Tobias B. Paul

Elephant Ranges in Ancient Sudan

Reevaluating the Narrative of the Meroitic War Elephant

Introduction

When academic inquiry into war elephants extends beyond Carthaginian general Hannibal's crossing of the Alps in the late 3rd century BCE, the prominent role of Musawwarat es-Sufra is frequently highlighted. While Meroitic cultural monuments are rarely noted outside specialist circles, no treatment on the history of war elephants omits reference to the beginnings of an indigenous African tradition of battlefield elephant use, as supposedly evidenced at this site. Musawwarat es-Sufra is one of the most significant and best-preserved archaeological sites in Sudan. Built in the mid-1st millennium BCE in the hinterland of the Nile, it remained in use until the 4th century CE. During this time, Musawwarat es-Sufra served as one of the most important ceremonial centers in the Kingdom of Kush, one of Africa's major early states.[1]

Stretching northward into Lower Nubia,[2] to the border with Egypt, where Kushite rulers maintained influence over key temples and local communities, the kingdom's core territory during the Meroitic period lay in the area dubbed the 'Island of Meroe' by Hellenistic geographers, known today as Butana.[3] Like most other archaeological sites of the Meroitic culture, the valley of Musawwarat es-Sufra is located within the Keraba—the rocky western part of the Butana—just under 25 kilometers southeast of the Nile and about 125 kilometers northeast of the confluence of the White and Blue Niles, at present-day Khartoum. The site contains numerous structures, which date primarily to the Meroitic Period (circa 270 BCE–300 CE). The most prominent monument in this valley is the Great Enclosure, an expansive and unusual cluster of buildings covering approximately 55,000 square meters. This labyrinthine complex includes a number of temples and long corridors that connect different groups of buildings, some of which are perched on terraces. Nearby, the oldest known temple dedicated to the indigenous lion-headed god Apedemak can be found, along with the largest artificial water reservoir of ancient Sudan, the Great Hafir.

Musawwarat es-Sufra is particularly remarkable for its abundant elephant representations, which appear in various locations throughout the site. The animals are featured in the reliefs of the temple of Apedemak.[4] Within the Great Enclosure, they are represented by a wall that culminates in an elephant sculpture, in column bases in front of the central temple and within the chapel-like Room 108, as well as in a semi-plastic relief in Temple 300.[5] Additionally,

1 Wenig (2013), Näser (2012). The kingdom, which lasted for over a thousand years from approximately 750 BCE to around 300 CE, acted as a cultural and trade interface between ancient sub-Saharan Africa, Egypt, the Greco-Roman Mediterranean, and the Near East. Scholars typically divide the history of Kush into the earlier Napatan and later Meroitic periods, reflecting the shift in the kingdom's political and cultural centers, as well as the locations of royal necropolises during these eras (Welsby 1996, Török 1997).

2 Kush is also often referred to as Nubia, particularly in reference to the region's broader historical and cultural legacy. In this article, however, the term refers to a geographical region rather than a cultural one. Nubia is located along the Nile, stretching from the southern part of Egypt down through northern Sudan. It is divided into Lower Nubia, between the First and Second Cataracts, and Upper Nubia, extending from the Second Cataract to the Napatan region just south of the Fourth Cataract. Upper Nubia was also the center of the Kerma culture, which preceded the Kingdom of Kush and flourished from approximately 2500 to 1500 BCE (Edwards 2004).

3 Wolf & Nowotnick (2021). Defined by a triangle of three major rivers, this region is bounded to the northeast by the Atbara, which meets the Nile 80 kilometers upstream from the Fifth Cataract, marking the northern tip of the Island of Meroe. The northwestern boundary is formed by the (White) Nile, while the southwestern edge is delineated by the Blue Nile. The Butana can be divided into two parts: the eastern part, which is a vast grass-covered plain, and the western part, known as Keraba, which is a rocky sandstone plateau characterized by flat-topped hills (gebels) separated by large wadis. For most of the year, the Keraba is dry, but during the summer rains, water flows into the wadis, allowing vegetation to grow. This seasonal vegetation supports animal husbandry and makes rain-fed agriculture possible.

4 Wenig (1993: 216-217).

5 Hintze, F. (1968); Hintze, F. & Hintze, U. (1970); Hintze, F. et al. (1971).

they are frequently found in graffiti scattered across the site.[6] This prominence of elephant depictions has captured the imaginations of visitors and researchers for generations and has sparked numerous hypotheses about the role of elephants in the Kingdom of Meroe and beyond.

According to specialist literature in ancient studies, the practice of elephant taming was prevalent in the Meroitic culture and possibly in preceding Kushite epochs as well.[7] The companion volume to the first international exhibition on the art of ancient Sudan stated: "It can scarcely be doubted that the Meroites were familiar with the art of taming African elephants and that they used these animals in military campaigns."[8]

This perception remains significantly influenced by the early work of Peter Shinnie, one of the most eminent scholars in Kushite archaeology, whose seminal book "Meroe: A Civilization of the Sudan" had a wide-reaching impact, especially in literature that does not specialize in the archaeology of Sudan.[9] Shinnie's portrayal of Musawwarat es-Sufra was notably distinctive: He presented it as a location whose walls and ramps were used for keeping and taming elephants,[10] and within its Lion Temple, actual lions were purportedly housed.[11] Shinnie himself did not uphold this interpretation in later publications.[12]

Further, Musawwarat es-Sufra was considered by some to have been a trading post for elephants.[13] It has been suggested that the war elephants of Ptolemaic Egypt, having been tamed by the Meroitic people, were transported through Meroitic intermediaries to loading stations on the coast of the Red Sea.[14] Yet, recent literature tends to adopt a more cautious stance, although it does not explicitly contradict the older hypotheses.[15]

However, the evidence supporting these interpretations is, at best, tenuous, as they rely solely on interpreting Musawwarat es-Sufra's elephant imagery as a literal depiction of real-world practices. In contrast, the explicitly religious context of these scenes suggests they are not reflections of historical reality but symbolic representations that should be understood within the broader artistic and cultural context of their visual culture.

The other central premise of the idea of Meroitic elephant keeping is the implicit assumption that elephants lived in the wild in the same regions and periods where they were depicted.[16] While this second premise is not necessarily incorrect, it is insufficiently nuanced and thus warrants detailed scrutiny. In the following sections, this article investigates the historical distribution of elephants along the Middle Nile Valley using a multidisciplinary approach. The analysis begins with a review of archeozoological evidence, followed by an examination of pictorial representations, including rock art, various artistic depictions found in architectural decoration and artifacts (primary art), as well as graffiti (secondary art). The discussion then moves to written sources. Finally, the article considers ecological and human impact factors, analyzing how environmental conditions and human activities may have influenced the distribution of elephants in the Kingdom of Meroe. Through this comprehensive approach, this contribution aims to provide a nuanced understanding of the topic, offering new perspectives on the complex relationship between elephants and their environment in antiquity. By doing so, it seeks to establish a more reliable foundation for considering the role of elephants in Meroitic culture.

6 Hintze, U. (1979).

7 Hintze, F. (1962: 183); Hintze, F. & Hintze, U. (1966: 24); Shinnie (1967: 101); Estigarribia (1982: 282); Jaritz (1998: 465); Lobban & Liedekerke (2000: 238), misquoting Welsby (1996: 43), who actually pointed out the uncertainty of a Kushite use of war elephants; Burstein (2008: 147); Kormysheva (2010: 237); Haaland (2014: 669). Krebs (1968) assumed a limited implementation under Ptolemaic influence; Hofmann (1975: 54–55) and Hofmann & Tomandl (1987: 165) ruled out a pre-Meroitic tradition and could only envision a Meroitic implementation under the guidance of Indians at most; as far as the author is aware only Török (1997: 396) opposed the view that elephants were kept in Meroe.

8 Hintze, F. (1978: 89).

9 Scullard (1974: 130); Spinage (1994: 265); Gröning & Saller (1999: 212); Kistler (2006: 71); Nossov (2008: 22); Trautmann (2015: 241–242); Cobb (2016: 203); Shell (2019: 82), Abakumov (2020), Miziur-Możdzioch (2024: 53-54).

10 Shinnie (1967: 94).

11 Shinnie (1967: 100–101).

12 Shinnie (1996: 111).

13 Jaritz (1998: 465); Wenig (2001: 86), Rilly (2017: 224).

14 Estigarribia (1982: 283).

15 Welsby (1996: 43); Charles & Singleton (2019: 226). Wenig (2019: 869): "Among the many representations of animals [among the graffiti in Musawwarat], there are also several elephants. Some assumed that this indicated that the elephants were tamed at the Great Enclosure. However, this discussion has long since been abandoned."

16 For example, Nowotnick et al. (2014: 25) state, "Today, the region just supports the keeping of small herds of sheep, goats, and camels, whereas depictions of the Meroitic period show that once elephants, giraffes, and ostriches populated the area […]," or Vincentelli (2016: 28) notes: "It is possible that ivory came from the Sudanese savannah where, in that time, the presence of elephants is certain." See also Lenoble (1994: 4); Török (1997: 396); Grzymski (2014: 3–4), Rilly (2017: 224).

Archeozoological Evidence

Though elephants are no longer found in erstwhile Meroitic territories,[17] the ancient distribution range does not necessarily align with today's habitats — indeed, elephants were present in the south and east of what is today the Republic of Sudan even in the recent past.[18] In Dinder National Park, named after the seasonal river that flows along the southern edge of the Butana, elephants from Ethiopia's Alitash National Park have begun to repopulate the area[19] after the extinction of the park's last herd in the mid-1950s.[20] Along the Gash, which flows through Kassala, and the Setit River, a tributary of the Atbara, there is an elephant population[21] in the border region between Eritrea, Sudan, and Ethiopia that was also present in the 19th century.[22] Both the Gash and Setit rivers run dry for much of the year.

Just as in historical times,[23] prehistorically the species would have roamed across Africa, excluding deserts devoid of water sources. However, existence does not imply abundance. The misleadingly labeled Green Sahara of the African humid period could only support ephemeral populations. The latest finds of elephants in the Sahara date to the last millennium BCE, likely relic populations surviving around favorable microhabitats, isolated by increasingly arid conditions. These late populations would have been remnants of a once more widespread distribution, with their gradual disappearance likely driven by the fragmentation of suitable habitats, ultimately leading to their extinction.[24] But what about the desert's periphery? Whereas the animals dwelling north of the Sahara are known to have perished by about the sixth century CE,[25] the later history of the populations in the Sahelian zone remains rather elusive.

While away from the river sporadic skeletal remains extend to the Neolithic period,[26] the lack of evidence from systematic investigations of faunal collections in the Nubian region suggest an earlier extinction along the Nile.[27] Positive evidence identifies the Kerma area as the northernmost boundary of elephant habitation in the river valley during the Mesolithic period.[28] South of the Sixth Cataract, elephants were a common component of archaeological assemblages until about 3000 BCE,[29] while a singular find from the fifth millennium hints at their continued presence between the Fifth and Sixth Cataracts.[30]

Archeozoological investigations of the Keraba region indicate an even earlier disappearance in the Central Nile hinterland, with the last elephant bones found in the mid-ninth millennium.[31] A similar geographic pattern emerges from the Upper Atbara: while the elephant had vanished from the hinterland, it persisted in the river valley between 2850 and 1550 BCE.[32]

Later findings are limited to tusk remnants, with a solitary fragment discovered in the city of Kerma.[33] Since Kerma's rulers had to import ivory,[34] this particular find likely attests to such trade, mirrored by the more extensive Napatan[35] and Meroitic[36] caches. Stable isotope analysis of ivory artifacts from antiquity has shown that "Southern Levant ivories were sourced from elephants that lived in the latitudinal vegetal belt classed […] as the wooded grasslands and more woody landscapes"[37] very similar to those in present-day South Sudan.[38] However, the overall

17 At present elephants range up to the 10th parallel in South Sudan, see Thouless et al. (2016: 119–123).

18 See Sikes (1971: 239) on the remaining populations in the 20th century. During the 19th century, elephants must have been encountered around Kassala. The savannas of the surrounding "Atbara lands" were used as hunting grounds for European zoos, see Menges (1876); Brehm (1891: 32). Elephants from upper reaches of the Atbara are also indirectly attested by Budge, who saw elephant corpses floating in the waters of the river near its confluence with the Nile, see Budge (1907a: 251–252). The assertion by Krebs (1968: 431–432), positing Kassala as the hub of the 19th century ivory trade, from which he deduces a frequent local occurrence of elephants, could not be substantiated by the present author through available literature. Rather, it appears that in Kassala, ivory was largely a commodity imported from Ethiopia, see Cumming (1940: 251).

19 Thouless et al. (2016: 34).

20 Sikes (1971: 239).

21 Shoshani et al. (2004).

22 Hinkel (1992: 36).

23 Nowak & Walker (1999: 998).

24 Gautier et al. (1994).

25 Nowak & Walker (1999: 1002).

26 Churcher et al. (2008: 12); Kröpelin (1993: 212); van Neer & Uerpmann (1989: 330).

27 Gautier (1968 & 1984).

28 Chaix & Honegger (2014).

29 Gautier (1988 & 1989).

30 Gautier (1986).

31 Peters (1989 & 1991).

32 Peters (1986 & 1992). Brémont (2020) also offers an overview of the disappearance of elephants in Egypt and Nubia based on archeozoological evidence.

33 Chaix (1993).

34 Morkot (1998).

35 Griffith (1922); Vincentelli (2011: 277 & 2016: 28); Welsby (2015: 73).

36 Carter & Foley (1980); Hintze, F. (1971); Näser (2004); Vercoutter (1962).

37 Shochat (2023: 372).

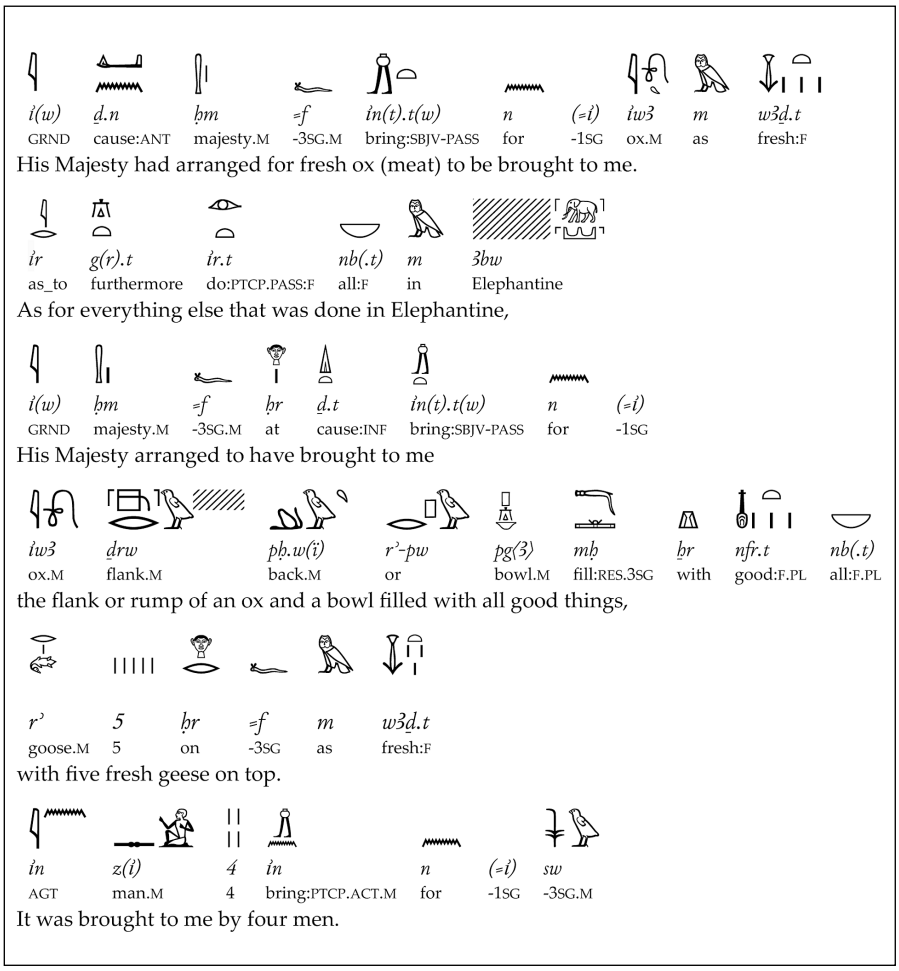
38 Shochat (2023: 366, fig. 4.4.3.1.1). As Shochat (2023: 377-378) argues: "The 13C, 15N, and 2H isotopic compositions, extracted from the dentinal collagen, reveal that the ivories' most plausible sourcing pools extended over an array of woodland landscapes, flanking the closed cano-

lack of bone finds partially reflects changes in human subsistence strategies as well as the limited depth of site deposits.[39] Therefore, additional types of sources are necessary.

Past Scholarship

Early scholars addressing the subject inferred the species' extinction in Egypt and Nubia in early Predynastic times (i. e., the early 4th millennium BCE)[40] based on the deep patination of elephant depictions and the superposition of rock art motifs.[41] When Störk addressed the question in the "Lexikon der Ägyptologie" he advocated for much later extinction dates around the Middle Nile Valley,[42] a viewpoint accepted in later literature.[43] Störk established that elephants likely inhabited Lower Nubia up until at least the Egyptian Middle Kingdom (ca. 1980–1760)[44] and possibly the early New Kingdom (ca. 1539–1077), assertions that almost certainly require revision.

The first case made for elephants in Nubia rests on a mistaken interpretation. Störk commended Váhala for rediscovering an inscription which mentions that, during an expedition to the south, four men presented a tethered elephant to Senusret I. Váhala, stating that to his day this text had eluded researchers' attention,[45] evidently was not aware that before him Breasted as well as Gardiner had written about it,[46] the latter emending the publication Váhala relied on (see fig. 1 for Gardiner's facsimile of the text).[47] The passage (= Urk. VII, 5, 19-21)[48] actually chronicles food items given by Senusret in Elephantine, which Váhala seems to have misread as elephant:[49]



py rain forests of central Africa. These landscapes with overlapping isotopic compositions in sub-Saharan Africa occur south of the Sahelian grasslands, western Kenya, or southeastern Africa, to state only the empirically proven regions. […] If elephants presumably inhabited the Sahelian grasslands, thus providing an ivory source closer to the Southern Levant, why are they not represented in the ivory repertoire?"

39 Peters (1992).

40 Hendrickx (2006).

41 Dunbar (1941: 63).

42 Störk (1975: 46–47), elaborated in Störk (1977: 10–18).

43 Zibelius-Chen (1988: 35 & 45); Tomandl (1999: 853, n. 36).

44 Dates for Egyptian periods follow the chronologies established by Hornung et al. (2006: 490–495).

45 Váhala (1970: 82).

46 Breasted (1906: 247, n. b); Gardiner (1908: 133–135 & pl. VIII A).

47 Morgan (1894: 183). Admittedly, Váhala's translation is odd even considering the errors in this publication.

48 Sethe (1935).

49 The linguistic glossing follows the guidelines established by Di Biase-Dyson et al. (2009). 1=first person, 3=third person, ACT=active, AGT=agent marker, ANT=anterior, F=feminine, GRND=ground, INF=infinitive, M =masculine, PASS=passive, PL=plural, PTCP=participle, RES=resultative, SBJV=subjunctive, SG=singular.

Fig. 1: East face of pillar 4 in the tomb of Za-renput (cropped from Gardiner 1908: pl. VIII A).

Rock Art

The second argument revolves around two instances of elephant petroglyphs,[50] at least one of which the authors argue confirms their continued existence in Lower Nubia.[51] This analysis is questionable for several reasons. Firstly, the existence of a signifier does not necessarily infer the local existence of the signified. The amount of detail in one case (fig. 2) suggests the artist's familiarity with elephants,[52] but this could have been acquired elsewhere.

Scenes of elephant riding and hunting from the Wadi Shalul in the Egyptian Eastern Desert[53] caution against inferring the local fauna solely from representations in rock art. These depictions are located along the route from Berenike to Edfu. Ptolemaic war elephants, captured along the Red Sea coast, were shipped to Berenike and then transported through the desert to Edfu,[54] as evidenced by various votive inscriptions found at the desert's edge.[55] It is therefore possible that the Lower Nubian elephant depictions are also connected to the Ptolemaic elephant hunters, whose presence at Abu Simbel is epigraphically documented.[56]

Secondly, the dating methods are tenuous. The first elephant petroglyph (figs. 2 & 3) superimposes two boat images that the authors date to a later pharaonic period and to the New or Middle Kingdom. In one case, this analysis is based on the mast and rigging. While a central mast and a line that could account to a backstay are certainly discernible, the other two lines could as well be addressed as the common round version of a central cabin rather than rigging. The image offers no details, such as a yard of a square rigging, pointing with any certainty to later pharaonic times. The researchers interpret the other boat as a C-group shape with a characteristic New Kingdom rudder. Given that a crooked rudder and a rudder missing its top section are both unusual features in boat petroglyphs, it is quite possible that the object has been misidentified. Instead of a rudder, the depiction might actually represent a fender or an anchor stone.[57]

The attribution of an elephant depiction (fig. 4) found at a site midway between Amada and Karanog is based solely on the observation that both the animal figure and a central pharaonic image were created through pecking and smoothing techniques.[58]

50 Almagro Basch & Almagro Gorbea (1968: figs. 160 & 178).
51 Almagro Basch & Almagro Gorbea (1968: 285).
52 The knees of the elephant in question point in the right directions, the markedly concave back of an African elephant is correctly rendered, there is a protuberance behind the front legs that could very well represent the uniquely positioned teats of an elephant cow, and the tail features a basal appendix that can be quite pronounced in some animals.
53 Morrow et al. (2010: 138, SHA 6 A & 146, SHA 14 A).
54 Cobb (2016: 195-196).
55 Bernard (1972); Mairs (2011).
56 Desanges (1970).
57 Cf. Engelmayer (1965: 60–70); Červíček (1974: 98–138).
58 Almagro Basch & Almagro Gorbea (1968: 170): "Esta figura está realizada con la técnica del piqueteado y luego alisado del interior de la figura, como la del faraón, de la cual no debemos colocarla muy lejanamente en el orden cronológico."

Fig. 2: Cropped from Almagro Basch & Almagro Gorbea (1968: Fig. 285).

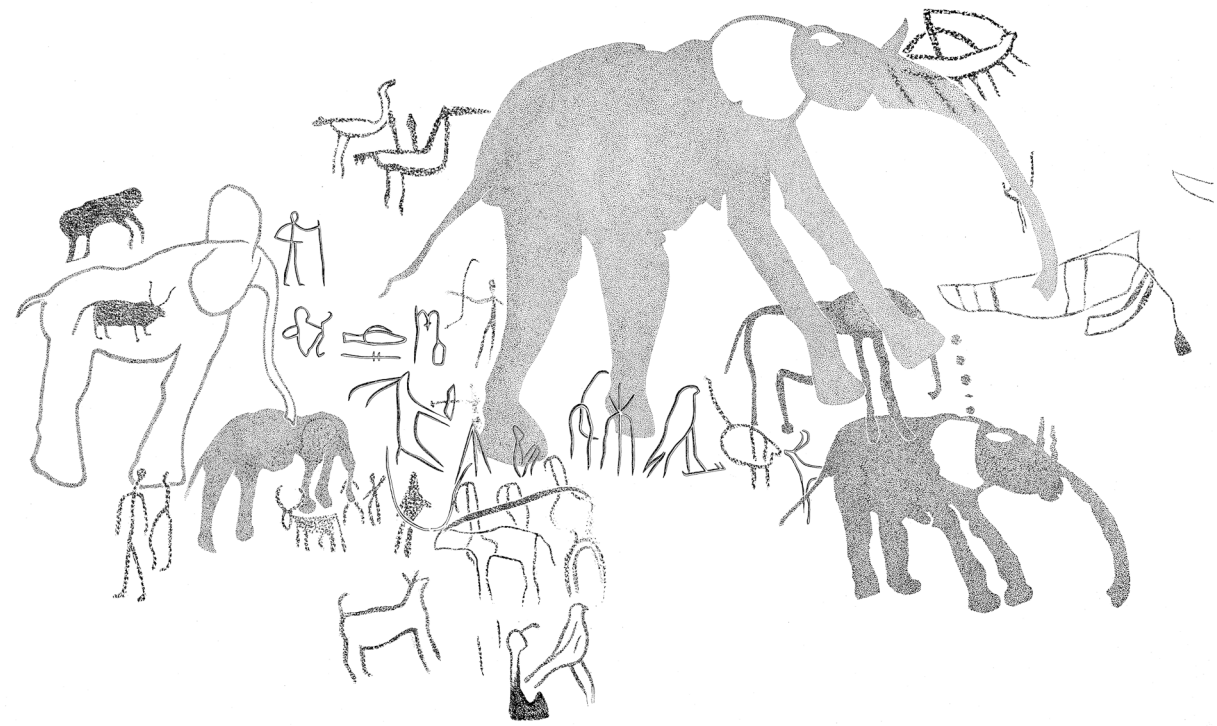


Fig. 3: Cropped from Almagro Basch & Almagro Gorbea (1968: Fig. 178).

Fig. 4: Cropped from Almagro Basch & Almagro Gorbea (1968: Fig. 160).

It remains unclear which evidence led the authors to "evidently"[59] assign the figure to the New Kingdom or later. The motif, a smiting king wielding a mace and wearing the white crown, is already attested in the pre-dynastic rock art of Lower Nubia.[60] The site is situated to the north of the Middle Kingdom fortress of Aniba[61] and at the route to Toshka, an area historically frequented by expeditions tracing back to the Old Kingdom era (ca. 2543–2120).[62]

But does the rock art evidence provide any insights? Wildlife is less prevalent than cattle depictions in the Middle Nile Valley, but among wild animals, elephants are common.[63] They occur frequently from the First down to the Third Cataract,[64] and are attested in the Red Sea Hills as well.[65] Further south they become scarce, with scattered sites featuring elephant petroglyphs found around Wadi Howar and the Fourth Cataract.[66] However, rock art sites in the Upper Nubian Nile valley are less well-documented. While the lower ratio of elephants compared to other motifs may be significant, their overall scarcity partially reflects the state of research.[67] Very little rock art is known from the Meroitic heartland, where the local sandstone's erosion adds to the lack of research.[68]

Elephants in rock art usually exhibit a high degree of patination, except for some from the Fourth and one from the Third Cataract. These exceptions, due to this and other factors, are suggested to date back to the Kushite and Kerma periods, respectively.[69] After examining more than 150 scenes from the Middle Nile Valley featuring elephants, the present author found no superimposition of or unambiguous relationship to motifs, such as horses, camel riders, inscriptions, or religious symbols that would clearly suggest a dating later than prehistoric periods.[70]

59 Almagro Basch & Almagro Gorbea (1968: 169): "Esta figura, evidentemente, debemos fecharla en el Nuevo Imperio o inspirada en obras del citado periódo." It may be doubted that the authors, prehistorians, had the Egyptological domain knowledge to correctly date Egyptian depictions. Doubts that they immersed themselves in the subject matter during the publication of the volume are not least raised by the consistently incorrect spelling of the place names with Qasr as Qars, which made it onto the title.

60 Darnell et al. (2012). Alongside the depiction of the king, there is also a flower-like symbol, similar to those found on the Narmer Palette and the Scorpion Macehead.

61 Ferreira (2019).

62 Shaw et al. (2010).

63 Otto & Buschendorff-Otto (1993: 70).

64 Allard-Huard (1993); Almagro Basch & Almagro Gorbea (1968); Edwards (2006); Hamdeen & Polkowski (2019); Hellström et al. (1970); Leclant (1973); Osman et al. (2011); Otto & Buschendorff-Otto (1993); Resch (1967); Váhala & Červíček (1999).

65 Pluskota (2006).

66 Fawzi Hassan (2014); Kleinitz (2012); Tahir (2014).

67 Kleinitz (2007).

68 Edwards (2006: 56).

69 Kleinitz (2012: 40–41); Osman et al. (2011: 328–329).

70 Again, the southern region possibly stands out, but dating the Fourth Cataract megafauna to Kerma times based on close spatial relations to cattle depictions hinges on the

Primary Art

Depictions, especially isolated ones, do not prove the local presence of elephants, but their absence does not necessarily reflect the contemporary fauna. This is clearly evidenced by the dearth of ovicaprids in the region's rock art.[71] Nonetheless, it seems surprising that such a remarkable animal would lack symbolic significance. One would expect it to play some role in the pictorial world of people living near it. While this holds true for the Nubian A-Group culture of the 4th millennium BCE, whose art regularly featured elephants,[72] other pre-Meroitic representations are rare in Sudan. Ivory inlays from the classic period in Kerma depict some elephants among other wild fauna.[73] From Napatan times, two ivory elephant figurines were found in a pyramid at el-Kurru (Ku. 4).[74]

Elephants appear more frequently as architectural decoration in Meroitic art, yet they are far from being a ubiquitous subject matter. This is especially true considering their distinct local and temporal focus: more than half of the approximately forty published depictions from the Meroitic period originate from Musawwarat es-Sufra.[75] All of these likely belong to a construction project undertaken by King Arnekhamani in the late third century BCE.[76]

Naga mirrors Musawwarat es-Sufra in its religious reliefs[77] and its elephant-shaped column bases.[78] A comprehensive quantitative and chronological discussion of this site must await further publication. Tentatively, it appears that iconography originated in the early building periods of Musawwarat es-Sufra and Naga[79] and persisted as a marginal phenomenon until the end of the Meroitic culture, as evidenced by a wood fragment from a pyramid at Gebel Barkal (Bar. 2)[80] and a relief from a pyramid at Meroe's Begrawiya North Cemetery (Beg. N. 35).[81]

Other Meroitic elephant representations span a variety of media, techniques, and styles, sharing few commonalities. Two frescoes from the city of Meroe[82] and a window grill from Qasr Ibrim[83] date to the later stages of the Meroitic period, while several small finds of diverse origins are mostly of unclear dating.[84] Given their dissimilarity, a shared symbolism is not discernible. Some of these small finds are considered Meroitic based on the assumption that elephants, particularly those that are ridden, are characteristic of Meroitic culture.[85] However, finds lacking distinct Meroitic features could also potentially be of Egyptian origin. The art of the Greco-Roman period of Egypt regularly featured elephants.[86] It is

contested dating of the latter, cf. Kleinitz (2007: 217). The proposed dating of a single petroglyph to the Christian era (Fawzi Hassan 2014: 1058) appears to rely primarily on the proximity of three elephants to a cross. However, without the publication of additional details or a photograph, this assertion is difficult to evaluate.

71 Kleinitz (2012: 47).

72 Hofmann (1967: 117); Trigger (1976: 35–36).

73 Reisner (1923: pl. 54-56).

74 Dunham (1950: fig. 11 f).

75 Cf. Billig (2004).

76 Scheibner (2011 & 2014b).

77 Hintze, F. (1959: pl. VI, fig. 43); Gamer-Wallert (1983a: 140–142 & 1983b: pls. 53 & 81).

78 Wildung (2018: 263–271); Schlüter & Perzlmeier (2021/22: 180–181).

79 Regarding Naga, this was personally communicated by field director Christian Perzlmeier.

80 Dunham (1957: fig. 62).

81 Lepsius (1849-1859: V, pl. 50 c).

82 Wenig (1978: 210, no. 132); Hintze, F. (1978: 104, fig. 75); Vinogradov (2013).

83 Plumley (1970: pl. XXIII, fig. 4); Vinogradov (2023).

84 A beaker (Dunham (1963: 447, figs. 242 & 243)), a lamp Dunham (1963: 192, fig. 138 a-d), and two statuettes (Charles & Singleton (2019); Desanges (1970: 35)), all made out of bronze, a faience figurine (Macadam (1955: pl. XCVI a, 0724)), ivory figurines (Dunham (1950: fig. 11 f)), and a wood fragment Dunham (1957: 92-93, fig. 62, pl. LXX D).

85 Cf. Charles & Singleton (2019).

86 Examples include statues (Komorzynski (1952); Jaritz (1998)); bronzes (Boreux (1932: 401), Musée du Louvre, E 5765, https://collections.louvre.fr/ark:/53355/cl010006175; British Museum, registration number 1814,0704.1649, https://www.britishmuseum.org/collection/object/G_1814-0704-1649; British Museum, registration number 1922,0712.11, https://www.britishmuseum.org/collection/object/G_1922-0712-11); terracotta objects (Roeder & Ippel (1921: 167); van Oppen de Ruiter (2019: figs. 16 & 26); Musée du Louvre, E 27423, https://collections.louvre.fr/ark:/53355/cl010034432; Musée du Louvre, AF 1240, https://collections.louvre.fr/ark:/53355/cl010029297; Musée du Louvre, AF 1033, https://collections.louvre.fr/ark:/53355/cl010021845; Musée du Louvre, E 29937, https://collections.louvre.fr/ark:/53355/cl010029748; Michael C. Carlos Museum, Emory University, object number 2010.024.001, https://collections.carlos.emory.edu/objects/27184/harpocrates-riding-an-elephant; Museum of Fine Arts Boston, accession number RES.62.52, https://collections.mfa.org/objects/287266/elephant-head-lamp; British Museum, registration number 1814,0704.885, https://www.britishmuseum.org/collection/object/G_1814-0704-885; Petrie Museum of Egyptian Archaeology, University College London, accession number UC2322, https://www.britishmuseum.org/collection/object/X__813; British Museum, registration number 1925,1120.61, https://www.britishmuseum.org/collection/object/G_1925-1120-61); faiences (van Oppen de Ruiter (2019: figs. 17-20), Musée du Louvre, E 14238, https://collections.louvre.fr/ark:/53355/cl010007794; Musée du Louvre, E 22582, https://collections.louvre.fr/ark:/53355/cl010019433; Musée du Louvre, E 11337, https://collections.louvre.

worth noting that half of the portable artefacts considered Meroitic that depict elephants were discovered in Lower Nubia, an area largely under Egyptian control during early Ptolemaic times.[87]

The pictorial evidence suggests an interest in using elephants symbolically, particularly within sacral-royal registers, during the early Meroitic period. Whether this reflects a regional and potentially related cultural shift toward an area where elephants were present is difficult to ascertain. This trend could also be explained by the extraordinary efforts Ptolemaic Egypt invested in capturing African war elephants during that period.[88]

The imagery itself offers few direct conclusions. There are no scenes of hunting or capturing, which might suggest the depiction of wildlife. Instead, a riding scene along with depictions of animals covered with saddle blankets and held by leashes from the Lion Temple of Musawwarat es-Sufra[89] may imply the portrayal of tamed elephants. However, this appears to be a means of symbolizing divine power. While the temple reliefs are embedded in religious iconography, the architectural sculptural elements and the small finds lack a distinct overarching symbolism and may merely be decorative.

Secondary Art

At Musawwarat es-Sufra, the Great Enclosure's graffiti corpus[90] contains a multitude of zoomorphs, including at least seven elephants — the only known pieces of published secondary art depicting the animal. Most of these graffiti are believed to be no older than the construction periods during Arnekhamani's reign.[91]

They are of particular interest, as the elephant graffiti there accompany images of other wild species. These species are otherwise excluded from architectural decoration (like giraffes) or are missing entirely from Meroitic art (such as ostriches and rhinoceroses).[92] This secondary art appears to represent a distinct register: while it incorporates some elements of the religious and royal canon, it often features scenes that clearly originate from the everyday world.[93] Yet, it remains uncertain as to which of these worlds the depicted elephants belong to. One must consider that the primary art could have inspired them, and while some specimens resemble those known from rock art, others more closely align with the style of the temple reliefs.

One image of a lion on an elephant's back might depict the rare act of predation, in line with other scenes such as dogs chasing hares, a crocodile drowning a leaping antelope,[94] and giraffes feeding on trees.[95] The dynamic posture of the elephant aligns with the naturalism of these depictions, however, the portrayal of the lion sitting on its hind legs contradicts the idea that the scene represents a real-life observation. Another graffito shows the god Apedemak in lion form in the same stance.[96] Could the lion on the elephant thus be a variation of the motif of riding gods also depicted on column 6 of the local Lion temple?[97]

Nevertheless, the strongest evidence of real elephant populations appears to be their association with other representatives of wildlife. The African megafauna graffiti found in Musawwarat es-Sufra could serve as evidence for a real-world occurrence of fauna characteristic of the East Sudanian savanna ecoregion within the Kingdom of Meroe. Still, especially under the assumption that this secondary art by tendency represents the art of the mobile pastoralist population of the Meroitic empire, the conclusion on elephants in the immediate vicinity is not imperative — the same holds certainly true for the graffiti of crocodiles and hippopotamuses, which could not survive in a region without constant bodies of water, such as the Keraba.

What is noteworthy, however, is the regional focus of Meroitic elephant depictions in the presumed contact region between those mobile groups of the Butana region and the more sedentary population along the Nile valley. Beyond this observation, one should not accept the pictorial sources at face value. The absence of elephants in Napatan art might stem from reliance on the Egyptian canon of images, not because the Kushite people were unaware of elephants. Their emergence in Meroitic times simply suggests a shift in symbolic communication, an evolution that certainly warrants further exploration.

fr/en/ark:/53355/cl010007829) and coins (van Oppen de Ruiter (2019: fig. 5). All online addresses accessed 1/8/2024. Further examples are listed in Boutantin (2014: 498-506) and Miziur-Możdzioch (2024: 205-207).

87 See Burstein (2008) on the extent of Ptolemaic control in Nubia and beyond.

88 See Casson (1993) for a concise overview of the introduction of the Ptolemaic elephant hunting program.

89 Wenig (1993: 216–217).

90 Kleinitz & Casties (2011-2012).

91 Hintze, U. (1979: 136).

92 Hofmann & Tomandl (1987: 90-95, 108-110, 126).

93 Kleinitz (2014).

94 Kleinitz (2013: 409).

95 Kleinitz (2014: pl. 8).

96 Kleinitz (2014: pl. 1).

97 Hintze, F. et al. (1971: pl. 96 c).

Written Sources

What insights can contemporary written sources provide regarding the geographical distribution of elephant populations? The proposal by Claude Rilly that the Meroitic name of Musawwarat es-Sufra, Aborepe, refers to elephants is intriguing.[98] However, the claim that Abore is cognate with the reconstructed proto-North Eastern Sudanic form *aŋgur, meaning elephant,[99] relies on a reconstruction of this proto-language that remains contentious.[100] If Aborepe did indeed mean something like "the resting place of the elephant", this does not provide direct evidence that elephants were present at this location during the Meroitic period, as toponyms are known to endure over long periods of time and often function as linguistic fossils, preserving ancient meanings long after the original context has changed.[101]

Pharaonic texts, in this regard, are not particularly informative; Egyptians were primarily interested in Kushite ivory. The sole reference to living animals is the multiple accounts of Thutmose's III elephant hunt during a campaign against the Mitanni. His stela from Gebel Barkal claims him, "without boasting, without a lie therein," as the only human king ever to have accomplished such a feat.[102] This raises the question of why he would have overlooked the chance to partake in another prestigious hunt in Nubia if the opportunity had arisen.

Given the Greek fascination with these exotic pachyderms, literary sources began to emerge as Hellenic writers gained insights into Sub-Saharan Africa. Herodotus was among the first, mentioning the enormous elephants of Aithiopia[103] in the fifth century BCE.[104] However, the terms Aithiopians and Aithiopia suffer from a lack of conceptual clarity. While Meroitic people were considered the quintessential Aithiopians, the term could also broadly refer to all inhabitants of Africa south of Egypt, extending to the Atlantic,[105] as well as to peoples in India.[106]

Knowledge of the lands of the Aithiopians expanded significantly following Alexander's conquest of Egypt, primarily due to the Ptolemaic efforts to secure an African source for their war elephants. As a result, very precise information about suitable regions was collected and compiled in Alexandria, particularly during the reign of the second Ptolemaic king, Philadelphos (284–246 BC), following his Nubian military campaign in the 270s. This close contact between the Ptolemies and the Meroitic kingdom continued until the end of the century. Even though these primary sources have not survived, substantial fragments of compendial works based on these reports can be found in the writings of later authors.[107]

It was not until nearly 300 years later that such detailed knowledge again reached the Greco-Roman world. This time it was Roman emperor Nero who planned a military campaign into Nubia, although he later abandoned it. For this purpose, scouts apparently not only explored the Nile valley, but also ventured deep into the hinterland.[108] Based on two quotations from the times of these Ptolemaic and Roman expeditions, it is asserted that elephants were to be found onwards from the Fifth Cataract in the third century BCE and that Meroe marked their northernmost range in the first century CE.[109] However, a closer examination of the sources paints a more nuanced picture.

The northern extent of the third century rests on the itinerary of Bion of Soloi, an author about whom little is known other than that he wrote one of the earliest works on Aithiopia. The few preserved fragments bear witness to his knowledge of the Meroitic kingship and the availability of precise geographical data, likely obtained during the Ptolemaic elephant expeditions.[110]

98 Rilly & de Voogt (2012: 101–102) explicitly describe this interpretation as a hypothesis aimed at explaining the abundance of elephant depictions at Musawwarat es-Sufra. Without these depictions, it is possible that the hypothesis might not have arisen. This raises a potential issue of circular reasoning: the depictions inspire the linguistic reconstruction, while the reconstruction is used to explain the presence of the depictions.

99 Contra Priese (1968: 174-175), who proposed that it is cognate with words meaning 'content,' 'rich,' 'satisfied,' or 'powerful' in Nubian languages.

100 Güldemann (2018: 278-283 & 299-308). While Breyer (2022) accepts this particular reconstruction, he himself (Breyer 2012: 148-149) cautions against the hasty adoption of reconstructed forms: "Doch Buchstabenfolgen unbekannter Bedeutung mit der Hilfe moderner Sprachen deuten zu wollen, die fast zwei Jahrtausende später gesprochen werden und für die es zumeist nur eine verhältnismäßig rudimentäre Dokumentation gibt, das erscheint mir beinahe unmöglich zu sein." The translation of Abore as elephant was, in any event, included in the Analytic Meroitic Dictionary, see Hallof & Hallof (2022: 18).

101 Perono Cacciafoco & Cavallaro (2023: 22-23).

102 Reisner & Reisner (1933).

103 The use of the spelling with "Ai-" serves to prevent confusion with modern Ethiopia.

104 Eide et al. (1994: 320).

105 Cf. Radt (2005: 515).

106 Schneider (2015).

107 Burstein (2000 & 2008); Casson (1993).

108 Eide et al. (1998: 884–895).

109 Störk (1975); Vernus (2005); Burstein (2008).

110 Burstein (2018); Eide et al. (1996).

This itinerary mentions a place called Zamnes, a location from where on elephants could be encountered. While another place further upriver has been equated with modern Korti, a reliable identification of Zamnes has not been achieved.[111] However, Karl-Heinz Priese has argued that this place was near the southern Nile arc located between the Third and Fourth Cataract. This area is where the river closely approaches the latitude of the Atbara's mouth. Furthermore, after the decline of the flood, numerous oxbow lakes remain in the wide river valley, offering a favorable habitat.[112] The elephant petroglyph on Us Island at the Fourth Cataract, which apparently does "not pre-date the Napatan-Meroitic period",[113] might also indicate that the species continued to inhabit this region.

Nero's scouts reported greener herbage, patches of woodland, and traces of rhinoceroses and elephants around ("circa") Meroe, as documented in an excerpt from Pliny's Natural History (Plin. Nat.[114] 6.185). This is usually understood as a statement concerning conditions approximately at the city of Meroe. The passage in question, however, speaks of Meroe in the sense of the island of Meroe, to which the city is contrasted in the subsequent sentence. Considering that the data basis of Pliny was probably a map that was supposed to meet military requirements of precision,[115] it is quite possible that "circa" Meroe was not a vague metaphorical use of the word, but rather meant the literal "around" (the island of) Meroe.

It is known from Seneca's report on these reconnaissance missions that soldiers also entered distant marshlands (Nat. quaest.[116] 6.8.3-4), suggesting that knowledge of areas far from the Meroitic capital was indeed available. This explanation could better reconcile the seemingly contradictory findings from Nero's expeditions, which Pliny also documented, stating that trees were scarce between Syene and Meroe, being represented only by palms (Plin. Nat. 12.19). He describes different groups of hunters and gatherers, as opposed to the crop-growing Meroites. Elephants are repeatedly mentioned in connection with these groups (Plin. Nat. 6.189 & 8.26), but not in relation to the savanna-dwelling cattle nomads.

Accounts of elephants on the fringes of Meroitic settlement areas align with other literary sources that discuss the elephants of Aithiopia. The most extensively preserved Hellenistic account of the region stretching from the Middle Nile to the Red Sea comes from Agatharchides of Knidos, whose work survives mainly through Diodorus Siculus and Strabo.[117] Drawing primarily on the third-century Ptolemaic elephant expeditions, Agatharchides frequently refers to the presence of these animals. He portrays various groups as hunters and gatherers, contrasting with the agriculturally oriented Meroites.

Some of these groups can be located along the Atbara and the Blue Nile, with elephants often mentioned in relation to them. In contrast, these animals are absent from his accounts of the savanna's cattle-nomadic tribes. Similarly, in Agatharchides' detailed discussion of the Aithiopians, referring specifically to the Meroites (amidst the broader spectrum of ethnic groups he labeled under the same term),[118] elephants are only mentioned in passing when he talks of the island of Meroe in its entirety — its diverse populace, their different means of subsistence, and its animals fleeing desiccated regions in favor of water-rich and marshy ones.[119] Likewise, Pliny describes forests and large fauna in the sparsely populated areas along the Blue Nile, but not along the Atbara or within Meroe's interior.[120]

Agatharchides provides a meticulous description of an elephant habitat in his extensive portrayal of African groups beyond the island of Meroe.[121] An elusive area on the west bank of the Nile,[122] contested for its resources by warring people, witnessed the seasonal migration of large elephant herds from upland regions. It is conjectured that these elephants migrate from areas where temporary water sources had dried up to the floodplain for browsing, where

111 Török (1986: 211–215).
112 Priese (1976: 173).
113 Kleinitz (2007: 40–41).
114 Plin. Nat. = Gaius Plinius Secundus (Pliny the Elder), Naturalis historia, Natural History.
115 Eide et al. (1998: 887): "Pliny probably had direct access to the documentation the expedition put together in Aithiopia. The distances […] indicate that Pliny collected the information he conveys here from a structured cartographical source, i.e., a map in which the distances between significant places and points were exactly indicated. […] The kind of map prepared by the centurions is revealed by the notes made on the fauna and flora and quoted by Pliny."
116 Nat. quaest. = Seneca Lucius Annaeus (Seneca the Younger), Naturales Quaestiones, Natural Questions.
117 Burstein (1989).
118 Eide et al. (1996: 638–650).
119 Eide et al. (1998: 810–818); Radt (2005: 499–505).
120 Eide et al. (1998: 850–855).
121 Eide et al. (1996: 650–655).
122 It is called "that [part] of the country along the Nile in Libya". Usually the term Libya was used to designate areas west of the Nile. According to Agatharchides, however, the Atbara River did not only run through Aithiopia but also through Libya. Since Hellenistic geographers considered the eastern tributaries of the Nile also part of the Nile, a more easterly location at least cannot be excluded.

they came into conflict with the valley's human inhabitants. It is remarkable how accurately this aligns with our current understanding of elephant behavior.

Ecological Considerations

Loxodonta africana, the African savanna elephant, can consume 200 to 300 kg of food and drink around 160 liters of water daily,[123] with water availability primarily dictating their distribution before food resources.[124] Due to their substantial dietary needs, elephants significantly shape landscapes, as only a few habitats can sustain a population long term. Consequently, savanna elephants naturally migrate in response to resource scarcity: venturing to the savanna during the rainy season, and to the riverbanks' gallery forest during the dry season.[125] Human activity has forced some elephant populations to remain in the dry savanna year-round, areas originally frequented only seasonally.[126]

Elephant territories can vary significantly, increasing as precipitation decreases.[127] Northern Namibian populations can range up to 10,738 km²,[128] slightly larger than the area of the Butana. A population in Mali typically roams an area of 20,028 km², with the largest territory of a female recorded at 32,062 km². These vast areas are seen as adaptations to the limited resources of the Sahel.[129] Former populations that migrated between foothills of the Ethiopian Highlands[130] along the Atbara, the Blue Nile, and the wadis into the Butana are thus highly plausible. This assumption is reinforced by observing populations of *Loxodonta africana* known as desert elephants.

Desert elephants exhibit behavioral adaptations to their harsh habitats. For instance, four-day drinking breaks have been recorded to reach food sources situated seventy kilometers away from the nearest waterhole.[131] Mauritanian elephants were still present in the early twentieth century at a latitude roughly midway between Meroe and the Atbara mouth.[132] However, the precipitation levels in this region correspond approximately to those two latitudes further south on the Nile. Desert elephants also inhabit Mali. Their habitat there is unique as the resource-rich southern territory lacks surface water seasonally, while the north usually provides a permanent waterhole. These animals only reside in the north during the winter, the peak of the dry season.[133]

A population in the Gash-Barka region, at the tri-border area of Eritrea, Ethiopia, and Sudan, is not categorized as desert elephants. Large parts of this habitat also dry up most of the year, and all but one of Eritrea's rivers carry water only in the rainy season. These elephants inhabit western Eritrea during the dry season and northern Ethiopia during the rainy season. Today, elephants in Eritrea are only found in areas with relatively high rainfall (up to 600 mm/a).

Historically, however, they were also seen in areas with about 100 to 200 mm of rain, where water reservoirs fed from the highlands create islands of vegetation in the arid landscape.[134] The existing population of roughly 100 animals seems to be remnants of once extensive populations. This assumption is supported by early travel accounts,[135] and even 19th-century accounts still describe seasonal migrations between the coast and the Eritrean highlands.[136]

Paleoclimatology

These comparisons hinge on the assumption that ecological conditions in Meroitic times largely align with those of today, yet some researchers propose much more humid conditions. The available data for reconstructing the climatic conditions of the Meroitic empire is sparse, presenting a research gap. The discovery of a hackberry seed, *Celtis integrifolia* (an invalid synonym of *C. toka*),[137] whose context unfortunately remains unclear, was interpreted as evidence of a climate at least four times wetter.[138] However, considering the dried fruits of this species are used as sweetener and for medicinal purposes, it is plausible that this was an import.

Moreover, descriptions of landscapes by classical authors are frequently cited as proof of a more

123 Nowak & Walker (1999: 999).
124 Hagos et al. (2003: 21).
125 Sikes (1971: 241–242).
126 Kröpelin (1993: 178).
127 Sukumar (2003: 159–168).
128 Sukumar (2003: 160).
129 Wall et al. (2013).
130 Where elephants were still common in the mid-19th century, as evident from Baker's expedition report, Baker (1868).
131 Ishida et al. (2011).
132 Grandidier (1932).
133 Wall et al. (2013).
134 Hagos et al. (2003); Shoshani et al. (2004).
135 Bruce (1790: 296); Paul (1954: 32, n. 2); Ayenachew (2016).
136 Blandford (1870: 259).
137 Sattarian (2006: 86).
138 Adams & Arkell (1976: 90).

humid climate.[139] Yet, these sources present such a varied picture that they are also used as arguments against this claim.[140] Indeed, inconsistencies in source material that reflect certain points in time are hardly contradictory if one considers the instability of Sahelian ecosystems. Due to strong fluctuations in precipitation, along with anthropogenic factors like desertification resulting from overexploitation of pastures with low sustainability, these environments dramatically change within a few decades, as seen at the lower Atbara in the 20th century.[141]

Scientific data has been gathered primarily in areas west of the Nile, with the closest explored regions being the el-Gaʿab Basin,[142] the Wadi Howar[143] and the Bayuda.[144] Climate evidence in the Keraba and the northern Butana only allows inferences for Paleolithic conditions.[145] High-quality paleoecological findings for the historical epoch in Sudan are only available from the Eastern Sahara.[146] According to model calculations, however, the Meroitic heartland lies outside the climate system for which these data apply.[147] It is furthermore impossible to equate them without an understanding of local conditions, since factors like larger residual water reservoirs can cause mesoclimatic deviations from macroclimatic conditions.[148]

In the Eastern Sahara around 700 BCE, the ecosystems that can still be found today had established themselves.[149] However, around 1000 BCE, the lower reaches of the Wadi Howar, which flows eastward from Chad and discharges into the Nile at the southern Nile bend between the Third and Fourth Cataracts, still featured savanna vegetation.[150] The wadi's aridification that began at this time was briefly interrupted by a period of increased humidity that can also be seen in North Africa outside the southeastern Sahara. For the Lower Wadi Howar, an annual precipitation of about 100 mm is reconstructed for this humid episode,[151] which would equate to a climate shift of about two and a half latitudes compared to today's conditions.

However, away from water bodies, this precipitation does not seem to have allowed for vegetation that deviated substantially from today's conditions, at least not in the Bayuda.[152] The data from the western vicinity of the Nile should largely transfer to the situation in the Northern Keraba and Butana.[153] This is also confirmed by model calculations based on groundwater analysis, suggesting that not only was precipitation in the Keraba below 220 mm over the last 5000 years, but also the groundwater levels were insufficient to support vegetation during the Meroitic period.[154] Even during more humid phases, the region was presumably on the borderline of habitats that can demonstrably support an elephant population.

In addition to local precipitation, rainfall patterns in the Ethiopian highlands, which contribute the Nile's main source via its eastern tributaries, are crucial for assessing the environmental conditions of the Butana. Core sample analyses from the Nile Delta indicate a dramatic increase in sediments from the Blue Nile during the Napatan period, signifying deforestation in the Ethiopian Highlands likely related to increased aridity. The ratio of sediments from the White Nile and the Blue Nile remained stable during the Ptolemaic period, while in Roman times, there was another shift favoring sediments from the eastern catchment area.[155]

Pollen stratigraphy in Ethiopia indicates a colder climate for the pre-Christian millennium up to late antiquity.[156] Diatom and oxygen isotope analyses of lake sediments in the northern highlands attest to a gradual increase in aridity that intensified during the third century BC until the onset of a wet period that lasted until around 500 AD.[157]

The available data from this region do not yet allow for clear conclusions as to whether rainfall in the highlands caused the wadis of the Butana to

139 Cf. Ahmed (1999) for a synopsis of relevant sources.
140 Wolf et al. (2015).
141 Gläser (1989); Yagoub et al. (2017).
142 Tahir (2014).
143 Kröpelin (1999).
144 Pflaumbaum (1987).
145 Gabriel (1997).
146 Kröpelin et al. (2008): "Paleoenvironmental records covering this period with similar data quality are unlikely to exist anywhere else in the arid climate belt of North Africa."
147 Liu et al. (2007).
148 Stefan Kröpelin, personal communication. It should also be noted that the paleoclimatology of arid areas faces some fundamental methodological challenges, primarily the fact that reconstruction relies on the study of limnic deposits, which may not be representative of a larger area, Kröpelin (1993: 216–220). These kinds of findings also tend to overemphasize climatic trends, Kröpelin et al. (2008: Supporting Online Text 1). Additionally, the data typically only allows for low chronological resolution, which is too coarse for synchronization with historical processes, Hoelzmann et al. (2004: 241).
149 Kröpelin et al. (2008).
150 Jesse (2014).
151 Kröpelin (1993: 234–245).
152 Pflaumbaum (1987: 118).
153 Kröpelin (1993: 238–239).
154 Scheibner (2014a).
155 Stanley et al. (2003).
156 Umer & Bonnefille (2002).
157 Marshall et al. (2009).

carry water more than once a year. Another decisive factor is the water retention potential of the terrain through which seasonal watercourses flow. Depressions in the northern clay plains of the Butana provide natural waterholes, while in the sandstone of the Keraba, human-made hafirs offer the only reservoirs.[158] Lastly, the isotopic analysis of human teeth indicates a dietary shift during the Meroitic period, likely due to increased aridity.[159]

Human Impact

This leads to the acknowledgment of another primary factor influencing the distribution of elephants: human activity. Since the feeding behavior of elephants conflicts with agricultural activity, especially in agriculturally favored areas within arid regions such as the former Meroitic settlement areas, conflicts are a constant throughout the elephant range. Nowadays, "among African Savanna Elephants, elephant and human density are inversely related, with elephants being completely excluded from areas with high human density," whereas "elephants and pastoralism are compatible in many regions of Africa."[160]

Contemporary observations from Ethiopia reveal that despite the highlands presenting ideal living conditions, elephants are infrequently seen in these areas. This scarcity can be attributed to the region's suitability for agriculture, resulting in a direct resource competition between humans and elephants.[161] This situation is not unique to Ethiopia, as in India, it is well-acknowledged that conflicts between farmers and elephants become inevitable once farming is introduced to elephant habitats, so that agriculture and natural elephant populations effectively exclude each other.[162]

Most areas along the Nile Riverbanks, with their rich history of agriculture, likely witnessed an early displacement of elephants. Further, an expansion of agricultural resources into the Keraba region during the Meroitic era[163] likely sparked fresh conflicts with elephants that had traditionally grazed in these territories. Elephants are cognitively capable of memorizing the availability of resources within their territories, and they utilize this mental map to traverse hundreds of kilometers of unknown territory to familiar locations.[164] This knowledge, acquired through observation of family members, leads to the social anchoring of behavioral patterns.

The retention of traditional migration routes even under changed conditions could have led to the rapid extinction of elephant populations in places where humans regarded them as pests or valued their ivory. This is exacerbated by a low reproduction rate[165] especially in arid regions,[166] that does not balance out losses from hunting.

Conclusion

In summary, even under the assumption of slightly higher precipitation levels during antiquity, the Kingdom of Meroe sat on the fringes of habitats known to sustain elephants. It is highly probable that elephants only migrated to these regions seasonally and in small groups, as the group size of elephants tends to diminish in drier habitats.[167] In particularly arid regions, elephant groups usually comprise only a single adult female and her offspring,[168] while male animals are mostly solitary animals.[169] Therefore, elephants would have been a rare sight in the northern Butana and the exception in the Keraba.

Firstly, the Keraba would not have provided the high-quality feeding grounds that the extensive grasslands of the Butana offered. Secondly, the only permanent water sources in the Keraba were occupied by humans, who not only had to defend their crops but also had the added incentive of meeting the Ptolemies' huge demand for ivory. Therefore, any small initial populations of elephants were likely to have quickly become extinct. However, a place like Musawwarat es-Sufra could have been an exception, as it does not seem to have been inhabited year-

158 Scheibner (2014a).

159 Kozieradzka-Ogunmakin & Sołtysiak (2023): "The isotopic analysis of human enamel samples from sites in Upper Nubia (Third to Sixth Cataracts) reveals an upward shift in the δ13C values following the early Meroitic period. This result indicates a progressive dietary shift towards greater consumption of C4 plants (sorghum and millet) and reduced consumption of C3 crops (wheat and barley). […] This agricultural shift, characterised by intensification of the cultivation of summer crops, may be attributed to contemporaneous climate change, reduced precipitation and increasing aridity in the region."

160 Wilson (2011: 74–75).

161 Yalden et al. (1996: 50).

162 Sukumar (2003: 298–299); Trautmann (2015: 56).

163 Cf. Scheibner (2014b); Wolf & Nowotnick (2021: 514 & 521-522); Wolf (2021: 137-142).

164 Sukumar (2003: 169).

165 Under favorable conditions, an elephant population can increase by four to five per cent annually, see Nowak & Walker (1999: 1000).

166 Fritz (2017): "Populations in more arid areas (< 400 mm annual rainfall) show much lower growth rates."

167 Sukumar (2003: 172).

168 Leggett et al. (2003: 310).

169 Sukumar (2003: 182).

round.[170] During periods when human presence was minimal, elephants, whose main feeding grounds were in the Butana, might have frequented this area to use hafirs as watering holes.

This does not mean, however, that elephants were excluded from the Meroitic sphere of influence. The elephant population density was undoubtedly much higher in the periphery of their dominion, where environmental conditions were more favorable. In the southern Butana, along the Blue Nile and upper reaches of the Atbara, throughout the inland delta of the Gash River, or even in certain regions on the Nile's west bank,[171] more consistent watercourses would have created gallery forests capable of supporting larger elephant herds. This was possible as long as these areas were inhabited by groups of people whose pastoral or foraging lifestyle allowed them to coexist with elephants.[172] The classicist notion of 3000 elephants accompanying the 250,000 armed men of Meroe, however, is highly questionable.[173]

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170 Cf. Wenig (2001), Kleinitz (2023).

171 Along the Nile's west bank opposite the Meroitic heartland the annual inundation provided excellent farmland but hindered the establishment of larger, permanent settlements. Instead, the higher terraces along the steep east bank offered elevated, flood-proof locations near the riverbed, making them more favorable for sedentary occupation, see Wolf (2021: 121).

172 See Brass (2015) on the power dynamics on the Meroitic frontiers.

173 This claim stems from Detlefsen's 1904 emendation of Pliny, replacing opificum (artisans) with elephantum, followed by Brodersen in 1996, likely due to assumptions about Kushite war elephants, see Eide et al. (1998: 886, n. 506).

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Zusammenfassung

Der Artikel hinterfragt das Narrativ einer meroitischen Kriegselefantentradition, das auf der Annahme beruht, dass Elefanten im Meroitischen Reich verbreitet waren. Daher untersucht der Beitrag die historische Verbreitung von Elefanten im mittleren Niltal, um die tatsächlichen Lebensräume dieser Tiere besser zu verstehen. Hierzu werden archäozoologische, bildliche und schriftliche Quellen analysiert, um ein differenzierteres Bild der Elefantenverbreitung zu zeichnen. Neben den Quellen berücksichtigt die Untersuchung auch ökologische und anthropogene Faktoren, die das Vorkommen der Tiere beeinflusst haben dürften. Die Untersuchung zeigt auf, dass in der bisherigen Literatur zu findende Angaben zur Verbreitung von Elefanten revidiert werden müssen. Die Ergebnisse deuten darauf hin, dass Elefanten gemäß den Quellen nur in den Randgebieten des Meroitischen Reiches vorkamen und vermutlich allenfalls saisonal und vereinzelt ins meroitische Kernland vordrangen.