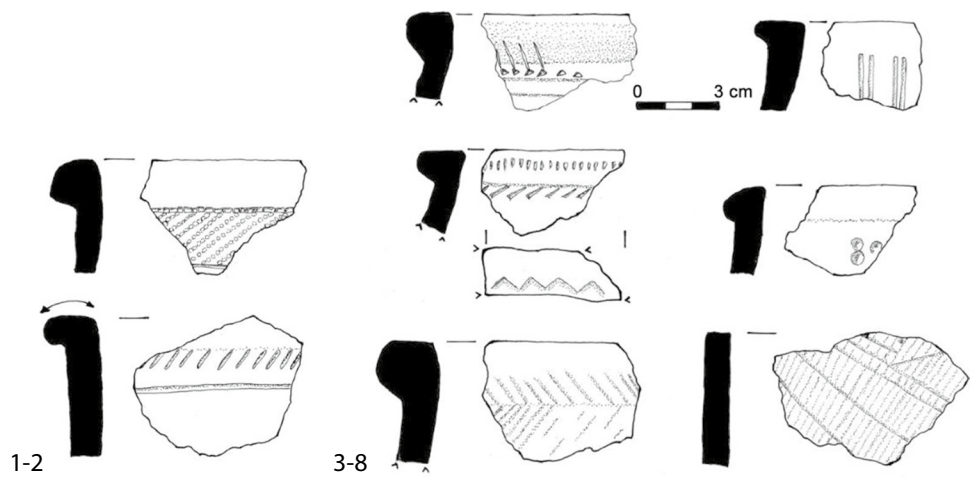

Fig. 7 Muanda group pottery from Katala (1–2) and Muanda group pottery from Muanda 8 (3–8)

Archaeozoology

Without regional reference collections, the identification of the marine fish, mollusks, and crustaceans relied on examples of living marine resources of the Eastern Central Atlantic published by Carpenter and De Angelis (2016). The scientific nomenclature follows the international standards of the *World Register of Marine Species* (http://www.marinespecies.org). To distinguish the relative importance of each species, several quantification methods were used (Claassen, 1998): the number of remains (NR), the numbers of right and left valves (RV and LV), the minimum number of individuals (MNI), and

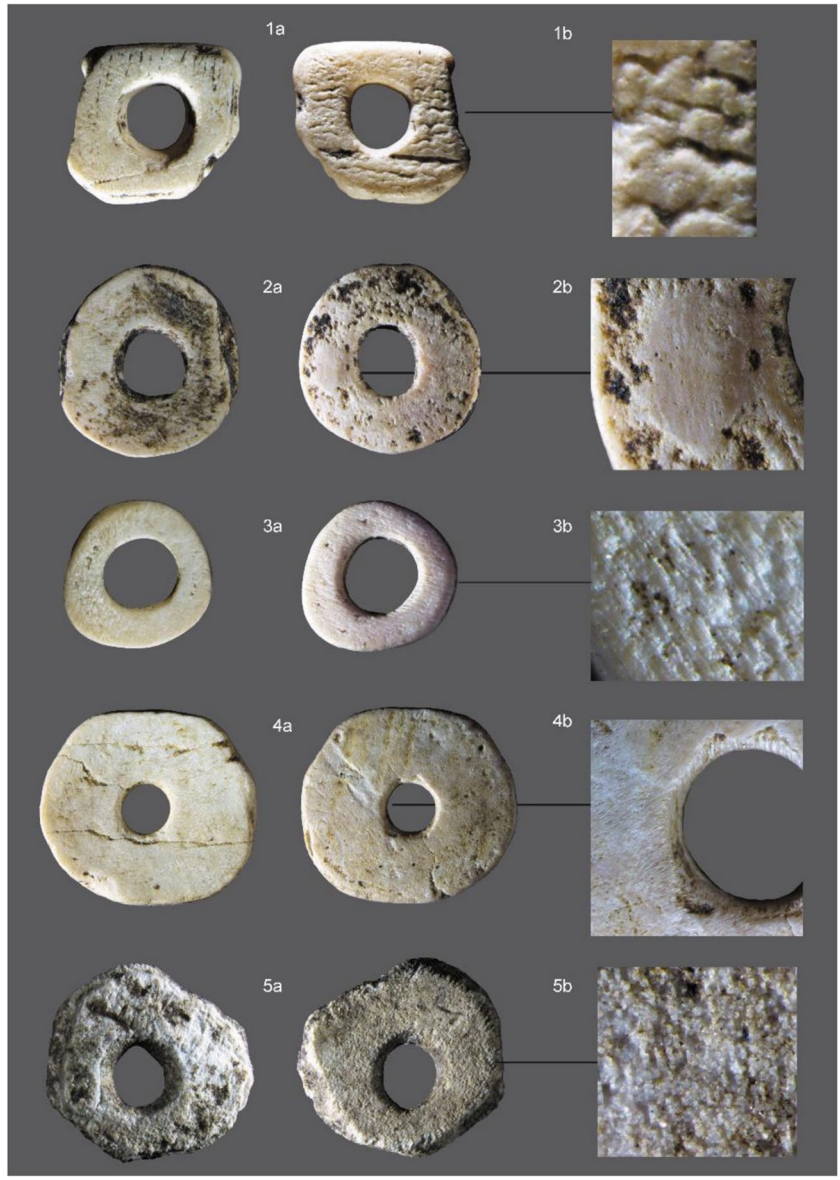

Fig. 8 Shell (1–4) and stone (5) beads from Muanda 6

Table 2 Measurements of the Muanda 6 beads

No	Depth (cm)	Material	Length (mm)	Width (mm)	Thickness (mm)	Hole diameter (mm)
1	−20/−30	Sea shell	4.59	3.91	1.03	1.5
2	−20/−30	Sea shell	4.43	4.19	0.79	1.7
3	−30/−40	Sea shell	3.31	3.17	0.67	1.7
4	−40/−50	Sea shell	6.16	5.93	1.02	1.4
5	−20/−30	Stone	4.79	4.26	1.08	1.6

the mass of the remains weighted to the hundredth of a gram (0.01). The analysis of the mammalian remains was carried out at the National Museum of Natural History in Paris (France) with the help of reference specimens from the Comparative Anatomy collections.

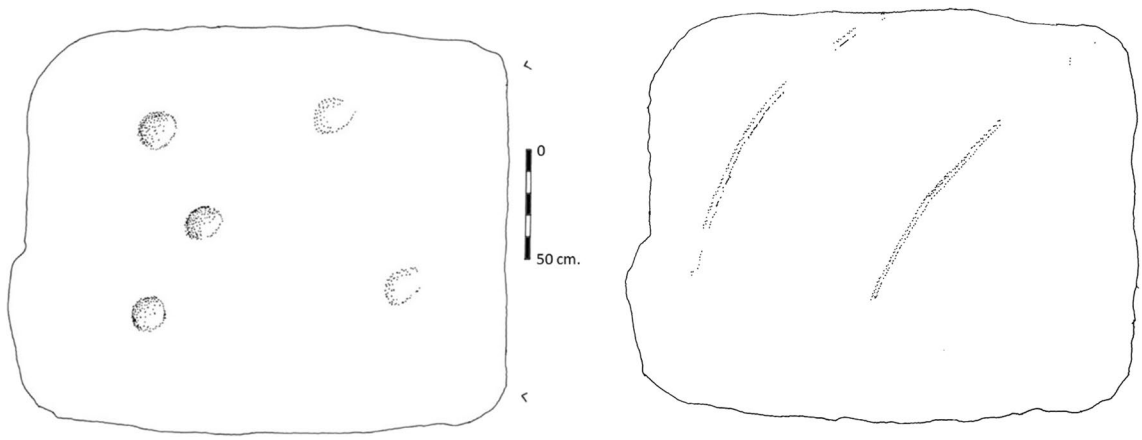

Fig. 9 The sandstone quern from unit 1

Mollusks and Crabs

At least ten species of marine invertebrates are present in the collection. These include nine mollusks (five bivalves and four gastropods) and at least one crab species (Tables 3-4; Figs. 10-11). The latter could not yet be identified at the species level. The bivalves include *Donax rugosus*, which lives in the surf zone and sheltered bays along open coasts; *Petricolaria* cf. *gracilis*, which lives by boring into various hard intertidal substrates; *Senilia senilis*, whose habitats are estuaries, lagoons, and mangroves; and two unspecified oyster species. Gastropods are represented by *Pugilina morio*, which live mainly in mangroves and river estuaries; *Stramonita haemastoma*, on rocky bottoms in shallow water; *Thaisella coronata*, common in mangroves; and *Tympanotonos fuscatus*, abundant on the mud flats of estuaries and in mangrove swamps.

Remains of 164 (NR) marine invertebrates with a mass of 386.04 g, approximately 88 MNI, were collected (Tables 4 and 5). All species in the series are edible, and the collection probably represents kitchen waste. Indeed, the size of the mollusks is larger than 15 mm, a size also consistent with ethnographic reports of marine mollusks collection (Gruet & Dupont, 2009, p. 561). The five crab remains have heating traces (Table 4), probably indicative of preparation prior to consumption (Table 4).

Fish

Despite a very limited number of remains (N = 37), at least four fish families were identified: Aetobatidae (eagle rays), Ariidae (sea catfishes), Sciaenidae (croakers), and Serranidae (groupers) (Table 5). Otoliths were the most commonly identified element (NR = 4, see Fig. 11). Unlike the Oveng site in Gabon (Van Neer & Clist, 1991), fish vertebrae are rare at Muanda 6 (NR = 1) despite careful dry sieving. This could indicate different fish preparation and discard processes between the two regions. Catfish (*Carlarius* sp.) dominate the assemblage, especially their dorsal and pectoral serrated spines, which are venomous and could cause very painful wounds (Seret, 1986). Most are small individuals of 200–300 g, with one much larger. They are followed in numbers by croakers (*Pseudotolithus* sp.), with at least one individual weighing approximately 3.5 kg. A small eagle ray (*Aetobatus narinari*) and a small comber or grouper were also recorded.

Mammals

The mammalian assemblage was meager (N = 74) and poorly preserved. The bones are quite fragmented, and no dental remains were found, severely limiting the species' identification. Most were small mammals. Four bones come from Cephalophinae, or duiker, while five came from medium-sized mammals and another 65 from small mammals. Their small size and the absence of anthropogenic traces on the remains prevent us from determining whether they represent animals consumed by the inhabitants or whether they

Table 3 Marine mollusks identified at Muanda 6, unit 1

Site information		Identification					
Unit	Depth	Taxon	NR	RV	LV	MNI	Mass
Survey	Surface	Bivalve					
"	"	*Donax rugosus*	6	2	4	4	3.26
"	"	Gastropods					
	"	*Pugilina morio*	1	0	0	1	64.72
"	"	*Stramonita haemastoma*	1	0	0	1	3.55
"	"	*Thaisella coronata*	4	0	0	3	11.02
"	"	*Tympanotonos fuscatus*	84	0	0	51	106.54
"	"	Muricidae	1	0	0	1	1.34
"	"	Total bivalves and gastropods	97	2	4	61	190.43
1	0/−50 cm	Bivalve					
"	"	*Senilia senilis*	4	0	0	2	34.91
"	"	*Donax rugosus*	1	0	1	1	1.42
"	"	*Petricolaria cf gracilis*	5	1	3	3	1.29
"	"	Tellinidae	1	0	0	0	0.08
"	"	Veneridae	1	0	0	1	0.70
"	"	Ostreoidea	3	0	0	1	29.24
"	"	*Neopycnodonte cochlear*	1	0	1	1	17.28
"	"	Ostreidae	1	1	0	1	30.87
"	"	Unidentified	1	0	0	1	0.01
"	"	Total bivalves	18	2	5	11	115.8
"	"	Gastropods					
"	"	*Stramonita haemastoma*	2	0	0	2	28.75
"	"	*Thaisella coronata*	7	0	0	4	41.49
"	"	*Tympanotonos fuscatus*	9	0	0	5	6.56
"	"	Unidentified	16	0	0	2	1.63
"	"	Total gastropods	34	0	0	13	78.43
"	"	Total from excavation:	52	2	5	24	194.23
		Total from unit 1	149	6	9	85	384.66

Table 4 Unidentified crab fragments at Muanda 6, unit 1

Numbers			Detail on numbers				Observations
NR	NMI	Mass	Claw	Left dactylopodite	Dactylopodite ind	Shell	Heated
15	3	1.38	7	3	3	2	5

were burrowers that died in situ after the human occupation. The few medium-sized Cephalophinae remains, however, probably represent kitchen waste. This subfamily of small bovines includes many species found in African equatorial forests, even though high fragmentation and the absence of metric data prevent identification to species level. One of the remains (a calcaneus) shows heating traces, suggesting it may have been roasted.

The Muanda 13 Site and the Kitona Style Group

Muanda 13 is the only site we test-excavated from the systematic survey of dozens of onshore oil platforms around Muanda, where we walked their surface, examined their profiles, and checked their soil heaps (Fig. 12). At Muanda 13, two pits were visible, dug from a buried village horizon at −20 cm running all along the exposed 65 m

Fig. 10 Main marine mollusks identified at the Muanda site 6, unit 1. 1, *Pugilina morio* (*L* = 97 mm); 2, *Senilia senilis* (*L* = 53 mm); 3, *Donax rugosus* (*L* = 26 mm); 4, *Tympanotonos fuscatus* (*L* = 35 mm); 5, *Petricolaria* cf *gracilis* (*L* = 40 mm); 6, *Ostreidae* (*L* = 78 mm); 7, *Stramonita haemastoma* (*L* = 43 mm); 8, cf. *Neopycnodonte cochlear* (*L* = 75 mm); 9, *Thaisella coronata* (*L* = 33 mm). * *L*, maximum length

Fig. 11 From left to right, right otolith from a *Pseudotolithus* sp., dorsal spine from a *Carlarius* sp. (scales of 5 mm), and unspecified crab dactylopodites (length: 15 mm)

Table 5 Number of identified fish at Muanda 6, unit 1

Taxon	NR	NMI	Mass
Chondrichthyes Batoidea (rays)			
Aetobatus narinari	1	1	0.2
Unidentified	1	1	0.03
Actinopterygii (ray-finned fishes)			
Ariidae (*Carlarius* sp.)	10	5	9.62
Sciaenidae (*Pseudotolithus* sp.)	2	1	3.18
Serranidae	1	1	0.07
Unidentified	22	0	8.36
Total	37	9	21.46

of the platform's eastern profile; both were fully excavated using 10-cm spits.

Context

Muanda 13 (S. 5° 58′ 11″; E. 12° 26′ 43″) is situated southeast of Muanda and east of Banana, at some 8 km from the coastline. It lies at 65 m above sea level on the sandy soils of the plateau overlooking the coastal plain to its west (Fig. 2), with mangroves 2 km to the south. A square oil-drilling platform cut into the modern savanna of the plateau exposed pottery in its northern and eastern profiles. A careful examination of the eastern profile recorded a single and continuous settlement layer at − 20 cm. This was composed of potsherds, wood charcoal, and stones that ran all along the 65-m-long platform's profile (Fig. 12), suggesting a large village. Two similar cylindrical pits of 50 cm width were identified that had been dug to − 100 cm below the occupation layer (Fig. 13); they were excavated by 10-cm spits with all their contents dry sieved. Pit 1 contained potsherds and wood charcoal, while pit 2 only held wood charcoal. No evidence of mangrove use was found in the occupation layer or the pits.

At Katala (S. 5°57′59″; E. 12°43′45″), a survey of the long bank profile found potsherds of the Muanda group (Fig. 8, nos. 1 and 2) stratified under the houses of a village situated on the bank of a river inside the Mangrove National Park. Other sherds similar to Muanda 13 (Fig. 14, nos. 11–16) found at a higher level are significantly larger than sherds from other sites, indicating they were less trampled after discard.

Chronology

Muanda 13 is dated by one wood-derived charcoal sample collected at − 70 cm in pit 1 (Table 1). RICH-26752 has a 93.3% probability of dating to 1063–1178 cal BP. The assemblage from Muanda 13 appears to be three centuries younger than Muanda 6. This is confirmed by the finds from Katala, where vessels were found stratified over Muanda group pots.

Pottery

During our 2018 surveys, Muanda 13 and Katala pottery was found at eight additional sites between the Congo River and Cabinda (Table 1). We have named it the "Kitona style" or "Kitona Group" after the modern village near the Muanda 13 site. As illustrated in Fig. 14, it has few typological similarities to Muanda ware. The pottery from pit 1 is thinner and lacks the characteristic thick lips of Muanda 6. Most of the sherds are either undecorated or have a unit of horizontal comb tracings (Fig. 14, nos. 2, 6, 7) under the lip (Fig. 14, no. 2). A comparison with decorated

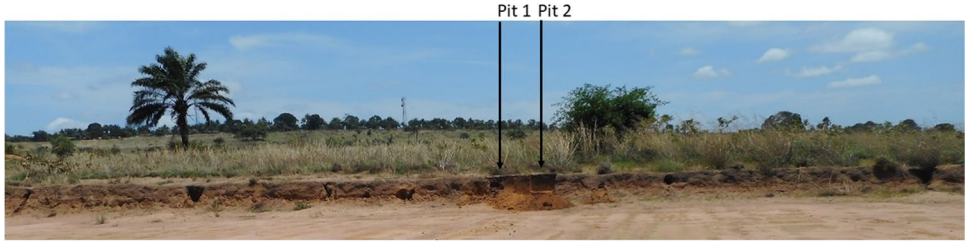

Fig. 12 Eastern profile of the oil platform at Muanda 13, showing the position of the pits

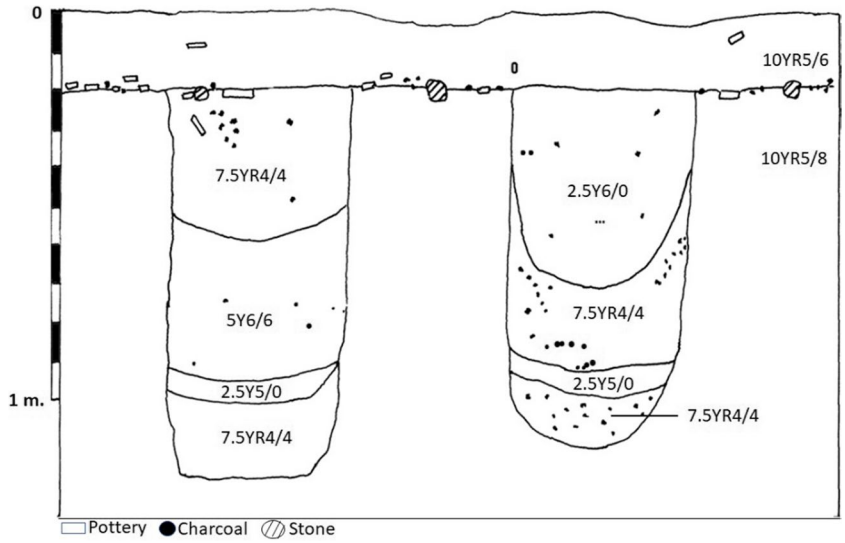

Fig. 13 East profile of the oil drilling platform at the Muanda 13 site

potsherds from other sites, especially those from Katala, clearly shows that the decoration layout is confined to the upper part of the vessels and bounded by one or more horizontal tracings (Fig. 14, nos. 8, 10, 13–15). Several sherds from Muanda 13 suggest the presence of geometrical designs (Fig. 14, nos. 6 and 8), some with a comb impression (Fig. 14, no. 8). This is confirmed by Katala (Fig. 14, nos. 13–15). The small assemblage from Muanda 13 did not preserve any vessel bases that would enable us to verify whether they were convex in shape. However, the long profiles from Katala strongly suggest they were, confirmed by a unique thick convex-shaped bottom (14.8 mm). The only slight similarities between the Muanda and Kitona assemblages are some thickened lips (Fig. 14, nos. 3 and 4) and frequently out-turned rims (Fig. 14, nos. 1, 2, 5) that are reminiscent of a few out-turned rims at Muanda 6. In other words, Kitona ware is not only chronologically distinct from Muanda 6, being younger (cf. supra), but its occupants also produced a distinct style of pottery. Further research will determine whether there is a continuum between the Muanda and Kitona groups or a clear discontinuity in their pottery-making techniques and styles.

Charcoal

Charcoal identification and interpretation were carried out at the Service for Wood Biology at the Royal Museum for Central Africa (Tervuren, Belgium). Endocarp-derived charcoal fragments were found in large quantity in all three units excavated at Muanda 6, whereas wood-derived charcoal fragments were found at Muanda 13. These were obtained from the fillings of two pits dug from a buried archaeological horizon. Twenty charcoal fragments from Muanda 13 (pit 1 at a depth of 55–60 cm) were selected for identification, using reflected light microscopy (RLM) and following the Central African identification protocol described in Hubau et al. (2012). Fragments were assembled into types that generally represent a group of species rather than one single species. Charcoal types were described applying the numbered anatomical features used for the online InsideWood database (Hubau et al., 2012; IAWA Committee, 1989; Inside Wood Database, 2016; Wheeler, 2011).

All the fragments belonged to a single wood type identified as *Annea laxiflora*, a shrub or tree that grows to 10–25 m in height and 30–90 cm in diameter, with small buttresses at the base (African Plants Database 2020). Mackinder and Wieringa (2013) have shown it lives in primary forests near waterfalls, along rivers, in valleys, on sides and tops of hills, and rocky ground; it is confined to the southern Mayumbe forest (Congo Brazzaville and DRC) and is present in northwestern Angola. It regenerates abundantly in forest patches and savanna-forest mosaic landscapes to the east (DRC) and south (Angola) of the Mayumbe mountains (Mackinder & Wieringa, 2013) where *A. laxiflora* is locally dominant, especially in the Luki reserve about 100 km from Muanda (Deklerck et al., 2019).

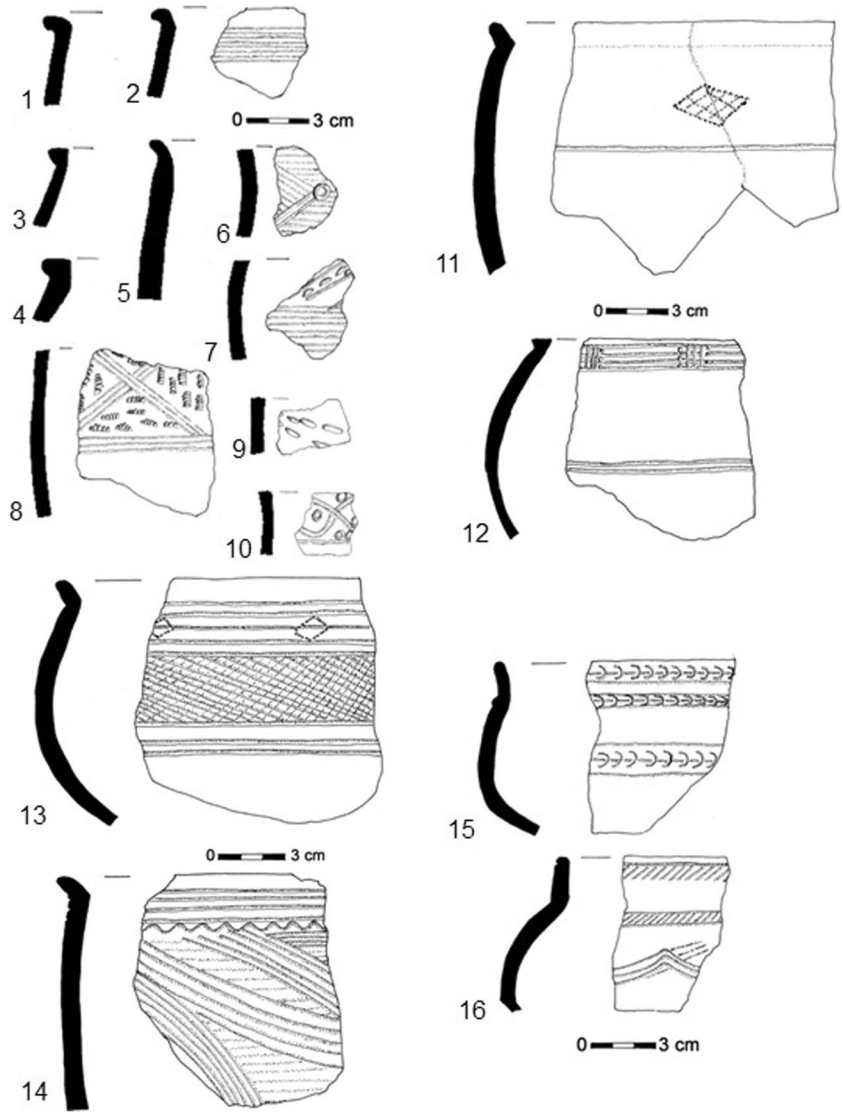

Fig. 14 Kitona-style pottery from Muanda 13, unit 1 (1–10) and Katala (11–16)

The presence of *A. laxiflora* in Muanda 13 indicates that some fuelwood was collected in forests, forest patches, and gallery forests ca. 1100 cal BP. In modern times, it is not recognized as useful to local communities (Latham & Konda ku Mbuta, 2010). Large patches of forest are now present to the east and south of the Muanda 13 site, while gallery forests fringe the savanna areas to the west and north. *Annea laxiflora* does not occur in mangrove environments, but we cannot conclude that this ecosystem was neglected for fuelwood collection based on a single charcoal assemblage. Excavations at Katala will verify whether wood procurement was situationally dependent on the location of each village.

Surface-Collected Pottery of the Bela Tshola Style

Apart from pottery directly related to the Muanda and Kitona Groups, found between the Congo River and the border with Cabinda province of Angola, another distinctive series of ceramics is identified in the same area, the Bela Tshola style group. The vessels are always found on the surface or within the first 10 cm of the sand cover. During interviews, the villagers of Bela Tshola confirmed that their parents made and used this type of pottery before pottery manufacturing disappeared on the coast. We can thus propose a nineteenth- and twentieth-century date for this style.

Our selection, illustrated in Fig. 15, shows the standard pot shapes made by coiling and presumably had convex-shaped bottoms. Their decoration units and patterns are limited to a few tracings between the neck and the shoulder, sometimes with another decoration area at the shoulder/body. Some vessels have a carinated profile (Fig. 15, nos. 5, 6, and 8). Using the detailed analysis of the seventeenth- through nineteenth-century Kongo Kingdom cooking pots from central Lower Congo (Clist, Nikis, et al., 2018, p. 264–266, table 19), we can identify a historical connection with the Bela Tshola style pottery, which uses a simplified repertoire of decorations that was common on pots, e.g., the wavy-line motif set up in a similar decoration structure (Fig. 15, nos. 3–6, 9). A reddish slip was applied, and the surfaces were burnished. This has also been recorded in the ethnographic "Kakongo style" found further northeast in the DRC (Kaumba Mazanga, 2022, p. 134–136 and vol. II, pl. 1). This link between Kongo Kingdom times and the modern potters is also found in other parts of the Lower Congo (Kaumba Mazanga, 2022).

Discussion

Cultural history

As noted in our introduction, the Muanda coast connects two areas south of the equatorial forest where early settlements are relatively well documented: the Atlantic Coast of Congo and the central part of the Kongo Central province of the DRC. In both zones, new settlers producing distinctive pottery appear in the archaeological record before the arrival of iron metallurgy. On the Loango Coast, Tchissanga pottery is dated between ca. 2530 and 2190 cal BP (based on 13 ^{14}C dates). Two older dates exist (Tx-5956 and Tx-7020) but the excavator has published his doubts about them (cf. Denbow, 1990a, p. 147, 2014, p. 88). In the Kongo Central province, Ngovo pottery dates between ca. 2290 and 2035 cal BP (based on 8 dates, Clist, de Maret et al. 2018a; de Maret, 1986).

The EIA along the coast started ca. 2060 cal BP (J. Denbow pers. comm.) and was characterized by four successive pottery styles until ca. 1250 cal BP (Denbow, 2014): the Herringbone (based on

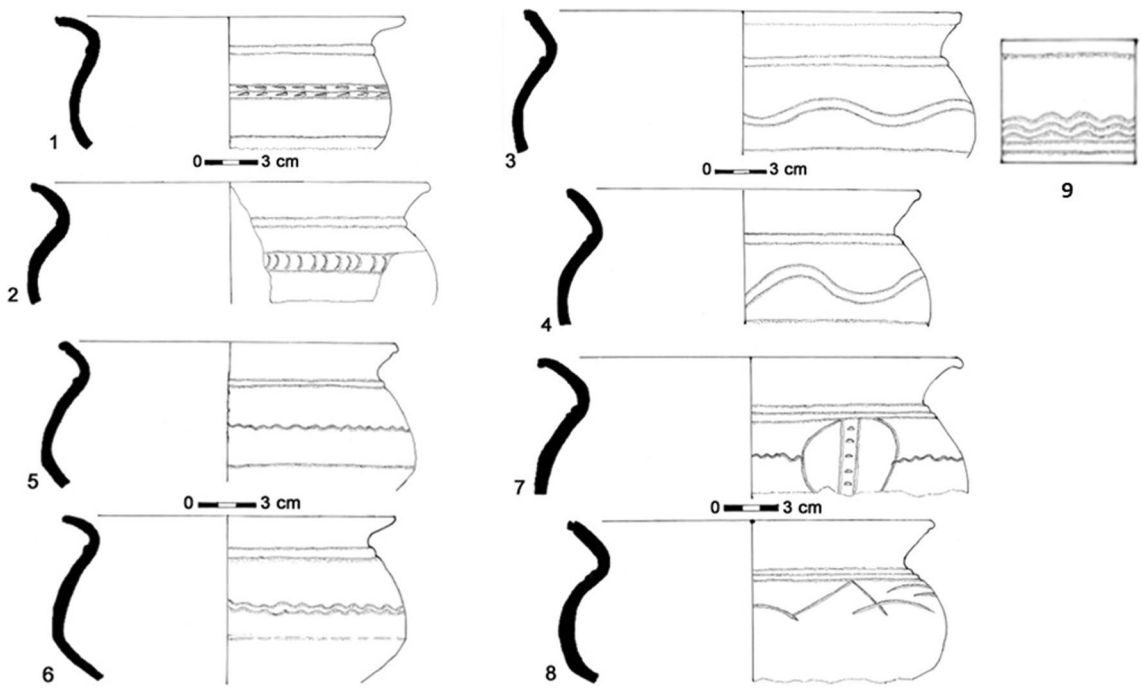

Fig. 15 Bela Tshola-style group, showing the diversity of decorative units within an identical decoration structure

11 dates: ca. 2060–1440 cal BP); a "different and as yet poorly known tradition" (Denbow, 2014, p. 71–72, based on 3 dates: ca. 1790 to 1410 cal BP); the carinated broadly grooved or CBG ceramics (based on 2 dates: ca. 1640–1610 cal BP), and the spaced curvilinear or SC tradition (based on 2 dates: ca. 1340–1250 cal BP).

Inland, the EIA started ca. 1940 cal BP with Kay Ladio pottery (based on 17 dates: ca. 1942–1661 cal BP, Clist, Hubau, et al., 2019; de Maret, 1990; Gosselain, 1988), followed by Kitala pottery (based on 4 dates: ca. 1710–1551 cal BP, Clist, Kaumba, et al., 2019), and, further east, by Gombe pottery sites in the Kinshasa area (AD 305–350 or ca. 1645–1600 cal BP, based on 3 TL dates, Cahen et al., 1983; de Maret & Stainier, 1999). The Muanda 6 settlement, which dates back to ca. 1410–1375 cal BP, does not correlate with any phases of the EIA from surrounding areas. It only fits with the dating of the spaced curvilinear or SC tradition found along the coast, 170 km further north in Congo. Also, the Tchitembo Lake shell midden site in the Congo is dated to ca. 1460 cal BP and shows a similar use of the coastal biome (Denbow, 2014).

Typologically speaking, however, apart from having the same convex-shaped bottoms found throughout the EIA in coastal Congo, the pottery from Muanda 6 is different from the SC wares (Denbow, 2014). In contrast to Muanda ware and the styles from coastal Congo, all the EIA productions in the Kongo Central province east of Boma, both north and south of the Congo River, have flat-bottomed pottery. Within the Kongo Central province, the Muanda group only bears similarities to the D-type pots of the Kongo group, especially in their lip shapes and convex bottoms. But these date to the sixteenth through eighteenth century AD and are associated with the Kongo Kingdom (Clist, Nikis, et al., 2018, p. 267–274). Surprisingly, the only pottery outside the Lower Congo region that shares a few features with Muanda ware is the Carboneras pottery of Bioko Island in Equatorial Guinea, dated from ca. 1490 to 910 cal BP (Clist, 2020). It also has convex-shaped bottoms and outward-oriented thickened rims (Clist & de Maret, 2021). However, the two pottery groups are geographically too distant to posit a plausible historical link.

Early pottery from Cameroon to the DRC appears to have been flat-bottomed well into the Early Iron Age and sometimes even into the Late Iron Age. Convex bases do exist on a few of the earliest village sites, but they are rare (see examples from pit III of the Obobogo site in Cameroon ca. 2600 cal BP, see Claes, 1985, p. 9, vol. 2: plates 29–30). Later, they appear to be a standard feature in specific areas and cultural groups: the EIA Carboneras group on Bioko Island in Equatorial Guinea since ca. 1500 cal BP (Clist, 2020; Clist & de Maret, 2021), the LIA Nandá and Angondjé groups, along the coast of northwest Gabon and southern Equatorial Guinea since ca. 1360 cal BP (Clist, 2005, 2021; Sánchez-Elipe Lorente, 2015; Sánchez-Elipe Lorente et al., 2016), the EIA "Herringbone ware" from ca. 2000 cal BP on the coast of Congo (Denbow, 2014), and the Muanda group ca. 1410–1375 cal BP on the DRC coast. However, ceramics from west of the Congo River do not show the same contrast of flat-based to convex-based pots as features delimiting EIA from LIA, as Seidensticker et al. (2021) have suggested for the Inner Congo Basin. Convex-based pottery also appears irregularly in the Cameroon Neolithic and EIA. It later became common in some of the EIA ceramic groups before becoming standard in the LIA, while some regions during the LIA only featured flat-bottom pottery. For example, at Kindu in the Lower Congo, flat-bottom pottery was found late in the LIA, dated to ca. 634 cal BP (Clist, Nikis, et al., 2018, p. 243–244). Likewise, in the Lopé group in central Gabon dated from ca. 820 cal BP (Assoko Ndong, 2002, p. 152–153) and in the Lom Pangar area of eastern Cameroon, flat-bottom pots still make up some 75% of the vessels ca. 560 cal BP (Gouem Gouem, 2019, p. 126). All of these suggest that this standardization was an irregular process, perhaps going hand in hand with a change in the daily use of the pottery related to changing culinary and social practices. More fieldwork is needed along the Atlantic Ocean coastline before we can assess the possibility of long-distance connections between these coastal communities and their relation with inland people, especially between Bioko Island and Muanda. The surprising discovery of this Muanda group underscores an urgent need for further excavations to improve its chronological anchoring and to reinforce our observation that during the Iron Age, the Lower Congo region had more variation in ceramics than previously suspected (Clist, Kaumba, et al., 2019).

While awaiting new ^{14}C dates for the Muanda group to determine its temporal variation around 1375–1410 cal BP, the preliminary identification of the Kitona group (ca. 1100 cal BP) further highlights the need for increased research in this badly understood Middle Iron Age time range when these communities thrived. Both the Muanda and Kitona groups co-existed at a time when others hypothesized that a regional population crash occurred, ca. 1550-–950 cal BP (Seidensticker et al., 2021), further weakening the proposal which had been already questioned (Clist, Denbow, et al., 2023). The Kitona pottery is strangely similar to the grammar of the more recent Mbafu group not only by several morphological and decorative aspects (Fig. 16) but also by the way the decoration is organized (see Clist, 2012, p. 189–193; Clist, Nikis, et al., 2018, p. 249–250). Mbafu was part of the ceramic complex used in the Kongo Kingdom and dated to ca. 670–500 cal BP (Clist, 2012; Clist, Nikis, et al., 2018, p. 248–253). Further investigation is needed to confirm the possible linkage between the Kitona and Mbafu potteries. A linkage would indicate continuity in pottery-making traditions from ca. 1100 to 500 cal BP. Any differences between the two traditions would be attributed to normal temporal and technological evolution. Such a relationship would also strengthen the historical and political reconstruction we have presented by identifying a Vungu polity that unified the lands north of the Congo River in the thirteenth century before morphing into the historical Ngoyo Kingdom around Muanda (Thornton, 2018, p. 37–39, 2020, p. 25).

This connection between pottery-making traditions on the DRC coast and sites far inland, north of the Congo River like Misenga, is not found with the Woven pottery further north as described by Denbow in his Congo excavations. There, at Condé and Loubanzi, Woven ware pottery has been dated to ca. 700 cal BP at Condé and ca. 430 cal BP at Loubanzi. These dates

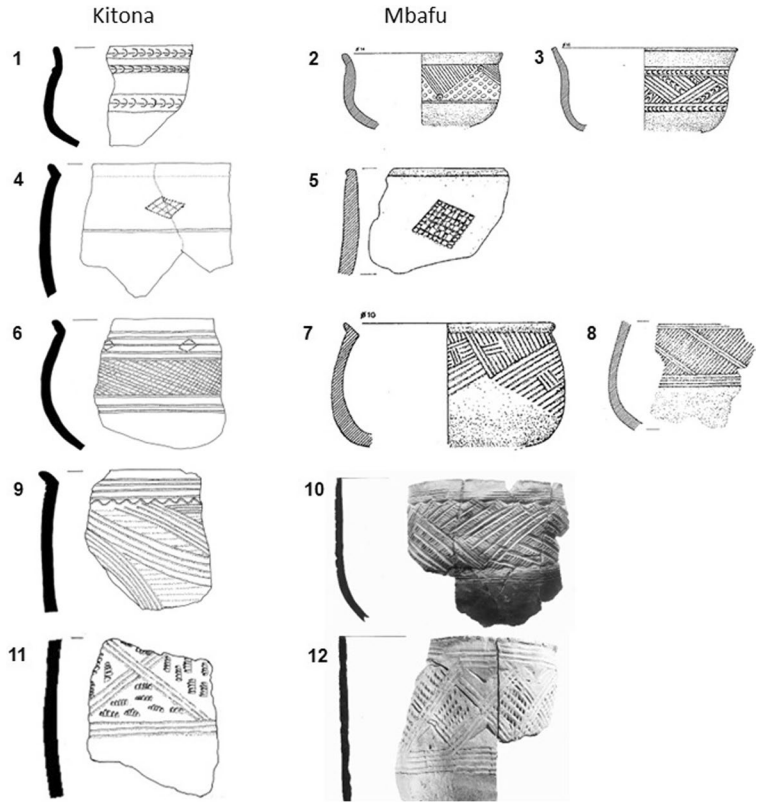

Fig. 16 Comparison between Kitona (Katala and Mouila 13 sites) and Mbafu group potteries (2–3, 5, 7–8 from Misenga site, Clist 1982; 10, 12 from Mbafu cave, de Maret 1972)

place these sites between the Muanda 13 and Misenga dates for Condé and contemporaneous with Misenga at Loubanzi (Denbow, 2014, p. 136–145). This similarity has been elaborated by Denbow (2014) and Cranshof et al. (2018, p. 188–195).

Archaeozoology

The Muanda 6 midden comprises bivalve mollusk shells, gastropod fragments from unidentified crabs, and vertebrate bones. *Tympanotonos fuscatus* made up the highest number of shells. Tetrapod bone fragments are mostly from micromammals (88%) and some middle-sized mammals similar to the Cephalophinae. One mammal bone and some crab fragments show evidence of heating. Fishing was probably carried out in the local mangrove and estuary environment where all the identified fish species live. Fishermen today divide the river fishing season into three periods depending on the amount of rainfall upstream that regulates the salinity of the water (Lucas & Péroches, 2021): (i) in the dry season between July and August when rainfall is limited, oceanic saltwater enters the mangroves, increasing the catch of ocean species (catfish, barracuda); (ii) during the peak of the rainy season in December–January, the water is less saline, bringing down the yield of ocean fish; (iii) the February–June period is intermediate. Another factor is the ocean tides. The best period for capturing crayfish in the rivers and mangroves is in the intervening months of September–December. The bivalve and gastropod species recovered suggest they were collected from estuaries and mangroves (*S. senilis*, *P. morio*, *T. coronata*, *T. fuscatus*, and *O. tulipa*) or along or near the beach (*D. rugosus*, *P. gracilis*, and *S. haemastoma*).

Mangroves are found 6 km to the southeast of the site along the Tonde River (Brian & Dartevelle, 1949, p. 86; Dartevelle, 1950, p. 4–5) and further south on the banks of the Congo River. To the north, they occur north of Vista village (today Nsiamfumu), 2 km to the northwest, and further north near the Cabinda border around the small coastal lagunas of the Kumbi, Masombo, and Lunga Rivers (Brian & Dartevelle, 1949, p. 86). The closest mangroves are thus just 2 km from the archaeological site, but they could have been further away considering the history of coastal erosion and our present ignorance of local climatic changes.

Hunting would have been practiced in the local savanna and forest environments. However, mammal remains cannot be used to discern whether hunting focused on one or the other ecotones, especially since animals may move between them on a daily or seasonal basis.

Dartevelle (1953, p. 1–35) discusses the modern use of several animal species excavated at Muanda. The Woyo people who inhabit the northern shores of the Congo River and the Muanda area use *T. fuscatus* as fishing bait and for fish and crab snares. They also consume several of the species of excavated shellfish (*D. rugosus* and *S. senilis*) and use them for ritual purposes. *Galatea congica*, which are collected today in large numbers from the bottom of the Congo River near the villages of Malela and Katala, are commonly sold in markets, as observed during the 2018 fieldwork and reported by Dartevelle (1950, p. 18, 1953, p. 6–9) in the 1930s and 1950s. They were not found at Muanda 6 (ca. 1375–1410 cal BP). This could indicate that people were not collecting *G. congica* from freshwater ecosystems, or that they were not yet part of the trading system. These mollusks from the Congo mouth were exploited on a commercial scale during the Kongo Kingdom (1300s–1800s) and have been found in excavations as far away as Kingabwa approximately 330 km to the northeast (Dartevelle, 1953, p. 30; Van Moorsel, 1968, p. 231) where they are dated to ca. 305 cal BP (Clist, 2012, p. 196–199). Another interesting species is *Crassostrea tulipa*, an oyster that lives on the mangrove tree roots. They were collected by the thousands at low tide by the inhabitants of Banana who sold them as far inland as Boma (Dartevelle, 1953, p. 9, 11, Fig. 12). It was also not an important component of the Muanda 6 prehistoric midden.

The occupants of Muanda relied intensively on the ocean, river, and mangrove ecosystems, but they also exploited oil palms. So far, we did not find any evidence for agricultural production. More evidence is needed before a clearer picture of the varied subsistence strategy of the early pottery-producing communities in the Muanda region can be determined. The archaeological signature of the preliminary knowledge indicates a mixed subsistence pattern where hunting, fishing in mangroves and the ocean, and collecting crabs, bivalve, and gastropods in mangroves and along the ocean beaches seem to have been the main resources. As soon as

villagers settled on the shores of the Atlantic Ocean, they made limited use of the mangrove resources, collecting some *Anadara senilis* bivalves at Okala (Gabon) around 2230 cal BP (Clist, 2005, p. 256). It is only centuries later, during the EIA and after 2000 cal BP, that shell middens are found on several settlement sites in Cameroon (Mouanko-Lobethal ca. 1800 cal BP, Williams-Schmid, 2001, p. 45–47), Gabon (Oveng ca. 1900 cal BP, Van Neer & Clist, 1991), Angola (Benfica I and II ca. 1800 cal BP, Ervedosa, 1980), and the DRC (Muanda), illustrating a larger reliance on mangrove, coastal, and river resources. Small beads, most of them made from marine shells, were found in Muanda 6 and similar ones have been documented other EIA contexts, at Kitala near Luanda in Angola (Abranches, 1992, p. 76) and Oveng in Gabon (Clist, 2005, p. 572).

Iron Metallurgy

The earliest evidence of iron in the region dates back to ca. 2110 cal BP, from the inland Les Saras site in the Mayumbe, Congo (Schwartz et al., 1990). Along the coast of Congo, evidence of ironworking is found ca. 2000 cal BP and is associated with Herringbone pottery (Denbow, 2014, p. 110, 117, 126). In the Kongo Central province (DRC), the iron production started ca. 1950–1900 cal BP in settlements with Kay Ladio pottery (Clist, Hubau, et al., 2019; Clist, Kaumba, et al., 2019). At Loukoko 1 in southern Congo, it began ca. 1910 cal BP (Dupré & Pinçon, 1997, p. 47). The three pieces of iron slag found at Muanda 6 cannot be considered conclusive evidence for local iron working. However, given the general regional context sketched above, the presence of iron smiths at Muanda centuries after the first iron working activity would not be surprising. The question would then be where they got their iron ore.

Earliest Pottery-Using Settlements on the DRC Coast

Finally, it is important to stress that the producers of Muanda ware were in all likelihood not the first settlers west of the Mayumbe mountains. The single date of ca. 1758 cal BP (Hv-10834 in Table 1) associated with pottery found near Boma (de Maret, 1985, p. 138) possibly points to earlier settlements, as does the undated flat-bottomed pot with iron slag from Ngoyo near Muanda (Kanimba Misago, 1987, p. 21). Although its burial at − 150 cm (compared to − 50 cm for Muanda ware) is not necessarily an indication of older age, the flat base of the pot probably is. As discussed above, flat-bottom pottery is characteristic of all pre-EIA productions in the two Congo and of all EIA wares in the Kongo Central province east of Boma. The Muanda group was probably preceded by earlier settlers in the coastal area north of the Congo mouth whose archaeological signature is not yet clear. The two dates of ca. 1374 and ca. 1539 cal BP possibly associated with Kay Ladio-looking pottery suggest that Kay Ladio-style pottery was still being made when Muanda ceramics were in use (Matonda et al. 2021, Fig. 3).

Although we registered no finds of polished stone axes or adzes on the DRC coast nor Ngovo Group or similar pottery, this does not mean they were not present. Indeed, pieces of evidence from James Denbow's work in Congo and ours in the DRC show that ancient settlement may be buried under 50 cm or more of sterile coastal sand, with no visible evidence on the surface. Fieldwork strategies to identify deeply buried sites need to be developed, especially in the absence of road construction, erosion, or other developments around Muanda that might bring buried artifacts to the surface. In this context, the start of construction work for the new deep-sea harbor at Banana in February 2022 will probably unearth important cultural evidence. However, neither preventive nor rescue archaeological excavations are presently planned. We must wait for additional research and discoveries to test our hypothesis.

Conclusions

The new archaeological findings presented in this article come from a previously underexplored part of the DRC. They support the coexistence of several distinct EIA cultural groups in the Lower Congo region of Central Africa. We have identified a new group, Muanda, found along the Atlantic coast between the Cabinda border and the Congo River mouth. It dates to ca. 1375–1410 cal BP. We identified at Muanda 6 a refuse area consisting of a small mound composed of thousands of shells from species common to mangroves. Fish and animal bones, crab shells, abundant palm tree

endocarps, a stone quern, numerous potsherds, small shell and stone beads, and iron slag were also recovered. This refuse area and its associated buried settlement level were stratified 50 cm below the coastal sand. In addition to evidence for the exploitation of palm trees, the zoological data shows the use of mangroves and coastal resources for fishing, collecting shellfish, and hunting inland game. The use of such multiple sources for subsistence is not specific to the Muanda group, but it is known all along the coast of Central Africa, from Cameroon to Angola. Our multiproxy research approach indicates that the producers of Muanda ware probably lived in a wooded savanna environment, with mangrove and gallery forests nearby. The fieldwork also uncovered evidence of a distinctive Kitona group dated to ca. 1100 cal BP. It is similar to the Mbafu group, a pottery style used in the Kongo Kingdom before its contact with the Portuguese in the late fifteenth century. It is worth emphasizing that both the Muanda and Kitona groups developed between the border with the Cabinda province of Angola and the Congo River at a time (ca. 1400–1100 cal BP) when there was a hypothesized population crash in Central Africa, ca. 1550–950 cal BP. Last but not least, a Bela Tshola pottery style was identified. It is associated with settlements dating to the last two centuries. While this work partly resolves some of our preliminary research questions, it also opens up new perspectives that require further fieldwork in the coastal area of the DRC, and along the coasts in Congo and Angola, to decipher from the data what constitutes a cultural pattern from specific and local idiosyncrasies.

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Data Availability The 2018 material from the DRC coast will be available at the Institut des Musées Nationaux du Congo, Kinshasa, Democratic Republic of Congo. As this article goes to press, it is still in Belgium, at Ghent University, before moving to the DRC.

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