Central African Copper

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Summary

Copper, considered a "red gold," had a major place in the political economy of Central Africa over the past two millennia. Copper was a rare resource. Its ore was only accessible in a few scattered locations in Central Africa, especially the Copperbelt in southeast Central Africa and the Niari basin in the south of Republic of Congo. Until the massive imports of European alloys beginning in the 16th century, only unalloyed and leaded copper objects were produced and used in Central Africa. The first instance of copper smelting in the region is dated around the 5th century AD, much later than for iron, and it has been mainly used over time as a means of exchange, for jewelry, and as material for artworks and decoration of objects. Different techniques have been used over time and space to produce the metal and manufacture the objects, some of them closely related to iron metallurgy. Smelting took place close to the deposits, and diverse processes relating to sociohistorical factors have been identified. Ingots, produced on the smelting sites, were one of the preferred forms for exchange, acquiring in some cases symbolic and/or monetary value. Manufacturing objects could take place far from the smelting place. Because copper and brass can easily be recycled, metal regularly changed shape to fit local needs and tastes.

From the late 1st millennium AD, copper has been exchanged over increasingly long distances in regional networks and, eventually, traded to the Indian and Atlantic Ocean coasts. Rising polities, such as the Kongo Kingdom in the 15th century, would have benefited from access to this resource. More broadly, copper was regularly associated with the expression of power and wealth but was also accessible to a large number of people. In addition to the economic value of copper, metalworking and the figure of the smith were closely associated with power. Copper's physical properties such as color and brightness were also important in its choice as a material for artworks as a way to support and enhance the role of the object.

Keywords: copper, Central Africa, Niari, Copperbelt, brass, croisettes, metalworking, trade, currency, Congo

Subjects: Archaeology

Introduction

Copper holds an important place in the economy of Central Africa in the early 21st century and it have been known and valued for almost 1,500 years as "red gold" (Herbert 1984). It was primarily used to produce ornaments, valued objects and currency while everyday metal objects were typically produced using iron. In addition to the importance of metalworking and the figure of the smith in Central Africa (Dupré and Pinçon 1997; de Maret 1985b), copper's scarcity, durability, and workability, as well as the symbolic aspects of its physical properties—color, luminosity, sound—made it the metal of choice to display wealth and prestige.

The importance of the copper trade has been highlighted in European sources since their first contact with African peoples in the 16th century in the coastal west Central Africa (Pigafetta and Lopez 2002; Ravenstein 1901) and in the 19th century in inland regions (Cameron 1877; Livingstone and Waller 1875; Stanley 1879). Several missionaries and colonial officers took a great interest in indigenous copper production techniques (Dupont 1889; Gutzeit 1934; de Hemptinne 1926; Marchal 1939; Pleigneur 1888) and left a few descriptions of the manufacturing processes and records of oral histories related to the organization of production. They form the core of existing ethnographic and historical sources because the colonial powers ended local exploitation through expropriation and prohibition in the early 20th century (Aguilon 1912; Dupré and Pinçon 1997, 57; Ladame 1921; Marchal 1939, 34). Before the seminal work of Eugenia Herbert (1984), which contributed to highlighting the importance of copper across sub-Saharan Africa, only a few scholars used these historical sources—both oral history and written—and ethnographic data to study the production and role of copper in the societies of Central Africa before the 20th century (Cline 1937; Sundström 1974). Because no textual sources are available for inland areas before the 19th century, we must rely on the material culture, mostly through archaeology, to study more ancient periods. However, only a few production sites in the Niari basin (Nikis 2018a; Lanfranchi and Manima-Moubouha 1984; Manima-Moubouha 1987, 1988) and Copperbelt (Bisson 1976; Anciaux de Faveaux and de Maret 1984) have received archaeological attention. Most of the archaeological copper objects we know come from the gravesites of the Upemba depression (de Maret 1985a, 1992; Nenquin 1963). Technical studies of copper objects also remain limited (Garenne-Marot 2019; Childs 1991).

This article will provide an overview of Central African copper, from extraction, to smithing, to its use and trade, beginning with its earliest known appearance around the 5th–7th centuries AD to the late 19th century. The article will focus mainly on Africa's two major copper deposits, the Niari basin and the Copperbelt (see figure 1).

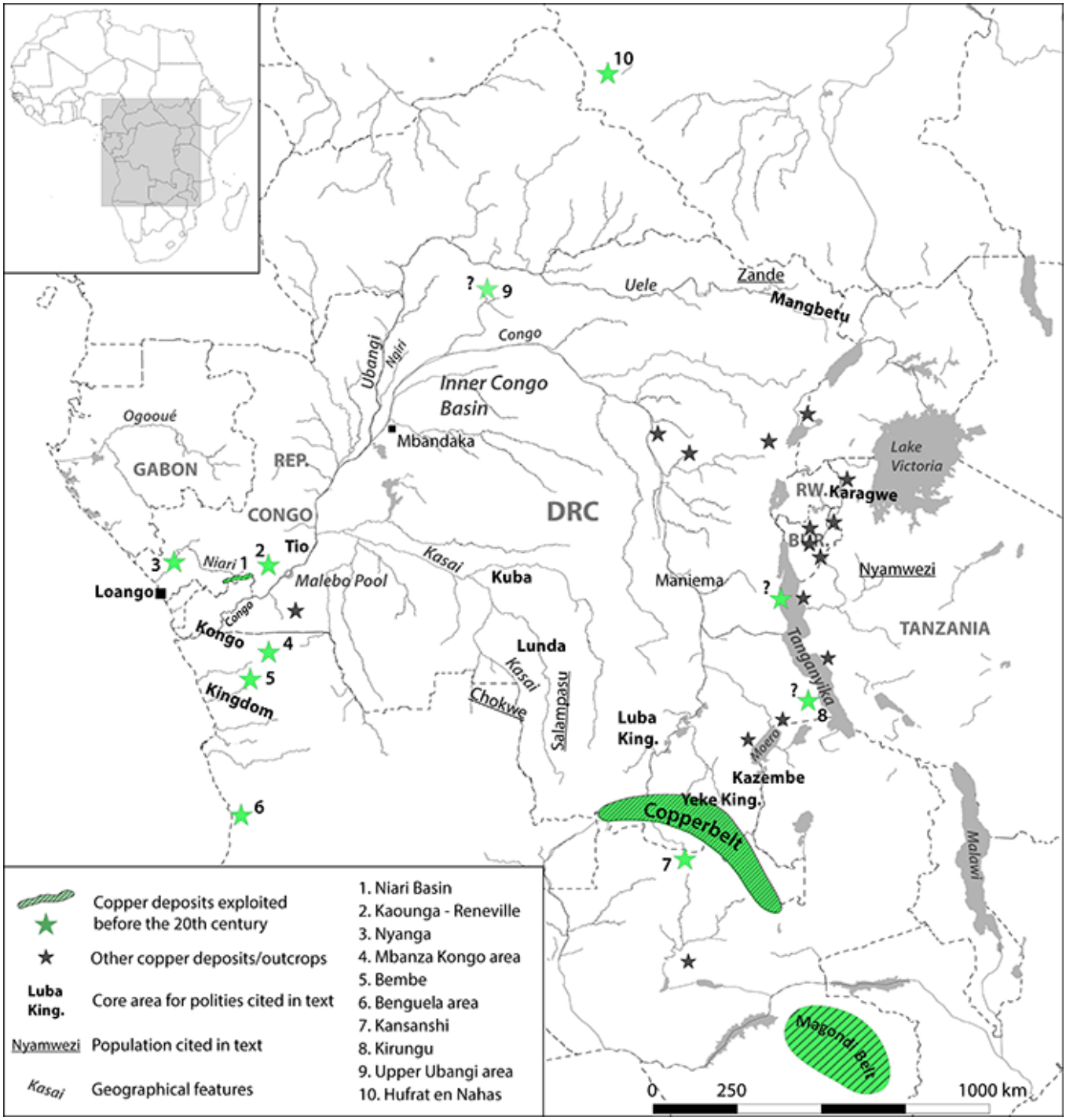

Figure 1. Map of main copper deposits in Central Africa and main geographical features, polities, and groups mentioned in the text.

Source: Nikis, CC-BY 4.0; information for the copper deposits from Bisson (2000); Laghmouch and Hardy (2008); Schulz and Briskey (2005); and US Geological Survey (2005).

The Source of Copper

The oldest evidence for copper production in Central Africa has been identified in the Copperbelt (see figures 1 and 2), at Kansanshi and at the Naviundu sites, and is dated to around the 5th–7th centuries AD (Anciaux de Faveaux and de Maret 1984; Bisson 1976, 185). Evidence for iron smelting is older and, consequently, it is likely that copper smelting techniques have been locally reinvented both in the Niari basin and in the Copperbelt by craftspeople already familiar with ironworking (Mapunda 2013; de Maret 2013).

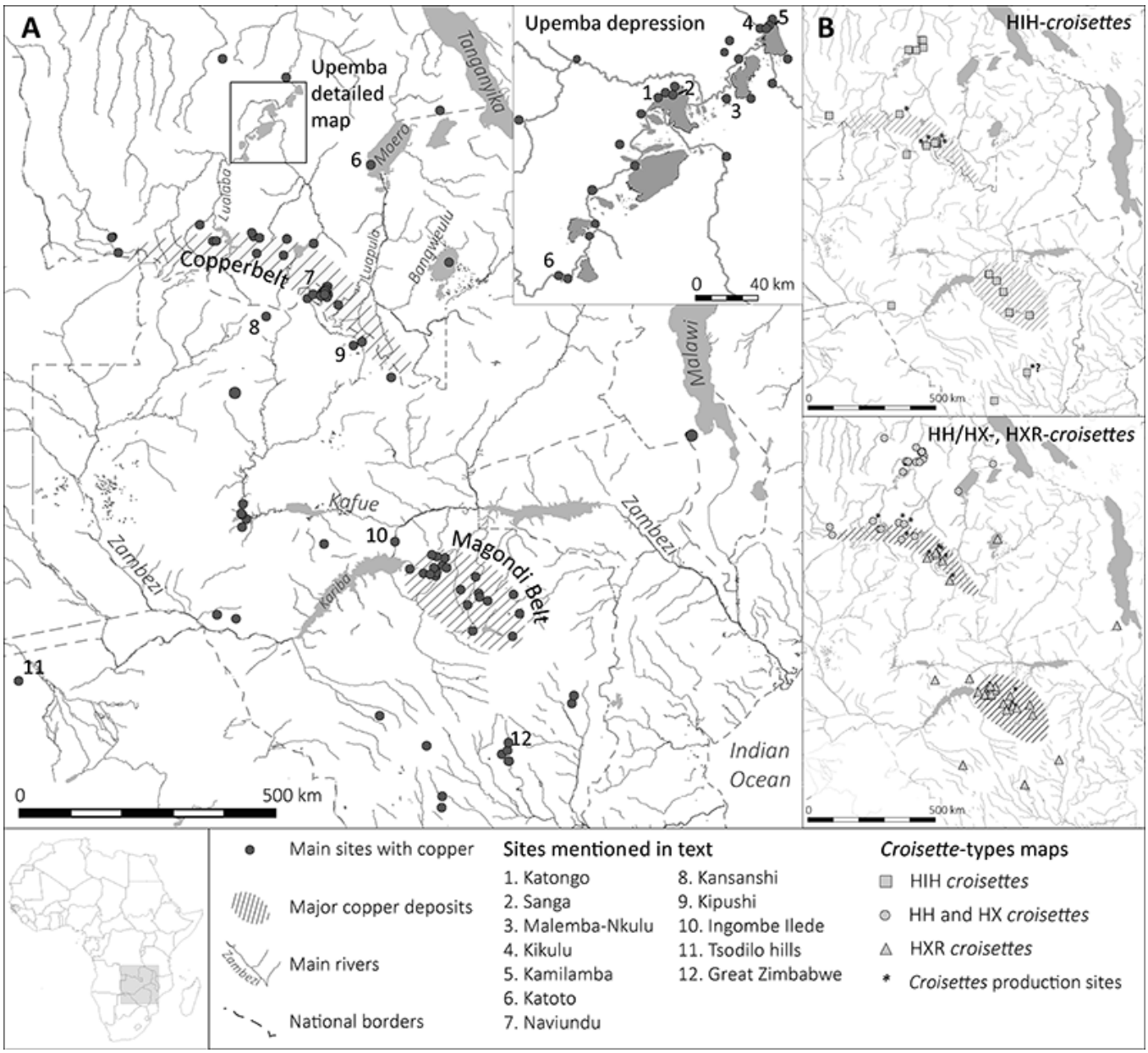

Figure 2. Map of the Copperbelt area. A, archaeological sites with copper production remains and copper objects. B, copper cross-shaped ingot distribution between the 9th and 14th centuries. C, copper cross-shaped ingot distribution between the 14th and 18th centuries.

Source: Nikis, CC-BY 4.0.

With the exception of a peculiar production of leaded copper in the 19th century in the Niari basin (see the subsection "Niari Basin" in the section "From Ore to Metal"), only unalloyed copper has been locally produced in Central Africa. This is in contrast with other parts of Africa, where alloys such as bronze were locally produced (Craddock et al. 1997; Molofsky et al. 2014). Alloyed copper started to flow into the region with European trade beginning in the 16th century, but remained limited to the coastal area until the second half of the 19th century. However, the development of the Swahili trade between east Central Africa and the Indian Ocean coast and the start of the European colonial occupation led to an increasing import of brass in Central Africa. Brass reached inland areas and overwhelmed local production in the late 19th century, except for regions close to the Copperbelt.

Unlike iron, which is available in many regions throughout Central Africa, copper ore is only found in a few scattered deposits across Central Africa (Bisson 2000; Laghmouch and Hardy 2008; Schulz and Briskey 2005; US Geological Survey 2005; see figure 1). Information about precolonial exploitation differs between areas and no comprehensive clear indication of exploitation before the 19th century is available for each deposits. The largest and best known deposits are the Copperbelt, ranging over *c.* 310 miles in southeast Democratic Republic of Congo (see figures 1 and 2), and the Niari basin, located between the modern towns of Boko-Songho and Mindouli in the south of Republic of Congo (see figures 1 and 3). Smaller deposits are also present in the same area (see figures 1 and 3), such as Nyanga or Kaonga-Reneville (Nicolini 1959, 87–111). These are the only regions that have been archaeologically investigated (Anciaux de Faveaux and de Maret 1984; Bisson 1976; Nikis 2018a) and where local mining works and smelting have been described (e.g., Brien 1909; Cornet 1895; Dupont 1889; de Hemptinne 1926).

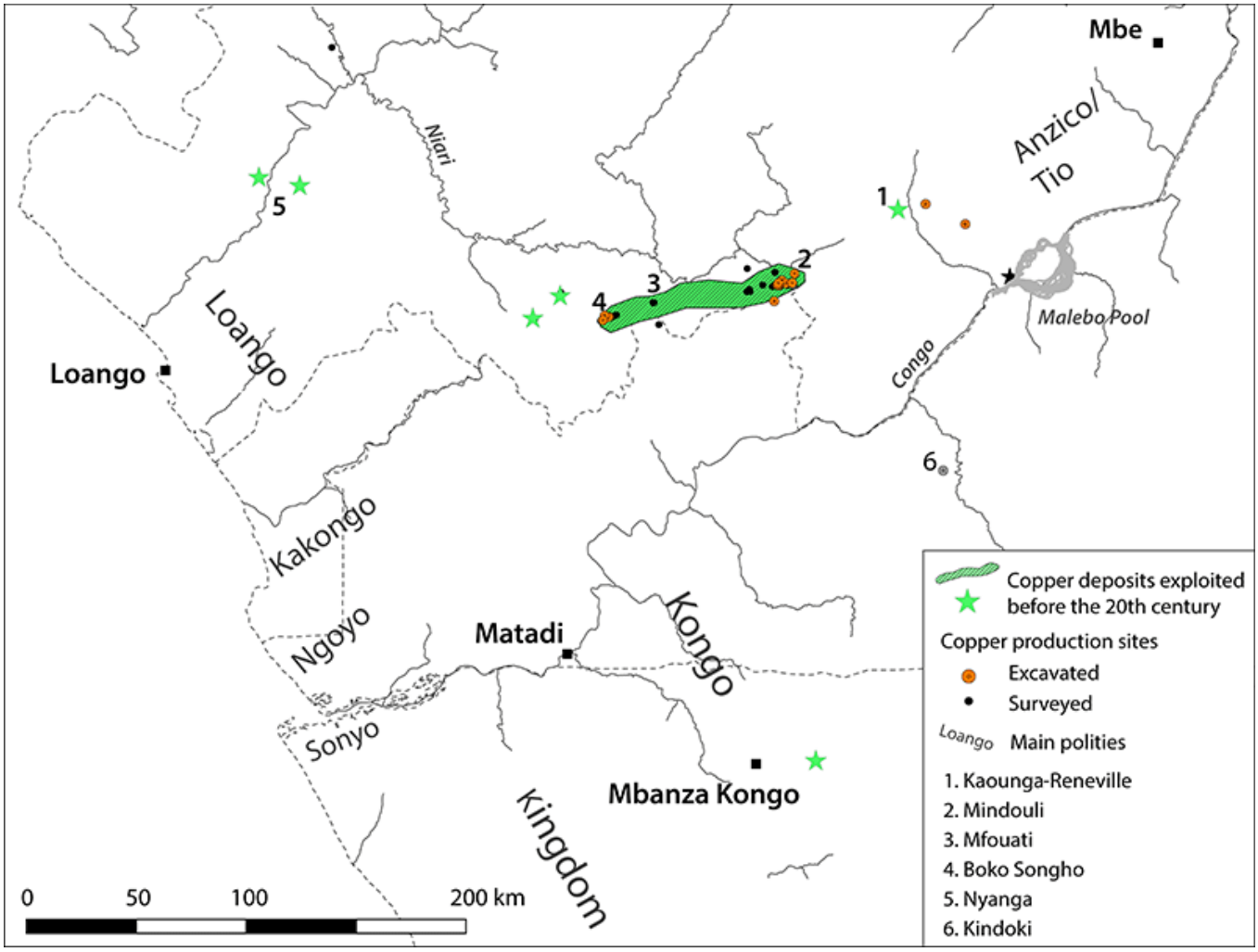

Figure 3. Map of the Niari Basin area with the main deposits exploited in the past, archaeological copper production sites, and main polities of the 2nd millennium AD.

Source: Nikis, CC-BY 4.0.

Historical sources from the 16th century onward mention several other deposits in Angola (see figure 1), such as around Mbanza Kongo, in the Bembe area, and around Benguela (Capello and Ivens 1882, 1:22; Monteiro 1875, 2, 198–199; Pigafetta and Lopez 2002, 95, 137; Ravenstein 1901, 17). In the 19th century, references were made to other copper deposits, such as the Hufrat en Nahas mine in South Sudan (Christy 1923), although it is unclear whether they were exploited like the deposit reported in the north of the Congo basin, near the upper Ubangi River (Liebrechts and Masui 1897, 148, 275), or along Lake Tanganyika, near Kirungu (Langhans 1902).

Geological knowledge of the miners is illustrated by examples of prospecting trenches in geological formations likely to host copper ore (Bisson 1976, 157; Dupont 1889, 346). Other environmental evidence, such as vegetation, may also have guided prospectors (Herbert 1984, 29). Based on the current evidence, extraction was limited to supergene formation—oxide, carbonate, and perhaps native copper ore—leaving primary sulfide ore untouched. The extraction was mainly conditioned by the shape of the mineralization, and trenches, open quarrying, and

shafts have been all observed in the Copperbelt and the Niari basin (Bisson 1976, 12–33; Herbert 1984, 68). In Boko-Songho, where the host rock derived from the weathering of limestone and iron minerals is loose, copper ore is easily extracted by open-air mining, whereas in Mindouli, where mineralization had a vertical orientation, shafts were used (e.g., Brien 1909, M21; Levat 1907, figure III; see Nikis 2018a for more details). In Kansanshi, the only mining site that received archaeological investigation (Bisson 1976; Phillipson 1968), trenches dated between the 15th and 17th centuries followed the mineralization, concentrating on the highest-grade ore parts and leaving the quartzite bedrocks untouched unless necessary to access the vein. The largest of these old works extended over 1,250 feet, in some cases 30 feet wide and as deep as 100 feet (Bisson 2000, 134).

In the late 19th century in the Copperbelt and Niari basin, extraction of ore was a seasonal activity, taking place perforce only during the dry season to avoid flooding the mining excavation (Bisson 2000, 92; Pleigneur 1888). Ore extraction was complementary to the agricultural work and the two activities were not in competition for labor forces (Herbert 1998, 141). Collective ownership of the mines seems to have been widespread in Central Africa (Bisson 2000, 94; Dupont 1889, 338; Herbert 1984, 42), but in a few places, such as in the western part of the Copperbelt, individuals or groups of people held exclusive rights (Capello and Ivens 1886, 70; Gutzeit 1934; Herbert 1998, 43; Marchal 1939; Rickard 1927; Sundström 1974, 218). Mining generally involved a large number of people, because the right to extract copper was less restricted than the smelting phase (Destrain 1891, 510; Herbert 1984, 44; Volavka 1998, 184). The social organization of mining was diverse, ranging from very restricted access to the mine, limited to initiated men (Ladame 1921; Marchal 1939), to the involvement of the whole community, including women who excavated and led teams of miners or owned mines, such as in the western part of the Copperbelt (Capello and Ivens 1886, 2, 70; Clark 1991; Rickard 1927). Even when women and children were excluded from the mining operation per se, they were involved in the collection of surface ore (de Hemptinne 1926, 382), the sorting and cleaning of the ore (Gutzeit 1934; Rickard 1927), and the supply logistics of the mining campaign, paid in some cases by the ruler or the mine owners in the same way as the miners (Marchal 1939).

The symbolic aspects have been little documented. The few sources mentioning them mainly insist on the hazardous nature of mining activity (Herbert 1984, 57; Walker 1925) and therefore emphasize the protection of miners through medicines and taboos—such as the prohibition of intercourse with women—and ceremonies to attract the favors of the ancestors or spirits of the earth (de Hemptinne 1926; Marchal 1939).

Copper Production

From Ore to Metal

Copperbelt

Unlike the mining processes, where the techniques used were mainly constrained by natural features, the diversity observed among documented smelting processes can be the result of sociohistorical factors. While smelting could take place near the mines or close to the villages, proximity of a water source seems to have been very important (Bisson 1976, 174, 214; Ladame 1921; Walker 1925). Termite mounds, a regular raw material used to build furnaces and other technical ceramics, also abound in these areas (e.g., Bel 1908, 198; Bisson 1976, 193, 201; de Hemptinne 1926, 385–386; Nikis 2018a, 368).

In the Copperbelt (see figure 2), the oldest production sites known so far, Naviundu (5th–7th centuries AD) and Kansanshi (6th–9th centuries AD; Anciaux de Faveaux and de Maret 1984; Bisson 1976, 185), show limited metallurgical remains—tuyere fragments, slag, and crucibles (Anciaux de Faveaux and de Maret 1984; Bisson 2000, 139–140). Because no detailed study of the material has been carried out, it is not possible to know at this stage if crucible smelting was practiced or if the furnace has disappeared.

While production in the 1st millennium AD seems to have been limited, it started to increase at the turn of the 2nd millennium AD. Changes in material culture, observed from both pottery and metallurgical remains, suggest significant sociocultural transformation in the area that would have been related to an increase in sites and population density (Bisson 2000, 124). Between the 9th and 13th centuries, evidence is only available in Kipushi. Smelting was performed using both direct tapping (when copper is directly poured from the furnace into an open mold) and nontapping furnaces, using crucibles to cast the ingots in an open mold (Bisson 1976, 222–223). In both cases, however, the metal was probably cast into HIH-type copper cross-shaped ingots (Bisson 1976, 222; see figure 4). The pottery on production sites shares affinities with the regional Luangwa co-tradition, encompassing a large part of modern Zambia in the 2nd millennium AD, and has been interpreted as the development and spread of regional lineage membership (Bisson 1976, 335; Phillipson 1974, 17).

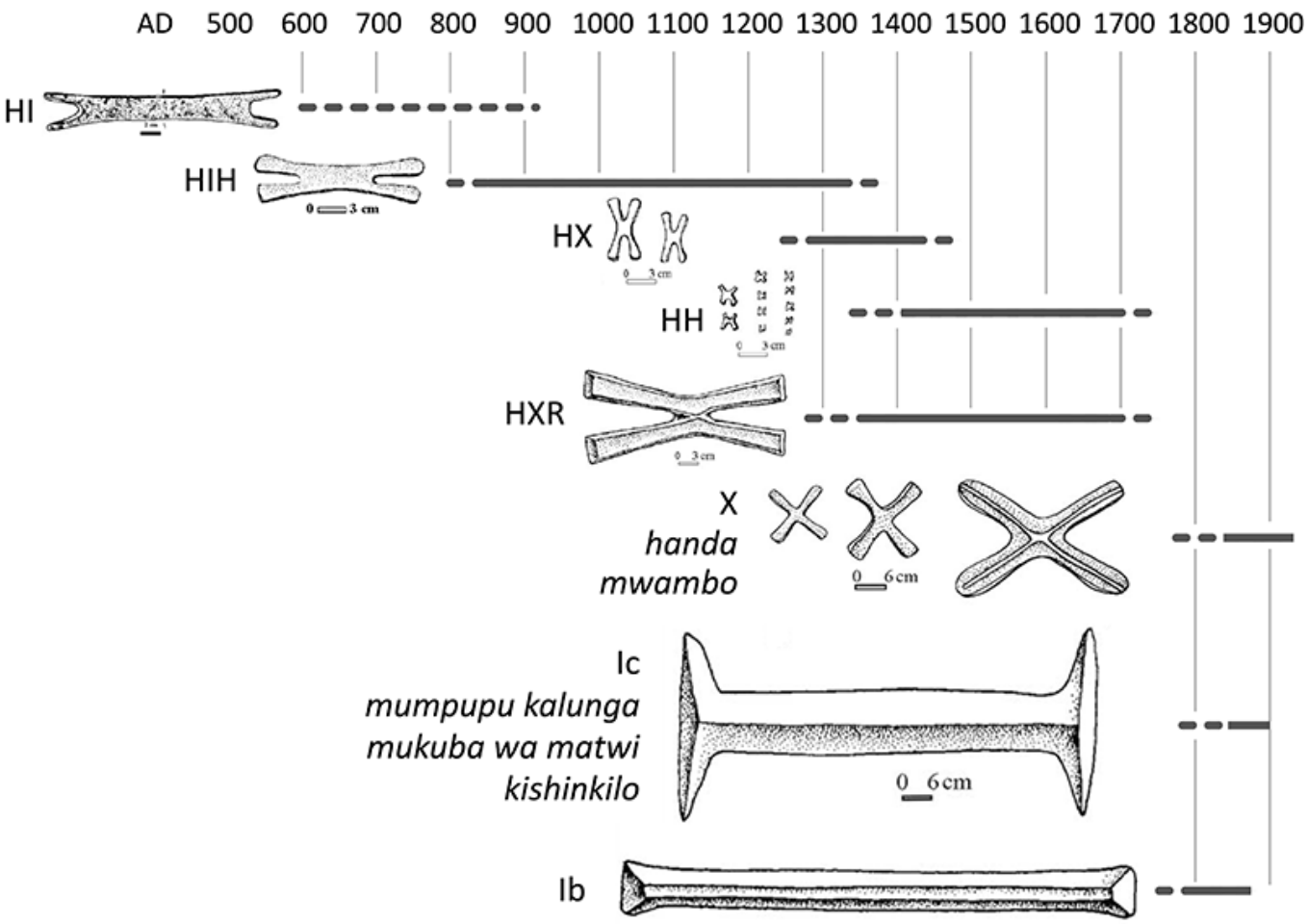

Figure 4. A broad chronology of ingots produced in the Copperbelt between the 6th and 19th centuries BCE.

Source: Nikis, CC-BY 4.0.

The period of greatest production at Kansanshi and Kipushi is dated between the 14th and 17th centuries. The material culture, which exhibits wide differences between the two sites, also differs from that of the earlier periods (Bisson 1976, 335–336). While Kipushi pottery is quite different from other known production in the area, at Kansanshi, the pottery shares similarities with that produced by the Kaonde people, who occupied the area in the 19th century (Bisson 1976, 336). The architecture of the furnaces also differs between the two sites. At Kansanshi, two types of nontapping furnace (copper and slags were mixed at the bottom of the structure) have been identified (Bisson 1976, 190). At Kipushi, the only type of furnace found allowed direct pouring of the copper, as in the previous period (Bisson 1976, 231). Despite the differences in the manufacturing processes, both sites produced the same type of ingot, HXR copper cross-shaped ingots (see the section "Fifteen Hundred Years of Trade from the Copperbelt" and figure 4). According to Bisson, production would have dramatically decreased after the 17th century at Kansanshi because the ore that was accessible without the use of industrial techniques would have been exhausted (Bisson 2000, 144).

Diversity in the smelting process in and around the Copperbelt is even better illustrated by late-19th- and 20th-century direct observation in the western part of the area or by oral tradition and re-enactments in other areas.[1] In contrast with the mining step, participation in the smelting process was generally restricted to members of the professional association, under the direction of a master smelter. Smelting could happen directly after the mining season, as with the Yeke smelter around the modern town of Likasi (de Hemptinne 1926), or throughout the year, as in the Kolwezi area (Clark 1991; Rickard 1927). In the archaeological context, both direct tapping and nontapping furnaces have been observed, but both types vary with regard to architecture and use. Around Kolwezi, in the western part of the Copperbelt, there was a combination of a temporary structure for the first part of the process and a refinement in a permanent furnace with a tap hole allowing for direct casting of *handa* (Kiswahili for bifurcation) copper cross-shaped ingots (also called *mwambo* [sing.; Kiluba], labeled X in figure 4 de Maret 1995) into open molds made of clay or shaped in sand (Clark 1991; Gutzeit 1934; de Hemptinne 1926; Lefebure 1930; Rickard 1927). In the center of the Copperbelt, near Likasi, re-enactments by old Yeke smelters showed a two-step process, smelting and refinement, using temporary structures (de Hemptinne 1926). Molten copper, collected in a crucible, was then poured into an open mold made of clay or termite mound; the most common shape was a rectangular ingot, with the intent of further processing. The Yeke, part of the larger Nyamwezi group, originated in central Tanzania, and before they settled in the Copperbelt in the second half of the 19th century, they were not practicing copper smelting in their home region. Oral tradition suggests they were initiated by smelters from the Sanga population, who were working the copper upon arrival of the newcomers (de Hemptinne 1926). The Sanga people first smelted copper in a permanent furnace and then refined it in a smaller furnace, with a tap hole that allowed them to directly cast the copper in an open mold. They produced large ingots in the shape of a double T, weighing between 26 and 110 pounds, called *mumpupu kalunga* or *mukuba wa matwi* (labeled Ic in figure 4; de Maret 1995). Similar ingots with and without a transverse end (labeled Ic, called *kishinkilo*, and Ib in figure 4; de Maret 1995) were produced in mines around the modern town of Lubumbashi, in the eastern part of the Copperbelt, but smelters followed a different manufacturing process involving two temporary structures. The crucible used to collect copper had a hole in the bottom that allowed them to directly cast the copper in an open mold (Ladame 1921). Archaeological and historical information about smelting highlights technical diversity over time and space—which makes sense in a region as large as the Copperbelt—but also some similarity and convergence. Unfortunately, the limited numbers of descriptions and archaeological evidence have thus far prevented any in-depth comparative technology investigation. Moreover, a series of re-enactments in the 1960s by Kaonde smelters originating from Kansanshi (Anonymous 1961; Bisson 1976, 50; Chaplin 1961; Dahn 1964; Miller 1994) raise questions regarding the representativeness of limited observation or limited archaeological structure as a witness to a technical tradition (Miller 1994, 84). Though the demonstration was given by the same smelters, there was some variation, which could result from a repertoire of technical knowledge among the smelters, used to adapt the process to the circumstances of the demonstration or to demonstrate their know-how by diversifying the processes. It could also be the consequence of sociocultural and/or geographical diversity among the smelters that went unnoticed by observers (Miller 1994).

Niari Basin

The oldest traces of known copper production in the Niari basin are dated to the end of the 1st millennium AD. However, they are limited to furnace bases, without any material culture that would allow a more precise contextualization. The shape of the furnaces and their use nevertheless suggest the existence of at least two distinct manufacturing processes between the 10th and the 14th centuries (Nikis 2018a, 252–262). More data are available from the 14th century onward. The Misenga tradition, located around Mindouli, is dated between the early 14th century and the first half of the 15th century (Clist, Nikis, and Nkanza Lutayi 2018; Nikis 2018a, 166–167), and the pottery, decorated with woven inspired designs, suggests that copper producers were part of a larger Kongo cultural area (Cranshof, Nikis, and de Maret 2018). Metallurgical activities likely took place in the vicinity of the settlements. The metallurgical remains—crucible and tuyere fragments, crushed slags, and a few copper objects—suggest that only the metal refining phase could have taken place on the excavated sites, but the possibility that crucibles were also used for smelting cannot be excluded. Roughly ellipsoidal ingots were cast in open molds and then hammered into bars of a relatively standardized size (Nikis 2018b; see figure 5).

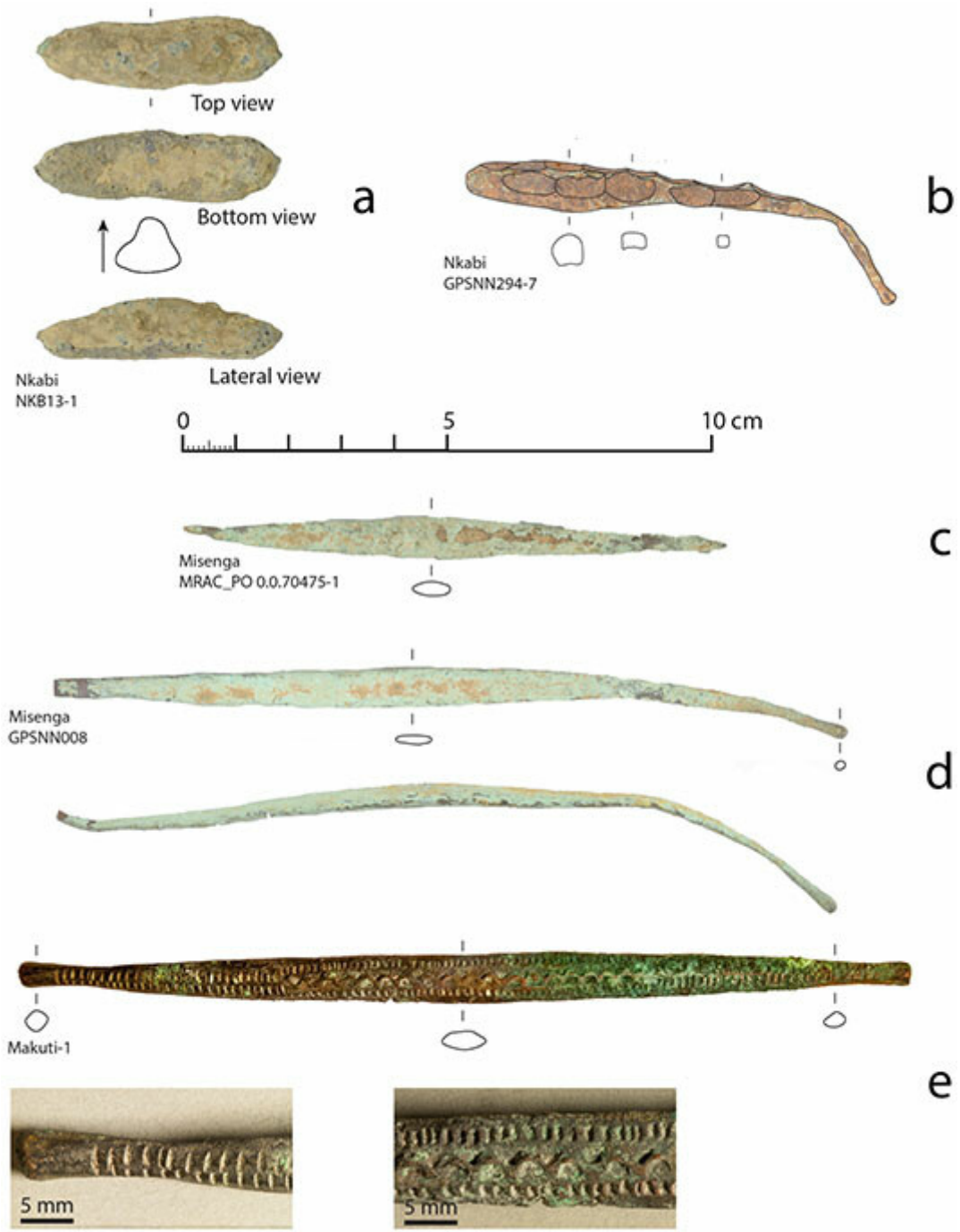

Figure 5. Ingots and copper bars produced at Misenga tradition sites, 14th–15th centuries AD. a, Ingot, Nkabi, Mindouli area, 2013 excavation (Nikis 2018a, 2:173). b, Ingot partially hammered, Nkabi, Mindouli area, 2013 excavation (Nikis 2018a, 2:173). c, Small copper bar, Misenga, Mindouli area, M. Bequaert's excavations, 1951, Royal Museum for Central Africa, PO.0.0.70475-1. d, Large copper bar, Misenga, Mindouli area, 2014 excavation (Clist, Nikis, and Nkanza Lutayi 2018). e, Large decorated copper bar, Makuti, Mindouli area, 2013 excavation (Nikis 2018a, 2:105).

Source: All pictures by N. Nikis, CC-BY 4.0.

Between the end of the 15th and the beginning of the 17th century, at least two distinct traditions developed in the Niari: Moubiri, centered around the Mindouli area, and Kindangakanzi, centered around the Boko-Songho area (Manima-Moubouha 1988; Nikis 2018a, 299–328). Both traditions are found in Mfouati, located between the two previously noted areas. Although they differ in their ceramic style, they share a number of common features. The various metallurgical sites are located in the direct vicinity of the deposits and seem to have been short-lived, mainly dedicated to the smelting of copper. In both cases, domestic pottery is reused as crucibles. This contrasts with both earlier and later known production in the area, during which specialized crucibles were produced. Recent works showed that while furnaces have been found at sites attributed to both traditions, crucibles were also used for smelting. The question then arises as to whether two different manufacturing processes were used concurrently or whether the site was occupied by different groups of smelters over a short period of time (Cordivari, Nikis, and Martinón Torres 2022). Two production sites outside the main deposits area of the Niari basin but close to the small outcrops of Kaonga-Reneville have been dated to that period, but have been little investigated (Dupré and Pinçon 1997, 47; Pinçon 1991).

There is little archaeological evidence regarding the period between the second half of the 17th century and the second half of the 19th century.Only one furnace with a few crucible fragments is dated to that period. In the second half of the 19th century, two metallurgical traditions have been identified, one in Mindouli and the second in Boko-Songho. The first direct description of the manufacturing processes in this area is also dated to this period. At Mindouli, these accounts suggest that several smelting processes may have coexisted (Barrat 1895, 464; Loir 1911, unpublished report; Maistre 1895, 14; Nikis 2018a, 341–342; Reibell 1903, 233–234), but the archaeological remains associated with the settlements do not show significant differences between the sites. Production likely took place on a seasonal basis on the outskirts of the villages closest to the deposits, suggesting a form of local specialization. In contrast to earlier periods, a great deal of slag is present at these sites, suggesting a better slagging process. The copper was refined in small crucibles of a standardized size (Nikis 2018a, 347–362).

At Boko-Songho, the archaeological evidence is remarkably consistent with the early European descriptions in the area (Cholet 1888, 68; Dupont 1889, 337; Laman 1953, 122; Nikis 2018a, 342–345; Pleigneur 1888). Copper was produced seasonally and only in villages in the direct vicinity of the deposits. During smelting in temporary furnaces, lead ore or metallic lead was added to the copper ore (Pleigneur 1888). The ingots were cast at the end of the process in open molds shaped in sand on the floor and were roasted on pierced ceramics; according to texts, this was to recover the red color of the ingot, probably by oxidizing the copper and/or removing the lead on the surface of the object. The copper ingots produced by this process (see figures 6a and 6b) have a fairly characteristic composition, with up to 20 percent lead (Nikis 2018a, 361–374; Rademakers et al. 2018).

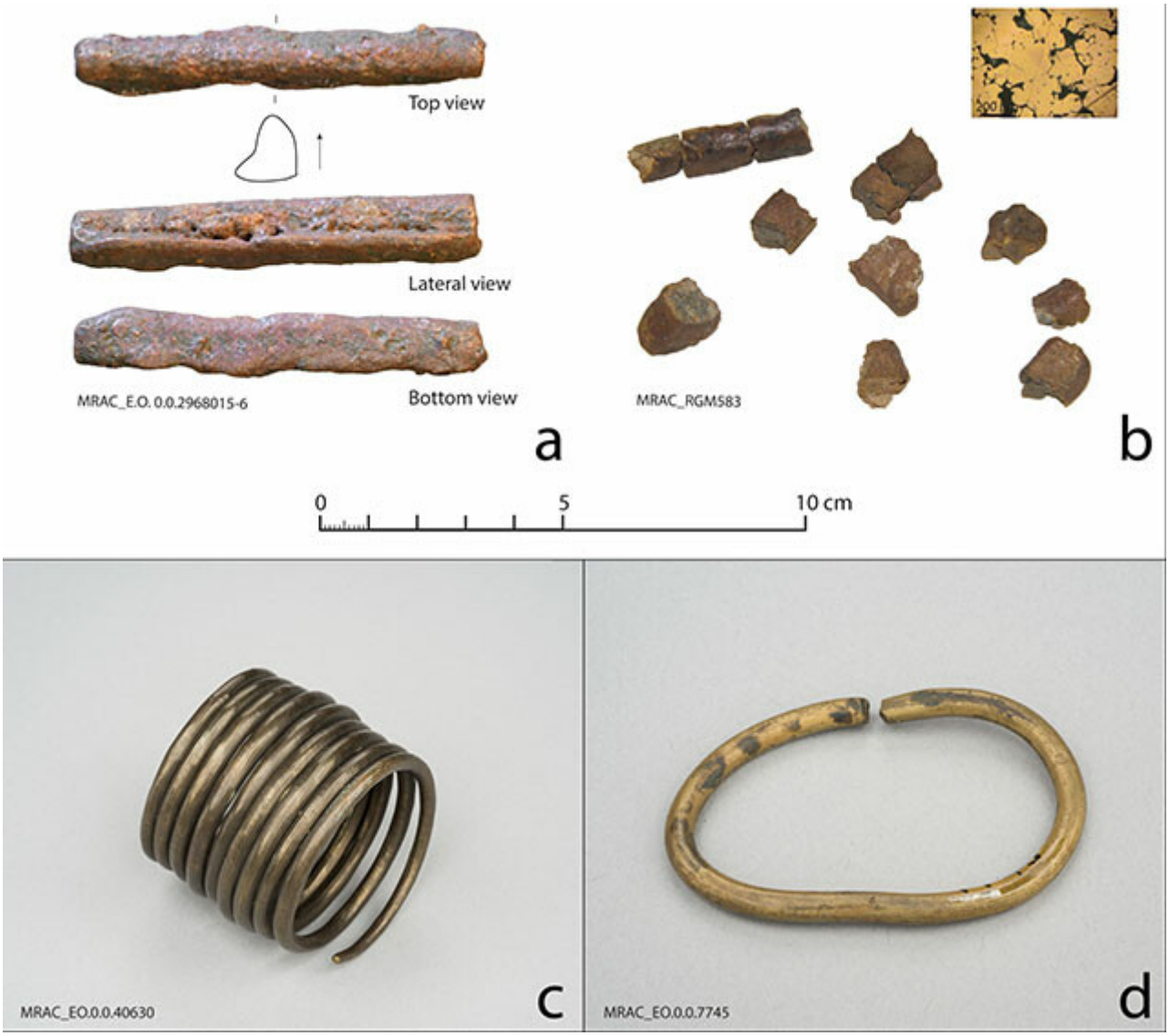

Figure 6. Leaded copper ingots and brass rods traded in western Central Africa in the 19th century. a, Leaded copper ingot, Matadi area, Royal Museum for Central Africa, EO.0.0.29681-5 (Nikis 2018a, CC-BY 4.0). b, Leaded copper ingots cut in pieces, Mbandaka area, Royal Museum for Central Africa, RGM 583, and micrograph of the internal structure. The black parts are lead and the yellow parts are copper (Nikis 2018a; Monin for the micrograph, CC-BY 4.0). c, Bracelet made from a brass rod, 3 x 3 inch, Royal Museum for Central Africa, EO.0.0.40630 (collection MRAC Tervuren; photo J.-M. Vandyck, CC-BY 4.0). d, Ring made from a brass rod, Lower Congo (?), 2.6 x 1.6 inch, Royal Museum for Central Africa, EO.0.0.7745 (collection MRAC Tervuren; photo J.-M. Vandyck, CC-BY 4.0).

Metal to Objects

While ingots could be traded as exchange items or used as prestige objects, in most cases the metal resulting from smelting was intended to be further transformed, either on the production area itself or by later consumers. Copper was mainly used to decorate bodies and objects or to create status items and/or currency. In rare instances, copper was used to produce tools (de Hemptinne 1926, 394, 398; Hiernaux, de Longrée, and De Buyst 1971, 34; de Maret 1985a, 157–158; 1992, 161; Nenquin 1963, 192), but most of them likely had a symbolic or exchange value

rather than a functional use (Nikis 2021). Because of the high value of copper over the centuries, objects were rarely voluntary discarded when broken or no longer used. In theory, both copper and brass could be recycled endlessly and objects could easily change shape throughout their life cycle. Two main categories of copper and copper alloy shaping techniques, plastic deformation, such as hammering, and casting, have been used in Central Africa.

While a few objects (Derricourt and Papstein 1976; Mills and Filmer 1972; Robertson 2000) have been found in settlement contexts in regions around the Copperbelt, most archaeological objects known so far have come from the Upemba depression (see figure 2; for a synthesis, see de Maret 1999; Nikis 2021). The Upemba depression is a 125-mile-long floodplain crossed by the Congo River with numerous lakes, home to a rich biodiversity. Over fifty archaeological sites have been located on its shores, of which six have been excavated: Sanga, Katongo, Malemba-Nkulu, Kikulu, and Kamilamba in the north and the center of the depression (Hiernaux, de Longrée, and De Buyst 1971; de Maret 1985a, 1992; Nenquin 1963) and Katoto in the south (Hiernaux, Maquet, and De Buyst 1972). With almost three hundred graves uncovered, it is one of the largest sets of burials excavated in sub-Saharan Africa. They provide an uninterrupted chronological sequence between the 6th and 19th centuries AD that is unparalleled in Central Africa. Contexts dated between the 8th and 18th centuries AD yielded a large number of copper artifacts (see figures 7 and 8). A more diverse and elaborate set of objects is found in the sites from the northern part dated to the Classic Kisalian (10th–13th centuries) have produced (Garenne-Marot 2019; de Maret 1985a, 1992).

Figure 7. Upemba depression graves. a, Two child graves, with a detail of the 35 ounces of copper ornaments found in one of them, Classic Kisalian (10th–13th centuries AD), burials 148 and 148 bis, Sanga, excavated in 1974 (©Courtesy of Pierre de Maret). b, Details of an adult's grave, Kabambian A (13th–15th centuries), Burial 27, Malemba-Nkulu, excavated in 1975 (©Courtesy of Pierre de Maret). c, Details of an adult's grave, showing around ninety small HH copper cross-shaped ingots, some of them tied together, Kabambian B (15th–18th centuries), Burial 4, Katongo, excavated in 1974 (©Courtesy of Pierre de Maret).

Figure 8. Upemba depression ornaments. a, Belt made with numerous copper rings, iron beads, and other individual objects such as iron blades, Classic Kisalian (10th–13th centuries AD), Burial 53, Sanga, excavated in 1957 (Nenquin 1963), 14.2 × 7.9 inches, Royal Museum for Central Africa, PO.0.0.79530 (collection MRAC Tervuren; photo J.-M. Vandyck, CC-BY 4.0). b, Necklace made of very fine copper wire, wound in very close spirals, Classic Kisalian (10th–13th centuries AD), Burial 34, Sanga, excavated in 1957 (Nenquin 1963), around 4.8 inches in diameter, Royal Museum for Central Africa, PO.0.0.79439 (collection MRAC Tervuren; photo J.-M. Vandyck, CC-BY 4.0). c, Necklace made of interwoven copper wire, Classic Kisalian (10th–13th centuries AD), Burial 34, Sanga, excavated in 1957 (Nenquin 1963), 4.3 inches in diameter, Royal Museum for Central Africa, PO.0.0.79440 (collection MRAC Tervuren; photo J.–M. Vandyck, CC-BY 4.0). d, Bracelet made from a copper rod, Kabambian B (15th–18th centuries), Burial 42, Sanga, excavated in 1957 (Nenquin 1963), 2.8 inches in diameter, Royal Museum for Central Africa, PO.0.0.79585 (collection MRAC Tervuren; photo J.–M. Vandyck, CC-BY 4.0).

A few studies have investigated the manufacturing techniques of Upemba artifacts (Childs 1991; Garenne-Marot 2019). The elaborate appearance of some belts or necklaces (see figures 7 and 8a–8c) is mostly due to the profusion of elements, the shaping and arrangement of which are mainly based on simple techniques, such as the linear assembly of links formed by bending a wire or a rod (Garenne-Marot 2019, 40). Some elements nevertheless demonstrate more elaborate techniques, such as the weaving of copper wires or very fine copper wires (0.2 mm) wound in a spiral to form beads, themselves assembled and twisted with strings of iron beads to form strands (Garenne-Marot 2019, 41–42). Studies by S. T. Childs (1991) show that the basic shapes—rods or wires—are produced primarily by plastic deformation such as hammering or welding, rather than by casting. These techniques suggest a transfer of technology from ironworking (Childs 1991).

Although it is possible that some wires were manufactured by wire drawing, which will have to be confirmed by metallography, it seems that the majority were produced by hammering (Garenne-Marot and Childs 2017, 22).

The wire-drawing technique was nevertheless well established in the Copperbelt at the end of the 19th century, where it was mainly practiced by Yeke craftsmen (de Hemptinne 1926). A 4-inch ingot was first transformed by hammering and then elongated by successive passages through a die, the single hole of which progressively narrowed (see figure 9a). The final result could be as thin as a few tenths of a millimeter (de Hemptinne 1926, 395–398) and could be twisted around a fiber core to produce wound wire bracelets (de Hemptinne 1926, 398). According to oral history, the technique was imported from the Yeke homeland in Tanzania (Ladame 1921, 691); this is confirmed by the shape of the tools, which are very similar to the dies coming from the Great Lakes region (Lagercrantz 1989; Lindblom 1939). Bangles (see figures 9b and 9c) were produced with similar techniques and tools in East Africa and in the Great Lakes region, such as Rwanda and Burundi, using copper imported from the Copperbelt, brass from the Indian Ocean, or local iron (Celis 1987, 1989; Celis and Nzikobanyanka 1976). Throughout this area, single-hole dies were used, which contrasts with the multihole dies used in eastern and southern Africa and notably found in the archaeological context at Ingombe Ilede, on the Zambezi River (see figure 2; Fagan 1969; Lagercrantz 1989; Lindblom 1939).

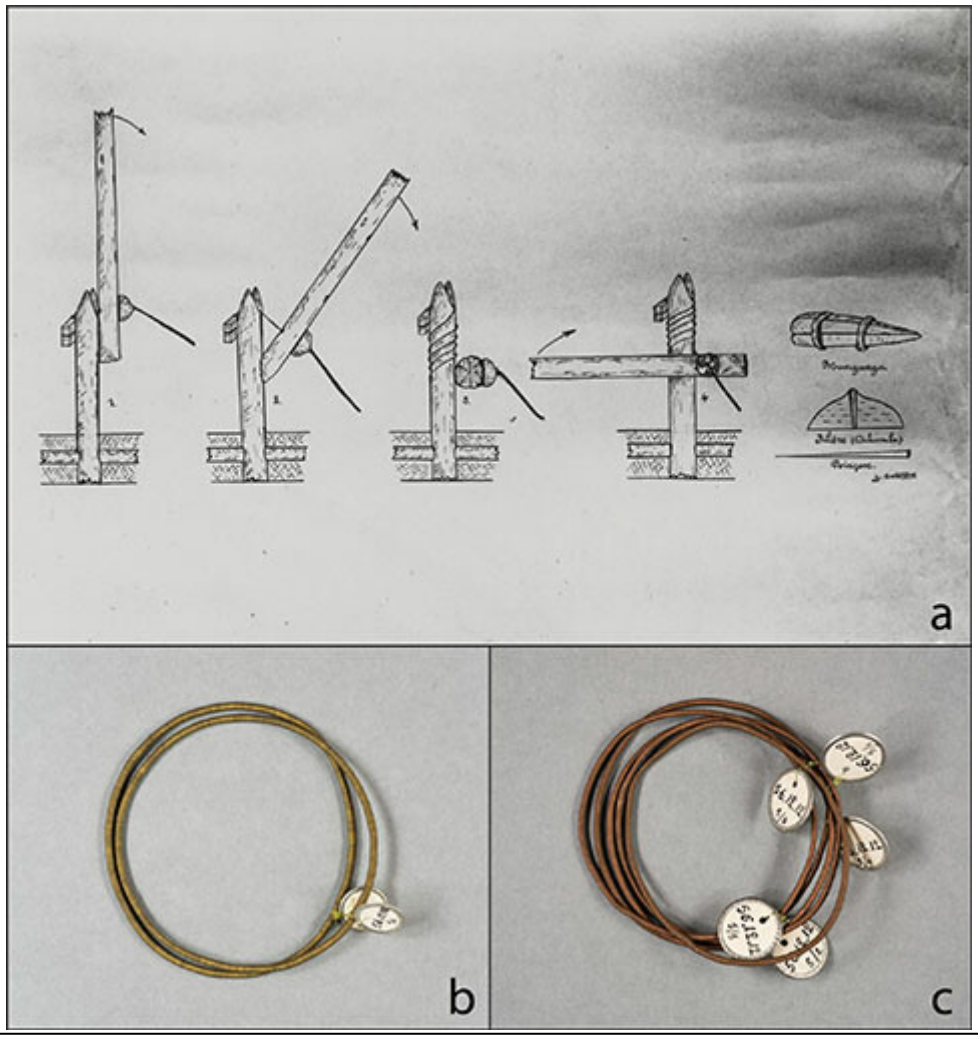

Figure 9. Wire drawing and copper and brass wire. a, Sketch of the wire-drawing process among the Yeke, central Copperbelt, in the late 19th–early 20th centuries by J. Swinnens, Royal Museum for Central Africa, AP.0.0.23028 (collection MRAC Tervuren; dessins de J. Swinnens, s.d., CC-BY 4.0). b, Bracelet made from brass wound wire, Rwanda, *c*. 1950, 3.8 inch in diameter, Royal Museum for Central Africa, EO.1956.12.11 (collection MRAC Tervuren; photo J. Van de Vyver, CC-BY 4.0). c, Bracelet made from copper wound wire, Rwanda, *c*. 1950, around 3 inch in diameter, Royal Museum for Central Africa, EO.1956.12.12 (collection MRAC Tervuren; photo J. Van de Vyver, CC-BY 4.0).

Wire drawing has held most of the attention in the Copperbelt, but sources also mention more laconically other object manufacturing techniques, mainly hammering (Colle 1913, 185; de Hemptinne 1926, 398; E. Maquet 1965, 47).

In western Central Africa, hammering has been used to transform Misenga ingots (13th–15th centuries) into copper bars of a standardized shape (see figures 5a–5c), some of which were decorated (see figure 5e; Nikis 2018b), as well as to manufacture the strips, ribbon, and bars used to create the intricate insignia (probably older than the 18th century) from the Lusunsi shrine in Ngoyo (Volavka 1998, 166–170). However, a shift may have occurred before the 19th century because casting seems to have been predominant in the production of objects and ingots in most parts of Central Africa at the end of the 19th century—with the exception of the Copperbelt and the areas using wire-drawing techniques that were already mentioned. Casting in an open mold was widespread for objects and ingots, with the preform of the pieces shaped in sand by hand or using a matrix (e.g., Coquilhat 1888, 160, 323; Dupont 1889, 669; Herbert 1984, 82–83; Laman 1953, 123; E. Maquet 1965). More peculiar techniques have been also mentioned. Some roots or soft wood, such as banana trees, were used to create a model that was covered in clay and heated to create molds in a similar way to lost wax casting (Laman 1953, 76, 124; E. Maquet 1965, 32, 88). The first crucifix produced in the Kongo Kingdom might have been made using a lost wax casting technique, as with their European counterparts (Volper 2011, 53–57; Wannyn 1961, 31–32), but methods described in the early 20th century used open molds (M. Maquet 1938; Wannyn 1961, 31).

Copper Trade, Use, and Value

Fifteen Hundred Years of Trade from the Copperbelt

Late-19th-century sources provide indications regarding the copper trade route, but following copper circulation between the production and consumption areas through the archaeological context can be difficult because copper objects can easily change shape. The characteristic shape of some ingots, on the one hand (Nikis 2017), and the chemical analyses—trace elements and lead isotopes—on the other hand (Rademakers et al. 2018, 2019; Stephens et al. 2020) nevertheless make it possible to partly reconstruct trade circuits.

Small-scale trade occurred from the beginning of production in the Copperbelt (Bisson 2000, 126), but metal quickly reached more distant regions, such as the Tsodilo hills area in Botswana (see figure 2) more than 620 miles to the southwest around the 7th–8th centuries AD (Stephens

et al. 2020) or the Upemba depression a few hundred miles to the north from the second part of the 8th century onward (de Maret 1992, 218). During the second half of the 1st millennium AD, copper was part of regional exchanges in the area between the Copperbelt and the Zambezi, circulating as ingots or finished products like wound copper bangles (de Luna 2016, 178–180). The increase in production in the Copperbelt (see the subsection "Copperbelt" in the section "From Ore to Metal") and the number of objects in the graves of the Upemba depression from the 9th century onward suggest a growth in trade from this period. The difference in usage between the Classic Kisalian (*c.* 10th–13th centuries) sites in the north of the depression and Katoto (*c.* 9th–13th centuries) in the south suggests distinct political economies that may be related to different trade networks (Nikis 2021, 4). In the wealthiest Kisalian graves, the abundance of copper and iron is the main marker of the wealth and status of the deceased, and great care and time are taken in the making of ornaments (see figures 7 and 8a–8c; Garenne-Marot 2019; de Maret 1999, 155–158). In Katoto, objects are less elaborate—ornaments are made of simple copper rod, for example—but the wealthiest graves display a larger number of coastal products such as cowries, conus shell, and glass beads (Hiernaux, Maquet, and De Buyst 1972).

Copper cross-shaped ingots (see figure 4 for an illustration of the different types over time and de Maret 1995 for a description of the typology) also appeared in the archaeological record around the 9th century (de Maret 1995; Rademakers et al. 2019). These types of ingots, also called *croisettes*, would have evolved from flat and fishtail ingots (see figure 4), found in different sites from the 1st millennium AD (Bisson 2000, 115–118; de Maret 1995, 143; Nikis and Livingstone Smith 2017, 898). Current evidence suggests the HIH cross-shaped ingots were produced between the 9th and 14th centuries, but are still found in graves from the Kabambian A period (14th to the late 15th centuries). Their distribution extends from the Upemba depression in the north to Great Zimbabwe in the south (see figure 2b). Although it cannot be ruled out that this type of ingot may have been produced in other areas—an HIH mold and evidence of copper working has been found in Great Zimbabwe (Bandama et al. 2016)—Copperbelt copper would have been exchanged in networks covering thousands of miles, maybe linked to the spread of regional lineage membership related to the Luangwa pottery tradition (de Maret 1995; Nikis and Livingstone Smith 2017; Phillipson 1974). These ingots were primarily exchange items and raw material, but their presence as grave goods during the Kabambian A (see figure 7b) suggests they gained symbolic value over time (de Maret 1995, 140–141).

Changes in copper use and production occurred at the turn of the 14th century. In the Upemba graves, the elaborate ornaments gave way to less elaborate pieces (see figure 8d) and, above all, to the deposition of copper cross-shaped ingots (see figures 4, 7b, and 7c; de Maret 1999). The latter formed the bulk of the copper objects found in graves during the Kabambian period (14th–18th centuries). Their shape evolved with time. During the Kabambian A (early 14th to late 15th centuries), HIH, HX, and large HH ingots coexisted in some graves (see figure 7b), but the first two models disappeared before Kabambian B (see figure 7c; late 15th to early 18th centuries), while the size of HH ingots decreased over time, reaching a size of less than half an inch. The decrease in size is also accompanied by increasing standardization (de Maret 1981). The size of the HH copper cross-shaped ingots and the conditions in which they were found in graves—bound together and placed close to the hips (see figures 7b and 7c)—or as currency hoards at

various points in the northern Copperbelt strongly suggest their use as currency (Nikis and Livingstone Smith 2017). They disappeared at the end of the Kabambian B. A shift in the copper supply also seems to have occurred between the Kabambian A and Kabambian B, as suggested by chemical analyses (Rademakers et al. 2019).

In the area previously occupied by HIH croisettes, two spaces become apparent with a boundary lying in the Copperbelt (see figure 2c) between the 14th and 18th centuries. While the central and western part of the Copperbelt produced the aforementioned HX and HH croisettes, which are distributed northward, the eastern part, including the Kipushi site, produced the larger croisettes known as HXR, which are distributed as far south as southern Zimbabwe (de Maret 1995, 138–140; Nikis and Livingstone Smith 2017, 899–903). The discovery of molds around the copper deposits in northern Zimbabwe indicates that this type of ingot was produced in different areas, distant from each other (Garlake 1970, 42; Swan 2007, 1005). The two distribution areas suggest that the Copperbelt and the adjacent area were involved in distinct economic spaces, which may be related to the sociopolitical context of the time (Nikis and Livingstone Smith 2017, 908). In the north, the Upemba depression would have been included in a wider political space, announcing the Luba Kingdom of the 19th century and extending its influence to part of the copper-producing areas (de Maret 1999). South of the Copperbelt, emerging polities and the growing importance of long-distance trade along the Zambezi River would have attracted part of the copper trade. The importance of copper among Zambezi neighboring communities is exemplified by Ingombe Ilede graves, where HXR ingots and trade wire have been found (Bisson 2000, 124; Fagan 1969; Killick 2017; de Luna 2017; de Maret 2013, 881; McIntosh and Fagan 2017).

Economic and political contexts also seem to have had an impact on the circulation of copper around the mid-19th century AD (see figure 10). In addition to distinct manufacturing processes (see the subsection "Copperbelt" in the section "From Ore to Metal"), different shapes of ingots were produced and they were traded along different networks (Nikis and Livingstone Smith 2017, 903). Copper-producing areas were involved in a web of trade and social relationships that included the major polities of the area. Because there was no monopoly on copper production, metal moved more easily in the population than other products, such as ivory (Gordon 2021). Copper was nevertheless also incorporated in the hierarchical title-holding system as tribute and part of the production moving up the social hierarchy to the paramount political authorities (Gordon 2021, 164, 169). These trade and social networks provided access to products from other regions, including the coast (Gordon 2021, 161; Nikis and Livingstone Smith 2017).

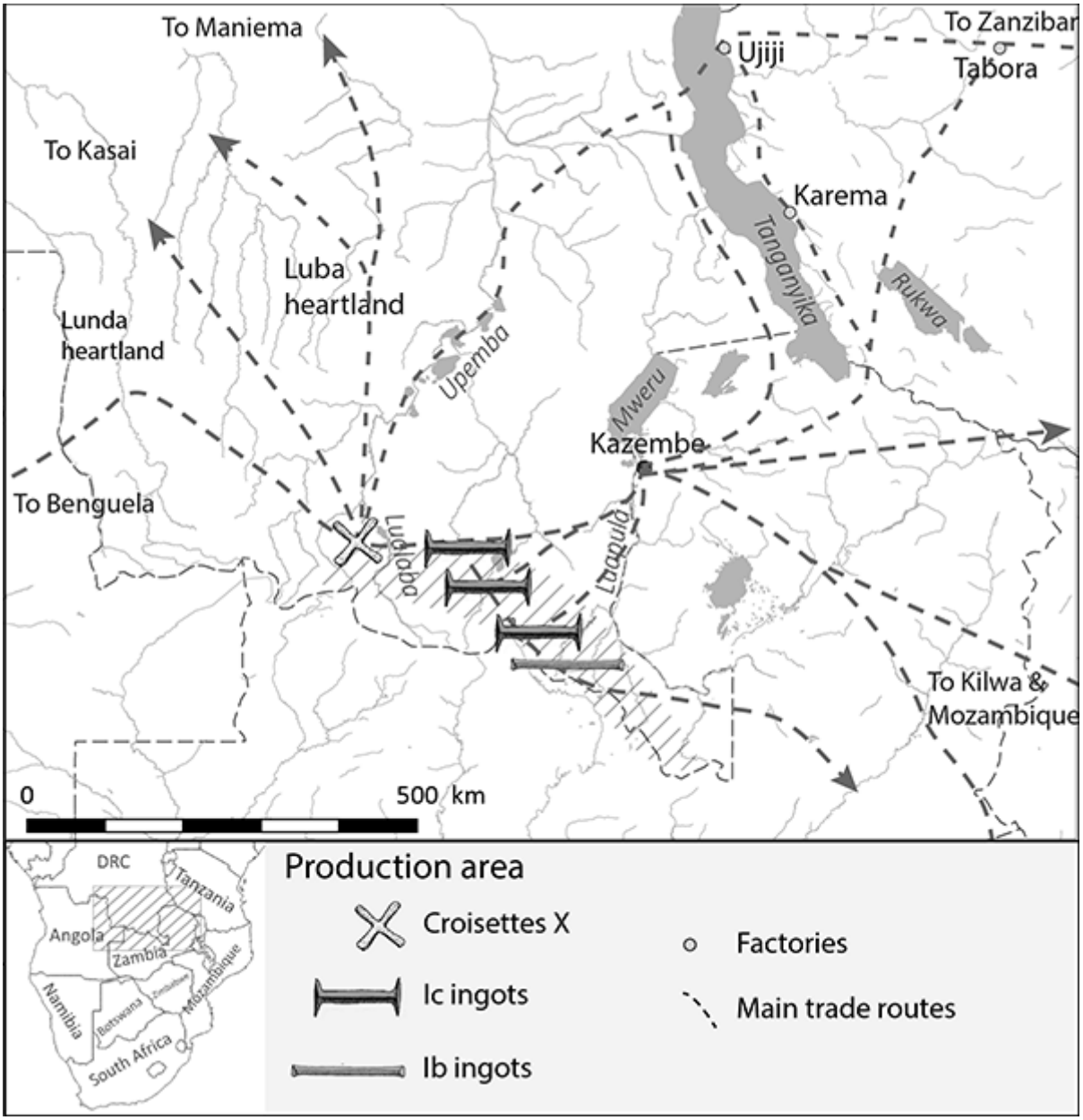

Figure 10. *Handa* copper cross-shaped ingots and Ib and Ic bar distribution, *c*. mid-19th century (Nikis and Livingstone Smith 2017).

The *handa* copper cross-shaped ingots produced in the western part of the Copperbelt were mainly traded north and west (see figure 10) to regions along the Kasai River, in northeast Angola, or to the Upper Lomami and Maniema, partially under the attraction of the western Lunda and Luba polities (de Maret 1995; Nikis and Livingstone Smith 2017). In addition to their value as exchange items and raw material, they were also used as social currency for dowries, as admission fees in some associations, or as a status item by some titleholders (de Maret 1995, 135). Consumers' groups, such as the Kuba, Chokwe, and Salampasu, transformed the copper into ornaments to decorate objects such as masks and ceremonial weapons or into other types of currency (Gordon 2021, 174; Herbert 1984, 225–226; de Maret 1995; Vansina 1962; Volper 2014, 79–83).

In the central and eastern Copperbelt, Ib and Ic ingots were mainly traded east and south (see figure 10) to the Indian Ocean coast through traders such as the Swahili and the Bisa. In these networks, the capital city of Kazembe acted as an important intermediary for imports and exports from and to the Copperbelt (Macola 2002; de Maret 1995; Nikis and Livingstone Smith 2017). The size of these massive ingots was adapted to long-distance trade and corresponded to the load that one or two men could carry (Mahieu 1925, 113).

From the mid-19th century and the rising development of the coastal trade, some Nyamwezi traders—involved in caravan trade with the coast and originating from central Tanzania—settled alongside major trading axes between the coast and southeast Central Africa (Abrahams 1967, 24–26; Legros 1996, 34; Roberts 1970). This includes the Yeke Kingdom that was founded in the central Copperbelt, which controlled the copper mine and the local ivory trade (de Hemptinne 1926; Legros 1996). While copper could be transformed and traded in different shapes for local and regional market such as ingots, hoes, axes, or plain bracelets, one of the main long-distance trade products was the copper wire they produced (Goodwin 1935; de Hemptinne 1926, 372, 402). Ivory was the primary regional export for long-distance trade but copper was one of the main lubricants of trade to the coast (Gordon 2021, 160; Legros 1996, 32; Smith 1963, 274). Bangles made of wound copper wire and ribbon, present in the archaeological record from the 1st millennium AD, were popular in a large part of south Central and East Africa (de Luna 2016, 178–180; Herbert 1984, 81) and were consequently a prime product for the caravan supply during their journey (Legros 1996, 35). Copper and ivory trade was first oriented toward the Indian Ocean coast through Swahili traders, undermining the monopoly of Kazembe (Legros 1996, 115; Macola 2002, 139–141). Around 1870, however, Msiri, the Yeke leader, shifted his attention to the Atlantic Ocean through the Ovimbundu traders, partly to escape the Swahili influence but also to gain access to a more diverse set of imported products (Gordon 2021, 172; Legros 1996, 120–122). This shift in the trade led to decreased interest in copper because the newcomers had access to cheaper imported brass through Angolan ports (Gordon 2021, 172).

In the second half of the 19th century, at least part of the copper consumed in the interlacustrine region—Rwanda, Burundi, Uganda—and part of modern Tanzania came from the Copperbelt through a trade route passing by the Tanganyika area (Cameron 1877, 223–224; Celis 1987, 262; Celis and Nzikobanyanka 1976, 164; Legros 1996, 117). Brass and perhaps imported copper from the Indian Ocean coast would have been the other sources or raw materials (Celis 1989, 33; Herbert 1984, 158). Copper was mainly used to produce ornaments—including plain and wound wire bracelets (see figures 9b and 9c)—but also some insignia, such as those used in Karagwe (Celis 1987; Celis and Nzikobanyanka 1976; Sassoon 1983; Trowell and Waschmann 1953; Uzoigwe 1972, 447). The source of the earlier copper found in the archaeological context in the interlacustrine region as early as the 9th century AD remains uncertain (Connah 1996, 91; Ntusi and Bigo 1998; Robertshaw 1997, 13, 1999, 139–130; Van Noten 1972).

Niari Basin and the Great Congo Trade

In the western part of Central Africa, the history of the copper trade before the 16th century remains elusive because only a few copper objects have been found outside the copper-producing area in an archaeological context. Although copper has been produced at least since the 9th century AD in the Niari basin, the first evidence of trade is found in relation to the Misenga tradition production sites dated to the late 13th to early 15th centuries (Nikis 2018b). The copper bars (see figure 5) they produced have been discovered in the surrounding region, including Kindoki, south of the River Congo or at the Malebo Pool, which may have been a political and economic center at the time (Clist et al. 2015; Nikis 2018b; Vansina 1973, 445). The presence of imported pottery from the upstream regions of the Congo River among production sites suggests that the area was involved in exchange networks potentially extending as far as the Inner Congo basin area (Nikis 2018a, 412–417). The copper objects thus far found in a secured archaeological context in the Inner Congo, however, are only dated to the 19th century (Seidensticker 2021, 300, 307; Wotzka 1995, 286, 373, 375). The importance of woven inspired motifs on the pottery found at the copper production sites also suggests that the political economy of the time valued not only copper but also other products, such as raffia cloth (Cranshof, Nikis, and de Maret 2018).

Evidence of copper trade with the coastal region also remains limited prior to the 17th century. Only one copper object from a context dated between the early 15th and early 17th centuries could predate the development of trade with European traders in the 16th century (Denbow 2014, 55).

During the 16th century, diplomatic correspondence between Kongo rulers and European courts and other descriptions of the region mention the copper mines in and around the Kongo Kingdom, including an area that could be identified as the Niari basin, as well as the trade of copper (Bal 1963, 90; Brásio 1953, 57–60; Cuvelier 1946, 108; Jadin and Dicorato 1974, 78, 80, 84–86; Pacheco Pereira 1892, 83; Pigafetta and Lopez 2002, 24). In the early 16th century, the Mani Kongo would have secured access to the copper from the Niari basin, which would have contributed to the securing of his power (Hilton 1985, 54–57). Diplomatic correspondence between Kongo and Portugal (Cuvelier 1946, 108) shows that copper may also have been exchanged as a diplomatic gift alongside more regular trade, as has been highlighted in other parts of Africa (Chirikure 2017).

In the first half of the 17th century, copper, along with ivory and redwood, was one of the main exports by Dutch traders from the Loango Coast (Martin 1972, 52–62). While late-16th-century descriptions suggest that copper came from deposits in the Nyanga area, by the loop of the Niari River (Martin 1972, 17; Nicolini 1959, 110; Ravenstein 1901, 43, 52), in the first half of the 17th century Loango smelters were sent to extract copper from a region that may correspond to the Boko-Songho and Mindouli areas (Dapper 1676, 158; Jones 1983, 53, 55; Ratelband 1950, 65, 67, 70). With the rise of the slave trade, both in the Kongo Kingdom and on the Loango Coast, mentions of local copper trade and copper mines in historical sources ceased until the slave trade was banned in the early 19th century (Nikis 2018a, 50). The near total absence of production sites in the Mindouli or Boko-Songho areas during the same period suggests that interest may have shifted away from local copper to other products (Martin 1972, 61, 107; Nikis 2018a, 401–403). In the meantime, European products began to flow in the coastal region. Along with cloth, luxury

items, and beads, for example, some European copper and brass were exchanged, including copper and brass plate or crucifixes that were later locally reproduced (Herbert 1984, 136; Person and Mouchi 2016; Wannyn 1961).

The copper produced in the Niari basin in the second half of the 19th century was exchanged in a complex set of local and regional networks, which has been called the Great Congo Trade. It allowed goods from the coast to travel to the Inner Congo basin and beyond along the Congo River and its tributaries and vice versa (Sautter 1966, 271; Vansina 1973, 248). Copper ingots from Boko-Songho (see figure 6) were traded locally but also traveled to Mbandaka through various regional networks (Coquilhat 1888, 160; Dupont 1889, 345, 320, 334, 669). Copper, and later brass, regularly changed shape to fit local needs, and the Congo basin was characterized by a diverse range of copper and brass currency (Guyer and Pallaver 2018; Mahieu 1924). Ingots could become currency, then ornaments, and then currency or ingots again, and multiple kinds of currency could be used in an area at the same time (Guyer 2004, 37; Van Leynseele 1983). The multiplicity and changing nature of exchange items allowed exchanges across different social and economic spheres (Guyer 2004, 37).

With the start of the French and Belgian colonial occupation in the last decades of the 19th century, European brass imports reached an unprecedented level, overwhelming local production (Sautter 1966, 374; Vansina 1973, 272). Brass and copper had similar uses and were included in the same networks. Popular exchange items were brass rods (see figure 6), called *mitako* in some parts of the Great Congo trade networks, that could be used as currency but also transformed into ornaments (Herbert 1984, 171; Mahieu 1924; Sautter 1966, 278; Vansina 1973, 282).

Copper produced in the Niari basin may have been traded to Gabon around the 14th–15th centuries AD (Villotte et al. 2021) and during the 16th century (Martin 1972, 41). Trade with Europeans on the coast of Gabon, however, would have introduced imported brass and copper from the 17th century, and it is likely that most of the metal used to produce late-19th-century objects, including the famous reliquary figures, was of European origin (Collomb 1978; Herbert 1984, 151, 226).

On the other side of Central Africa, the Zande and Mangbetu groups of the northeast Congo basin were also consumers of copper in the 19th century; among others uses, the Mangbetu rulers used copper for insignia. The metal mainly came from the Hufrat en Nahas mine through Sudanese and Egyptian traders, but this source was not secure because of the changing relations with the Sudanese and Egyptian polities (Herbert 1984, 164; Keim 1983). It is unknown whether copper was in use before the 19th century and if another source may have supplied the area (Herbert 1984, 164).

Symbolic Value of Copper

As already highlighted with different examples in this article, copper supported the display of wealth and power, both by the accumulation of objects and by use of the metal for specific types of objects, in addition to its value as an exchange item. Historical and ethnographic examples hint

about the symbolic value associated with the use of copper. The rarity of copper to produce or embellish objects made them ceremonial or ritual rather than functional. Its material properties such as color and luminosity were also of particular importance (Herbert 1984, 277–279).

Logically, copper was regularly linked to the importance of metalworking. Among the Luba, where the smith figure was of prime importance in the investiture ceremony, the founder of the Luba state is said to have left a copper axe, a reference to the creative and destructive power of the king (Childs and Dewey 1996, 161). In Burundi, the first blacksmith king used a copper hammer and spears to display his superiority to others (Celis and Nzikobanyanka 1976, 5–13; Herbert 1984, 248). In the Tio Kingdom, the royal smith took part in the investitureand he made the brass collars that only the *makoko* and some of its vassals were allowed to wear (Nikis 2020, 225; Vansina 1973, 332–334, 380). The objects from the Lusunsi shrine were part of the investiture ritual in Ngoyo and would have indicated, among other things, the importance of metalworking, which was also closely associated with power in the Kongo world (Bostoen, Ndonda Tshiyayi, and de Schryver 2013; de Maret 1985b; Volavka 1998). The color would also have been important, because in the Kongo world, the red color referred to blood—suffering, but also generating life—and was associated with female forces (Herbert 1984, 279; Volavka 1998, 16–17). It was also the color of the transition between worlds, such as that of the ancestors (Cornet and Farris Thompson 1981).

The gleaming effect of the hundreds of copper arms displayed by the Mangbetu king was intended to impress viewers and to express his wealth and power. He wore red parrot feathers and was covered with powered red cam wood (Herbert 1984, 248; Schweinfurth 1874, 47–48). Among the Kuba, where brass was reserved for the king and the royal drum was decorated with copper, the words for brass and copper derived from roots related to luminosity (Herbert 1984, 280; Vansina 1978, 275).

Similarly, the *ekalangu* shiny copper disc worn on the chests of the chief and his sister in different groups in the Upper Kasai region was a reference to the gleaming sun (Ceyssens 1993, 102), and masks in the same area were polished to produce a similar effect and impress viewers (Bastin 1961; Ceyssens 1993, 110). The famous reliquary figures from Gabon covered with polished brass and copper and placed in the half-light would have also produced an impressive visual effect, enhanced by the play of color between the yellow brass and red copper (Collomb 1978; Perrois 1971, 67). While the reliquaries protected the community, the copper and brass protected the underlying wood structure, and copper wire and strips protected the relic it was keeping from supernatural interference (Nikis 2020, 226; Siroto 1968, 86). A similar reference to protection could be seen in the copper or brass bracelet used in the Lemba healing society of the Lower Congo and Niari basin region as a symbol of the priest's authority; it also referenced the health and prosperity promised by that society (Herbert 1984, 255; Janzen 1982, 141–142).

The value of copper in ancient societies of Central Africa is undeniable, but one should refrain from giving the metal too central a role in their political economy. Copper has been used to support the expression of power and wealth, but except in rare instances, it was also accessible to a large part of the population (Gordon 2021). For example, everyone involved in the copper

production had their share, and in the Upemba, a few copper objects have been found in graves of individuals who did not belong to the higher levels of society (de Maret 1992). The accumulation of metal or its use for particular insignia was a way to distinguish the holder.

Moreover, the political economy generally included other materials and products. It has already been mentioned (see the section "Niari Basin and the Great Congo Trade") that Central African networks were characterized by a diversity and multiplicity of currency during the 19th century, and the insignia were also diverse (see, for example, from different polities, Reefe 1981; Vansina 1973, 1978). More ancient societies likely relied on multiple products to display wealth and power, as illustrated by the Upemba graves and the multiple objects found in them—iron, shells, and probably clothes—which may have been used as a symbol of status (de Maret 1999), or by the importance of raffia cloth among Misenga communities (Cranshof, Nikis, and de Maret 2018; Nikis 2018a). The production area itself seems to have remained in most cases peripheral to the core area of the major polities to which they were linked. The means of subsistence of producing communities was generally primarily agricultural, and copper production seems to have been a side or seasonal activity for most of the people involved, except for master smelters who could work yearlong (Gordon 2021, 162; Herbert 1998). Unlike iron, which was necessary for everyday life, copper does not seem to have been essential to either producing or consuming communities and could consequently be replaced with other products when it was no longer available or devalued, as could have been the case in the Niari basin between the late 17th and the early 19th centuries or in the Upemba depression around the 18th century (de Maret 1981). Any further investigation into the role of copper, both in producing and in consuming communities, should therefore consider the political economy as a whole.

Numerous future research avenues remain. Most of the ancient producing areas still need to be archaeologically investigated in detail, and the oral history, museum collections, and archives have much to offer with regard to the production, use, and value of copper in the recent past.

Laboratory analyses have proved useful to highlight manufacturing techniques and ancient exchanges, but remain limited and should be extended to a larger set of samples to gain a more detailed picture. However, these methods alone cannot provide an understanding of the complexity of the exchange networks, their nature (gifts, trade, tribute, etc.), and the multiple trajectories of objects between their places of production and deposition. They must be combined with additional lines of evidence, such as other aspects of the material culture of the investigated area, the oral history for recent periods, or linguistics. A systematic investigation of the vocabulary linked to copper as it has been successfully applied for other types of material culture (e.g., Bostoen 2005; Klein-Arendt 2004) remains missing. Such linguistic research highlighting practices, uses, and value or shared knowledge and connections between regions and with other crafts in different parts of Central Africa would be welcome.

Further Reading

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Notes

1. Only a few important smelters in the western portion of the Copperbelt received a certain amount of copper from the colonial mining company as compensation for continuing to produce *handa* copper cross-shaped ingots, which were of social importance across the region (Gutzeit 1934). The Kolwezi area was consequently the only region with an active smelting operation during the 20th century. A smelting re-enactment was commissioned by the late director the Lubumbashi Museum for educative purposes in 2001, indicating that technical knowledge has been maintained throughout the 20th century (D. Muya wa Bitanko, *Enquêtes sur la métallurgie et la poterie anciennes au Katanga: budgets 2001 et 2002: Rapport intermédiaire*, unpublished reports, file 2011, Prehistory and Archaeology Archives, Tervuren, Belgium: Royal Museum for Central Africa). Several re-enactments were performed in the first half of the 20th century. In 1924, Nguba, an old Yeke master smelter, gave a demonstration of the smelting processes in the central part of the mining region, around the modern town of Fungurume and Likasi (de Hemptinne 1926). The re-enactment was performed again and filmed in 1956 for the 50th anniversary of the Union Minière du Haut Katanga, one of the main colonial mining companies (Liesenborghs, Vleurinck, and de Schlippe 2009). Kaonde smelters originating from Kansanshi in the 1960s also gave demonstrations in diverse parts of Zambia during the 1960s (Miller 1994).

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