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Routes of interaction across northern central Tigray (Ethiopia) between 2nd and 1st millennium BCE: interdisciplinary research in the Rama area

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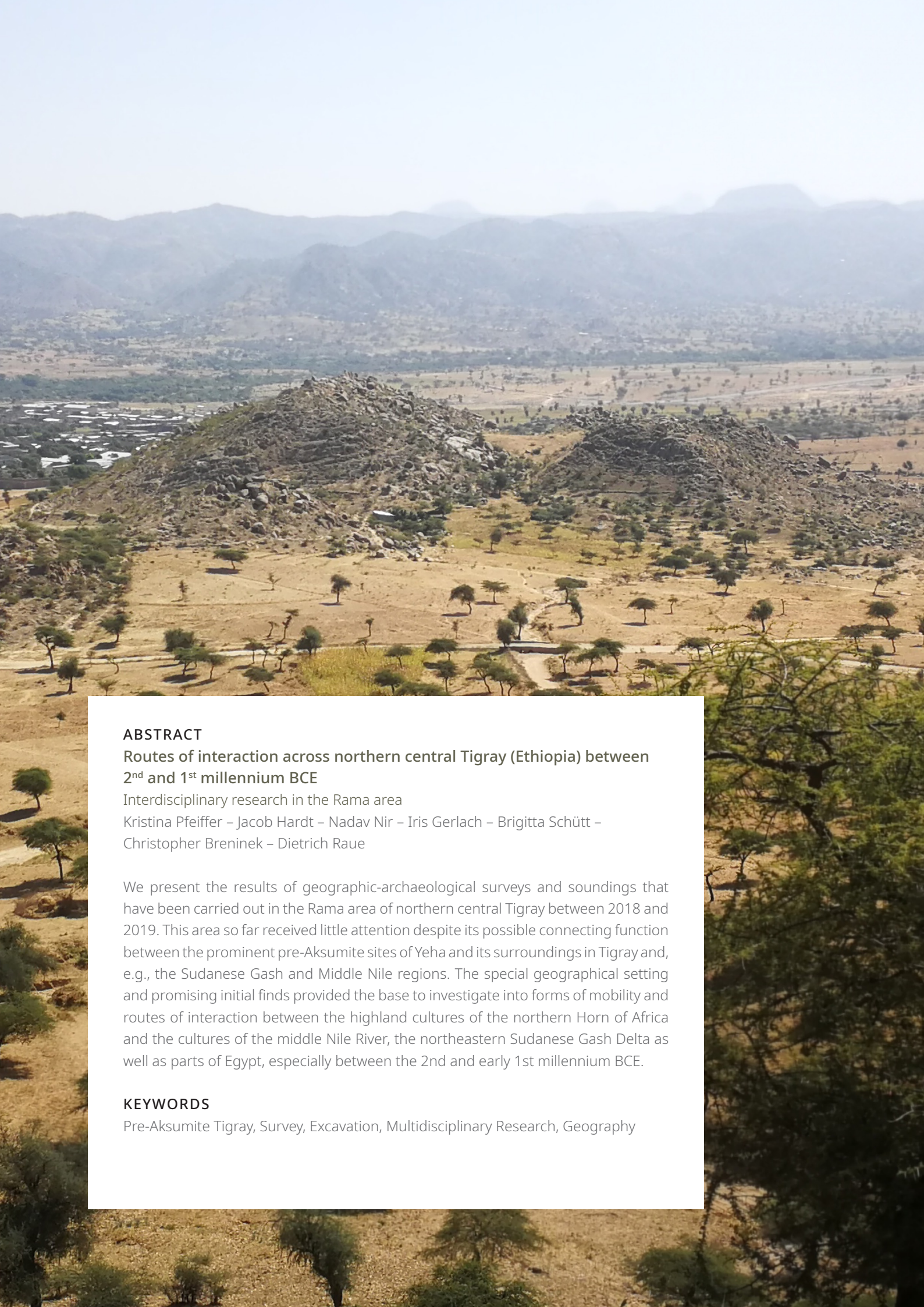

ABSTRACT

Routes of interaction across northern central Tigray (Ethiopia) between 2nd and 1st millennium BCE

Interdisciplinary research in the Rama area

Kristina Pfeiffer – Jacob Hardt – Nadav Nir – Iris Gerlach – Brigitta Schütt – Christopher Breninek – Dietrich Raue

We present the results of geographic-archaeological surveys and soundings that have been carried out in the Rama area of northern central Tigray between 2018 and 2019. This area so far received little attention despite its possible connecting function between the prominent pre-Aksumite sites of Yeha and its surroundings in Tigray and, e.g., the Sudanese Gash and Middle Nile regions. The special geographical setting and promising initial finds provided the base to investigate into forms of mobility and routes of interaction between the highland cultures of the northern Horn of Africa and the cultures of the middle Nile River, the northeastern Sudanese Gash Delta as well as parts of Egypt, especially between the 2nd and early 1st millennium BCE.

KEYWORDS

Pre-Aksumite Tigray, Survey, Excavation, Multidisciplinary Research, Geography

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Interdisciplinary research in the Rama area

Preface

1 The project "Routes of Interaction" has been funded since 2018 as part of the priority programme "Entangled Africa" of the German Research Foundation (SPP 2143).[1] The German part of the joint project is being conducted by the Sanaa Branch of the Orient Department of the German Archaeological Institute (DAI), the Institute of Geographical Sciences of the Freie Universität Berlin (FU), the Egyptian Museum Georg Steindorff of the University of Leipzig (UL) and the Cairo Branch of the German Archaeological Institute. The Ethiopian Heritage Conservation Authority (Mr. Abebew Ayalew)[2] and the Tigrai Culture and Tourism Bureau (Ms. Birkit Gebremedhin) are overseeing the Ethiopian part of the project.

1. Introduction

2 The Ethiopian-German joint project focuses on interdisciplinary research on ancient intra-African connectivity, trade and interaction between northern Tigray and the Gash Delta region and Egypt. From the 2nd to the early 1st millennium BCE, the northern Horn of Africa was incorporated in various forms of interaction between the highland cultures of Abyssinia and the cultures of the middle Nile River as well as the north-eastern Sudanese Gash region. The chronological framework marks a timespan during which the formation of complex societies began in the northern Horn of Africa and during which supraregional intra-African contacts existed between these societies.[3] Thus, cultural contacts between Tigray, the local groups addressed as Late Neolithic Ancient Ona cultures (Munro-Hay – Tringali 1991, 137; Curtis 2009, 327–350) in Eritrea with the Eastern Sudanese groups such as Jebel Mokram (Manzo 2017, Table 1), later

1 The scientific processing of the finds was interrupted with the outbreak of the pandemic and the war in Tigray and could not yet be resumed. Therefore, the information on the number of finds, types of objects and pottery forms has not been finalized. Corresponding information must therefore remain partially undetailed. Since it is currently not clear whether renewed visits to the border region Tigray – Eritrea will be possible, we would like to present the preliminary results despite these limitations.

2 Formerly the Authority for Research and Conservation of Cultural Heritage – ARCCH (Dr. Mulugheta Feseha).

3 See de Souza 2023; de Souza 2022; Liszka – de Souza 2021; Raue 2019a; Raue 2019b; Raue 2018; Manzo 2017.

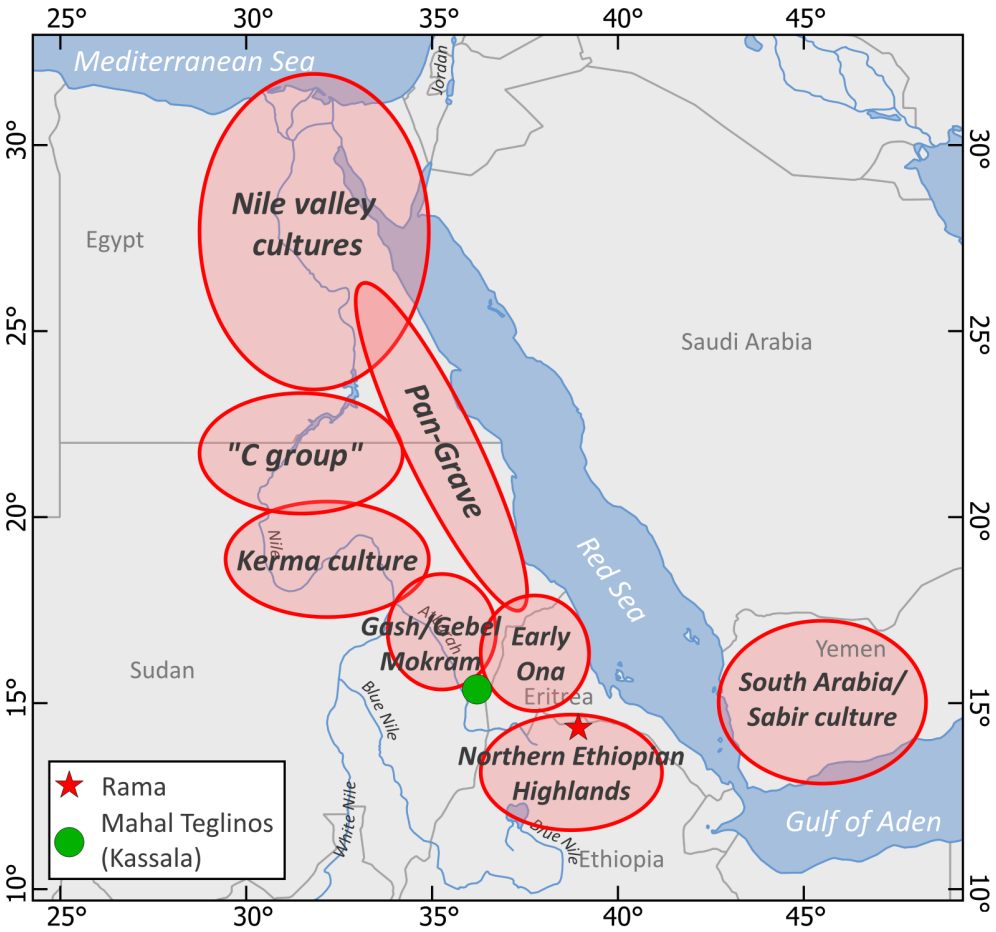


Fig. 1: Schematic map of North-East Africa and Southern Arabia with the approximate localisation of the cultural groups addressed in this article.

Butana and Gash Group[4] as well as with the late Kerma / C- Group in Nubia and Pan-Grave groups on the southern Eastern Desert of Egypt are investigated.[5] Contacts with the Nile delta region and the cultures of the 2nd millennium BCE on the southern Arabian west coast (Sabir culture) will also be considered (Fig. 1).

3 To date, only a few studies investigate aspects of inner-African networks other than trade and exchange, tangible and intangible things.[6] Hence, the presented project aims at reconstructions of settlement patterns, interaction routes and long-distance pathways in the Ethiopian highlands as well as in adjoining areas. Archaeological surveys in the Ethiopian highlands aim at detecting possible paths of communication between the Ethiopian highlands and the lowland cultures of eastern Sudan as well as the cultures of the Egyptian Nile Valley since a systematic study of intra-African contact networks is still lacking from the viewpoint of the northern Horn of Africa.

4 From the end of the 4th millennium BCE onwards, regional and supraregional interaction routes connected the Ethiopian highlands not only with regions in northern and north-eastern Africa, but also with the Arabian Peninsula (especially South Arabia), the Mediterranean, and India via the Red Sea. Important routes for communication and trade were maritime routes over the Red Sea but also rivers and river valleys such as the Nile River with its major tributaries, the Gash Delta (Manzo 2017) as well as dry valleys. Ancient ports such as Adulis in present-day Eritrea (Zazzaro 2013), Djibouti,[7] and Ain Sukhna (Somaglino 2022a; Somaglino 2022b), Berenike (Hense – Kaper – Geerts 2015; Sidebotham 2011) or Mersa/Wadi Gawasis in Egypt (Manzo 2010; Manzo 2012) were

4 See Manzo 2017, 263–273; Fattovich 1991, 40–47; Fattovich 1993.

5 For the discussions about cultural contacts in wider Nubia see Raue 2018, especially 202.

6 Fattovich 2010; Wolf 2014; Manzo 2019; Hardt – Nir – Schütt 2023.

7 For sites within Djibouti, see e.g. Poisblaud 2012 and Gutherz 2017.

convergence points of routes between land and sea. Find assemblages from these sites clearly demonstrate how established the route networks were and how long the use of such convergence points was handed down (Raue 2018, 204).

5 The cultures of the Sudanese and Egyptian Nile Valley developed an increasing demand for precious goods like incense, gold, furs of wild animals and obsidian – materials that were reported to originate in the land of "Punt". Mainly from the perspective of Egyptology, the question of the localisation of the land of Punt, the identification of the sources of the goods from Punt and their route to Egypt plays an important role.[8] Several researchers propose the Ethiopian-Eritrean highlands and the middle Nile Valley including the Gash Delta as the location of Punt since these regions maintained contacts with Egypt through trade from the mid–3rd millennium to the late 2nd millennium BCE.[9] Yet none of these studies have resulted in scientific evidence for the exact location of Punt. The subject of the exchange of goods from Punt has predominantly been investigated through written and iconographic sources and mainly from an Egyptian perspective; comparable sources from the Ethiopian-Eritrean highlands have not been discovered yet. Nevertheless, both the archaeological and epigraphic sources reveal that natural resources such as obsidian (Khalidi – Lewis – Gratuze 2012), gold, ivory and incense were indeed present in the Ethiopian highlands and played an important role (Gerlach 2017). Furthermore, human beings[10] as well as exotic animals (e.g. rhinoceros, during the mid–2nd millennium BCE (Breyer 2016, 82–84)) were evidently important commodities for trade and exchange.[11]

6 Egypt imported obsidian raw material from the Ethiopian highlands already during the 4th millennium BCE. The raw material was transported to Egypt where it was then locally worked into the desired shapes (e.g. fragments of obsidian vessels from the formative phase of the Egyptian state since 3250 BCE, Abydos royal tombs).[12] In the Gash Delta and eastern Sudan, Ethiopian obsidian was discovered during excavations at sites of the Gash-, Aqordat- and Gebel Mokram group (3rd –2 nd millennium BCE) as well as in 'Aqiq and Erkowit.[13] Moreover, comparisons of ceramics from the Gash Delta and the Ethiopian highlands attest to direct contacts between these regions.[14] In terms of aromatics and Egypt's immense demand for frankincense, the trade network might also have reached as far as the Ethiopian highlands.[15] Similarly, Egypt`s demand for gold was possibly met not only by resources that occurred in Nubia and the Eastern Desert, but also by Ethiopian gold. Whether or not goods from Egypt or the middle Nile Valley reached the northern Horn of Africa in return – and if they did, then at what point in time – still remains just as unclear as the course of such interactions. Until now it has been assumed that direct contacts between Egypt and the highlands first emerged through maritime trade. Prior to that, it was thought that Nubia and the Sudanese Kerma Culture subsequently profited as middlemen from such trade (Phillips 1997, 439–441). Therefore, a land route was assumed, and the finds of the Italian Mission in the Kassala-Region / Gash-Delta provided strong evidence for well-developed

8 See summary in Breyer 2016; Manzo 2022, 21; see also Fattovich 2018, 205–209.

9 Fattovich 1991; Breyer 2016; Manzo 2019; critical remarks against these views were put forward by Meeks 2018, 283–292.

10 Especially of short stature: Breyer 2016, 53–54, 114–127, 382 Doc. 3; Pieri – Antoine 2012, 7–8.

11 Egyptian sources of the later 3rd millennium BC report about a long-distance trade network in the Early Bronze Age, which was used by emissaries from Egypt to travel to Punt and Lebanon. Seyfried – Vieler – Elmar 2008, 466–469.

12 Dreyer 2007, 65 Nr. 45; Roy 2011, 264; Bavay – de Putter – Adams et al. 2000, 5–40; O'Sullivan 2023, 8.

13 Zarins 1990, 533; Phillips 2003, 439–440; for the agency of mobile populations in such networks as e.g. the so-called Pan Grave Culture, see de Souza 2019 and Bietak 1996.

14 Raue 2012, 172–173 on finds from Rama / North Tigray. Pre-Aksumite sherds were found at sites of the late Butana- and Gebel Mokram group dating to the 2nd and 1st millennium BCE: see Manzo 2012; Manzo 2019.

15 Grimal 1992, 87; Roy 2011, 252; Raue 2019a.

trade networks in the 2nd millennium BCE. Field studies have shown that pre-Aksumite communities had cultural links to the Gash Delta region (near Kassala), which witnessed the rise of chiefdoms, and the Tihama region on the South Arabian coast.[16] A limited number of regional terrain surveys for researching settlement history concentrated on the Asmara plateau with sites of the Ona culture, the region north of Adigrat (D'Andrea – Manzo – Harrower et al. 2008; Harrower – D'Andrea 2014), the corridor between Aksum and Yeha (Japp – Gerlach forthcoming), the area around Yeha,[17] the surroundings of Aksum itself (Sernicola 2017) as well as the region around Shire (Finneran 2005). The settlements of the so-called Ona culture are assumed to have existed foremost on the Asmara plateau in Eritrea – displaying a purely indigenous cultural character.[18]

7 However, apart from single findspots or find categories, systematic investigations of indicators and forms of intra-African communication and trade networks in these areas are rare. The same applies to supraregional geoarchaeological investigations of the palaeo-environment and studies on the use of natural resources as possible influential factors that led to interactions. In order to reconstruct routes of interaction, we focused on the examination of sites, which was performed from a comparative archaeological and historical perspective in combination with physical geography.

2. Geographical overview

8 The cultural history of the northern Tigray plateau was played out against a backdrop of climatic, ecological and sedimentological perturbations affecting large areas of northern Ethiopia and East Africa since the Early Holocene. Present-day climatic conditions appear to have been established during the 2nd millennium BCE with at least three humid phases occurring over the past 4000 years.[19] The study area is located between the Adwa chains and the Mereb River (Rama area) in a relatively wide and flat depression, which is drained to the north by the Midamar (Inda Shawit) River.[20] The Midamar River is a tributary of the Mereb (Gash) River, which forms the border between Ethiopia and Eritrea in this region. About 5 km south of the Gash River (Fig. 2), the village of Rama can be found. The depression is c. 10 km long (NS) and 4 km wide (EW); the infill consists of thick layers of presumably Cenozoic unconsolidated sediments. The bottom of the depression is located at an elevation between 1350–1450 m asl, whereas the adjoining regions of the Northern Ethiopian highlands, especially to the south and east, are at elevations of >2000 m asl. To the north of the area, a c. 500 m wide water gap gives access to the Mereb River. The enclosed shape of the depression, the relatively low elevation, the abundance of water and the relatively flat terrain make this area outstanding in northern Tigray.

9 Most of the structure consists of intrusive Precambrian and Phanerozoic granite (Tadesse – Hoshino – Suzuki et al. 2000). It is surrounded by the Late Proterozoic Metaandesites of the so-called Tsaliet Group. Its eastern border is delineated by a number of northeast-southwest trending thrust faults, which indicate the tectonic nature of the structure (Fig. 3). Thus, the geological setting differs significantly from the highland

16 Fattovich 1988, Fattovich 1989, Fattovich 1990; Munro-Hay 1993; Brandt – Manzo – Perlingieri 2008.

17 Fattovich 2009; Gerlach 2017, 360; Japp – Gerlach forthcoming.

18 Schmidt – Curtis 2001; Curtis – Schmidt 2008; Curtis 2009; Fattovich 2010.

19 Williams 2021; Williams 1988; Grove 1993; Hardt – Nir – Schütt 2023; Hassan 1997; Brancaccio – Calderoni – Coltorti et al. 1997; Machado – Pérez-Gonzalez – Benito 1998; Bard – Coltorti – DiBlasi et al. 2000; Darbyshire – Lamb – Umer 2003; Dramis – Umer – Calderoni et al. 2003; Gerlach – Weiß 2015, 4–6; Marshall – Lamb – Davies et al. 2009, 114–127; Pietsch – Machado 2014, 119–136.

20 Busch – Hardt – Nir et al. 2021; Hardt – Nir – Schütt 2023; Nir – Stahlschmidt – Busch et al. 2021; Nir – Stahlschmidt – Busch et al. 2022.

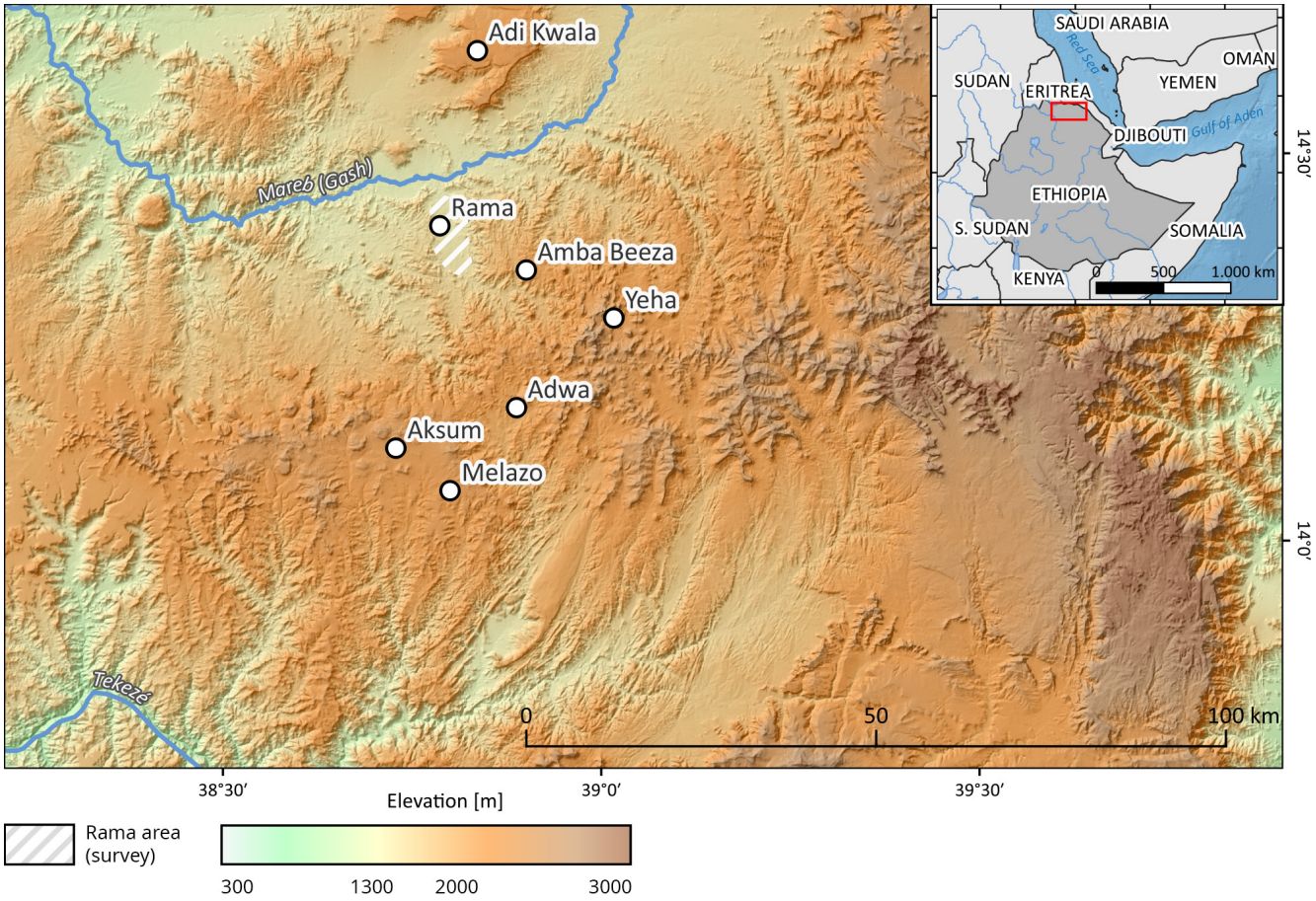


Fig. 2: Overview map showing the context of the study area (white frame) in northern Ethiopia and the Horn of Africa (inset). Hillshaded relief map based on AW3D30 digital elevation model (JAXA). Inset map made with Natural Earth.

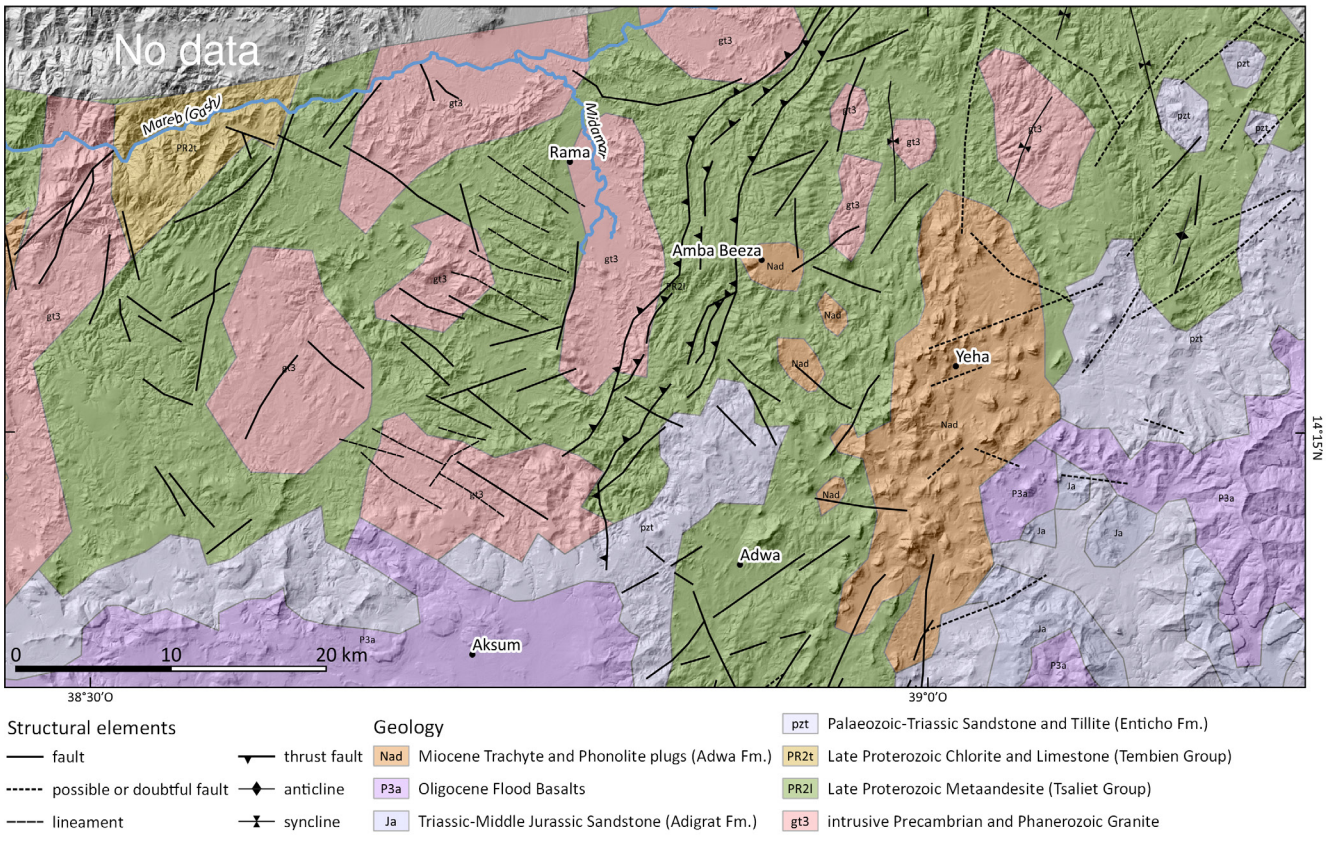


Fig. 3: Morphostructural map of northern Tigray. Geology simplified after Geological Map of Ethiopia 1:2 M (1998). Structural elements after Geological map Sheets of Ethiopia 1:250 k, Hagos et al. (2010), and Machado (2015). Hillshaded relief map based on AW3D30 digital elevation model (JAXA).

regions around Aksum, Adwa and Yeha where either extrusive (basalt, phonolite) or intrusive rocks occur (Tadesse 1999). The rock formations of the stepped plateau highlands originate from the Mesozoic (Adigrat Formation) (Beyth 1972), the Paleogene (Oligocene Trap basalts) (Hofmann – Courtillot – Féraud et al. 1997) and the Neogene (volcanic plugs and domes) (Hagos – Koeberl – Kabeto et al. 2010; Natali – Beccaluva – Bianchini et al. 2013). Locally, Precambrian basement rocks are exposed in the area of Rama and its surroundings belonging to the Arabian-Nubian-Shield. The uplift of the Arabian-Nubian-Shield is most likely linked to the activity of the Afar Plume and the subsequent emplacement of trap basalt starting at c. 40–30 Ma (Machado 2015).

10 The climate in the city of Adwa (1900 m asl), c. 30 km SE of Rama, is classified as a dry-savannah climate corresponding to *BSh* climate in the Köppen-Geiger system (hot semi-arid climate) (Fazzini – Bisci – Billi 2015). The climate is altogether tropical with annual average temperatures of c. 20°C [1982–2012] (climate-data.org); April is on average the warmest month (average April temperature: 22°C) and December on average the coolest month (average December temperature: 17°C). The annual rainfall averages between 600–700 mm [1982–2012] (climate-data.org). As an effect of the southeast African monsoon, by far the most precipitation occurs in the rainy season between June and September (Abebe 2014). With an elevation of c. 1900 m asl, Adwa is situated c. 500 m higher than Rama (c. 1400 m asl). Given a lapse rate of c. 1°K per 100 m in dry air, average mean temperatures in Rama may be expected to be up to 5°K higher in Rama than in Adwa. Correspondingly, because of the location of Rama in the lee of the depression, expected rainfall amounts are on average lower than in Adwa.

11 Large proportions of the Rama area are in use for agriculture. Implemented irrigation measures result in a perennial evergreen zone along the floodplains of the Midamar River. The area is an important source of fruits in Tigray, such as avocado and mango (Busch – Hardt – Nir et al. 2021).

3. Survey in the Rama area

12 This paper reports the results from three seasons of geographic-archaeological surveys conducted by the joint Ethiopian-German expedition. The surveys aimed at documenting material evidence for the extension of trade networks that included the highlands of Ethiopia in the 2nd and earlier 1st millennium BCE. Little is known about the history of the Rama area, but in 2011 and 2013, sherds with a strong affinity with the pottery production of the Sudanese Gash Group were found close to an impressive landmark that is today named *Wentah* (Raue 2012, 172–173). Studying routes of interaction and aiming at reconstructing network patterns, the Rama basin is of special interest since it might have served as a “gateway” region connecting the Sudanese lowlands and the Ethiopian highlands.

3.1 Methodology

13 The surveyed concession area measuring a total of 100 sq. km was divided into two survey corridors: one with a rectangular shape running from the northern border of Rama to the south (12 km north-south by 6 km east-west), and a narrow corridor running southeast from the south-eastern end of the Rama area towards Yeha this area has a length of 15 km and a width of 1.9 km.

14 The Rama project concentrates on interaction routes, traditions of long-distance trade routes, geographic landform classification, site characteristics and densities,

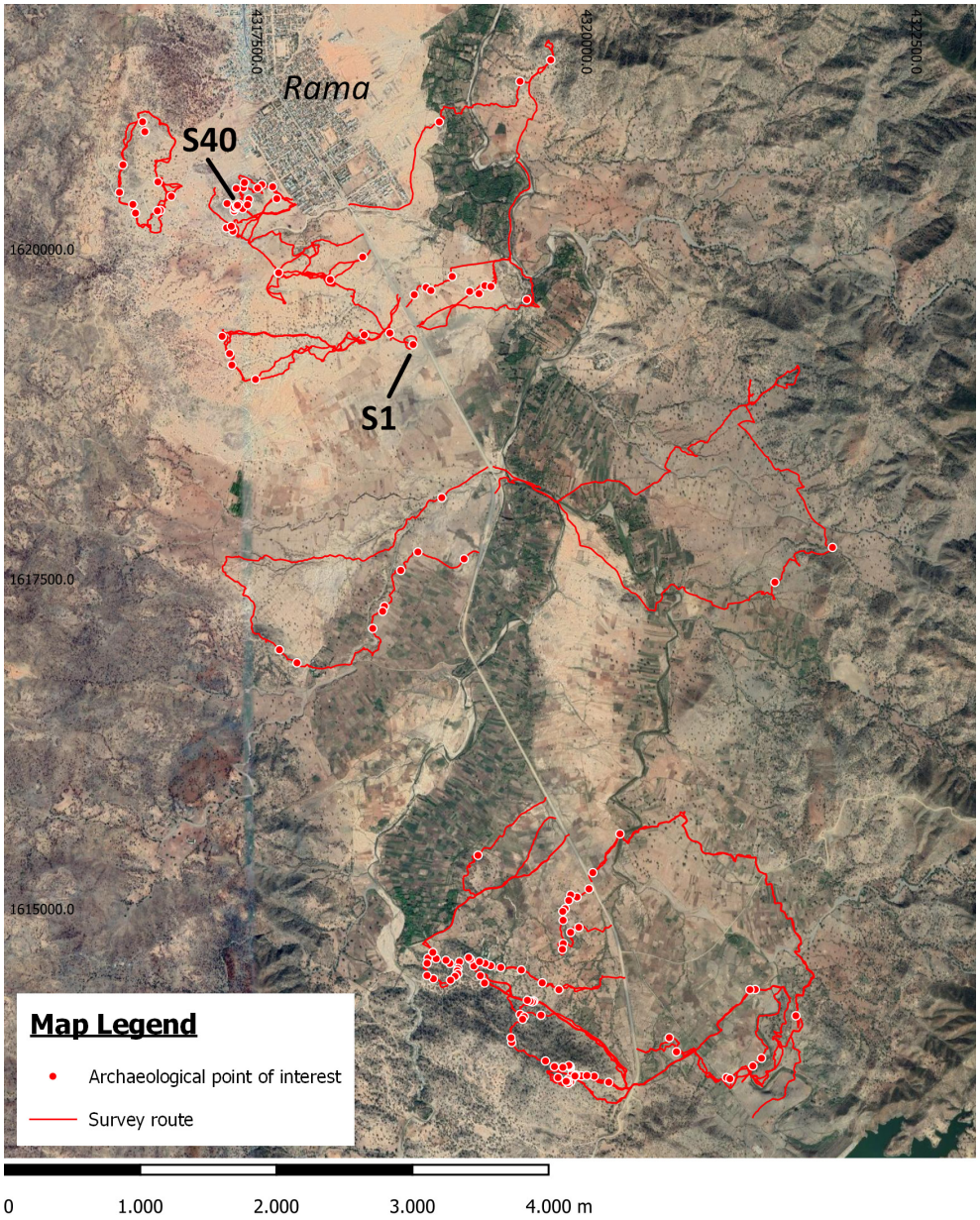


Fig. 4: The 42 square km survey area showing 166 sites and topographically selected survey tracks overlaid on aerial imagery with UTM 37N coordinates.

geographical factors and the role of gullies in landscape and pathway formation.[21] These features are studied on the basis of archaeological and geographic surveys, complemented by least-cost path analyses (Hardt – Nir – Schütt 2023). The data of the surveys and investigations might allow us to show the perceived concept of "landscape scales" of indigenous populations in the area along an axis from Aksum northwards to the Mereb River and might provide important indicators for 2nd millennium BCE environment and living conditions as a whole. In order to reconstruct historic and prehistoric geographies and landscape histories of pre-Aksumite communities and their embedding into regional and supraregional networks, we chose a wide variety of promising methods that were in-field and lab research:

15 The field work strategies comprised different types of pedestrian surveys based on: 1. archaeological points of interest, and 2. geographical points of interest (topography, hydrology, human-related surface features such as gullies and holloways). In addition, oral history was recorded, interviews with the indigenous population were carried out and sites were shown to us by locals. As lab investigations we applied aerial

21 Nir – Knitter – Hardt et al. 2021; Nir – Stahlschmidt – Busch et al. 2022; Busch – Hardt – Nir et al. 2021.

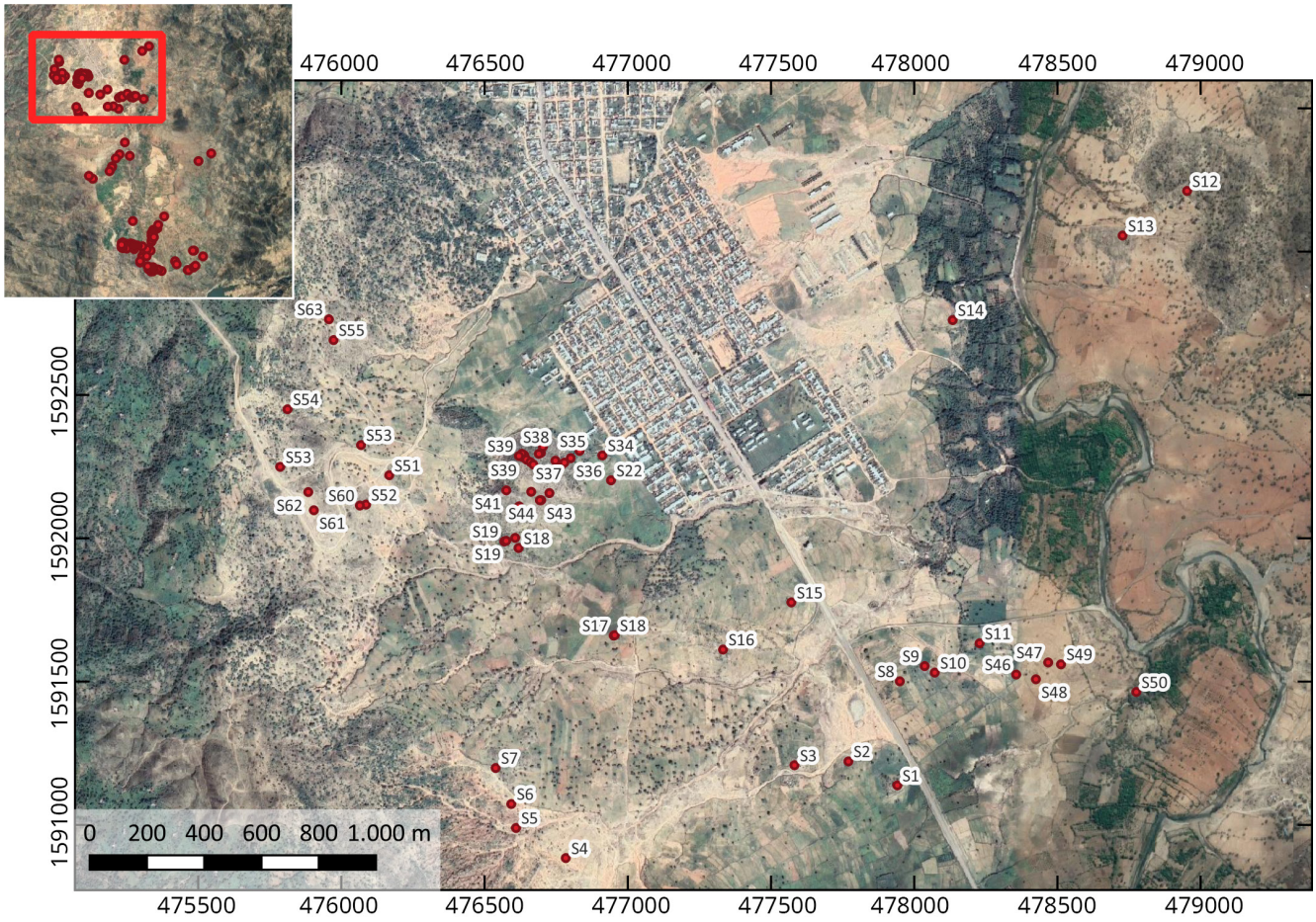


Fig. 5: Map of the northern part of the survey area showing the sites mentioned in the text. Please refer to Figs. 28, 29, 30 for a closer view of the depicted find clusters. Coordinate system UTM 37N.

imagery analysis, least-cost path analysis, gully erosion susceptibility modelling and studies of historic travel reports and archaeological sources.

16 During the 2018 and 2019 field seasons, a total of 166 sites were recorded, numbered sequentially (S1, S2, S3 ff.), documented and partly sampled (Fig. 4).

3.2 Survey 2018

17 In 2018 first archaeological survey work was conducted nearby the village of Rama in northern Tigray. At a first step, surveying areas were chosen on the basis of an exploratory trip in 2011, prominent landmarks were recorded. Further areas were selected with the help of satellite images and on-site reconnaissance. During the 2018 season, a total of 45 sites was recorded (S1–S45).

18 The landmark called “Wentah” (S1) by the local population consists of a roundish hill of about 400 sq. m and a height of c. 4 m (Fig. 5, Fig. 6). On top of the hill is a pile/stack of three granite boulders measuring about 12 m in total and visible from all parts of the Rama depression. The surface of the hill, which consists of flat granitic bedrock, is covered by weathered top soil and gravel, shrubs and scattered low vegetation. Predominantly on the bedrock and to a small extent (15 x 10 m) on the field to the north, pottery sherds, clay figurines of bovines and obsidian flakes were found. Towards the south and west, no finds were detected.

19 The majority of pottery sherds on the surface consisted of small quantities of Aksumite and post-Aksumite sherds. Some fragments (amount of >10) show a very finely executed decoration (impressions and incisions) that are attested in the Sudanese

Fig. 6: Overview of the "Wentah" site S1.

Nile Valley in the 2nd millennium BCE[22] (Fig. 7, 1a–r). Three figurines of bovines were found on the site; they are made of the local clay with lots of quartz grains. Their original measurements were about 4–5 cm in length, 1.5 cm in width and 2.5–3 cm in height (Fig. 7, 2a–c). Considerable numbers of grinding stones as well as obsidian tools and flakes[23] finds were recorded at the surface, too (Fig. 7, 3a–b).

20 Sites S2 and S3 are groups of granite boulders. Whereas S2 is located west of S1 and measures c. 40 m in length by 30 m in width, site S3 is much larger and has an extension of c. 150 m by 100 m; it consists of a large group of granite boulders that are separated by a modern track. The southern group of S3 is marked by a large boulder of c. 5 m height, and a line of granite blocks to its west may point to a small shelter area. In the northern group a section of about 70 cm depth, which was recently excavated by local farmers, was encountered. It provided valuable evidence for the relation of the surface to the underlying strata since it yielded a group of sherds that belong to a plain burnished fine fabric that is not seen on the surface and lacks the ubiquitous quartz temper. Among the total of surface sherds at S3 (amount of >100) one roughly incised fragment of late Aksumite date was found. Obsidian flakes were recorded throughout the entire area of the site. In contrast, the surface assemblage consisted of finely decorated, thin-walled potsherds similar to the finds in S1 (see Fig. 7, 4a–e).

21 Sites S4–S7 are grouped west of the main road on the fringe of the western Rama area; gullies and creeks dominate the area with sparse vegetation (see Fig. 5). The sites were found on agricultural fields, granite and sand hills of different sizes (up to 150 m by 80 m). All sites revealed pottery sherds (minimum amount per site >2), some with mat impressions, but they remain of undetermined date. Whereas the group of sites S8–S11 is located east of the main road, sites S12–S14 are located along the creek plain eastwards of Rama town (for details see Fig. 29). Site S8 is located on a field, where a few potsherds (amount of <3) of a thick-walled ware with mat impressions were found. Similar to the pottery sherds of sites S9 and S11 – granite boulder groups of c. 80–100 m x 20 m – they are of undetermined date. S10 is a field south of S9 and a site of greater interest since it shows modest evidence for settlement activity. In S10 querns and grinding stones (Fig. 7, 5a–c) are scattered in an area with a diameter of at

22 See also Manzo 2022, 12; Adams 1977, 152–154.

23 Unfortunately, due to the civil war in the Tigray region, a proper scientific processing of the obsidian objects could not take place until today. Based on the initial recording and photographic documentation, drills, bladelets, denticulate and notched tools can preliminarily be defined.

Fig. 7: 1a–o: Wentah (S1) – fine ware with impressed decoration; p–r: Wentah (S1) – fine ware with impressed decoration. 2a–c: Wentah (S1) – clay figurines of bovines. 3a–b: Wentah (S1) – fragments of obsidian flakes and of a grinding stone. 4a–e: Surface finds of S3 – fine ware with impressed decoration and obsidian flakes. 5a–c: Surface finds of S10 –Selection of querns and grinding stones from the surface.

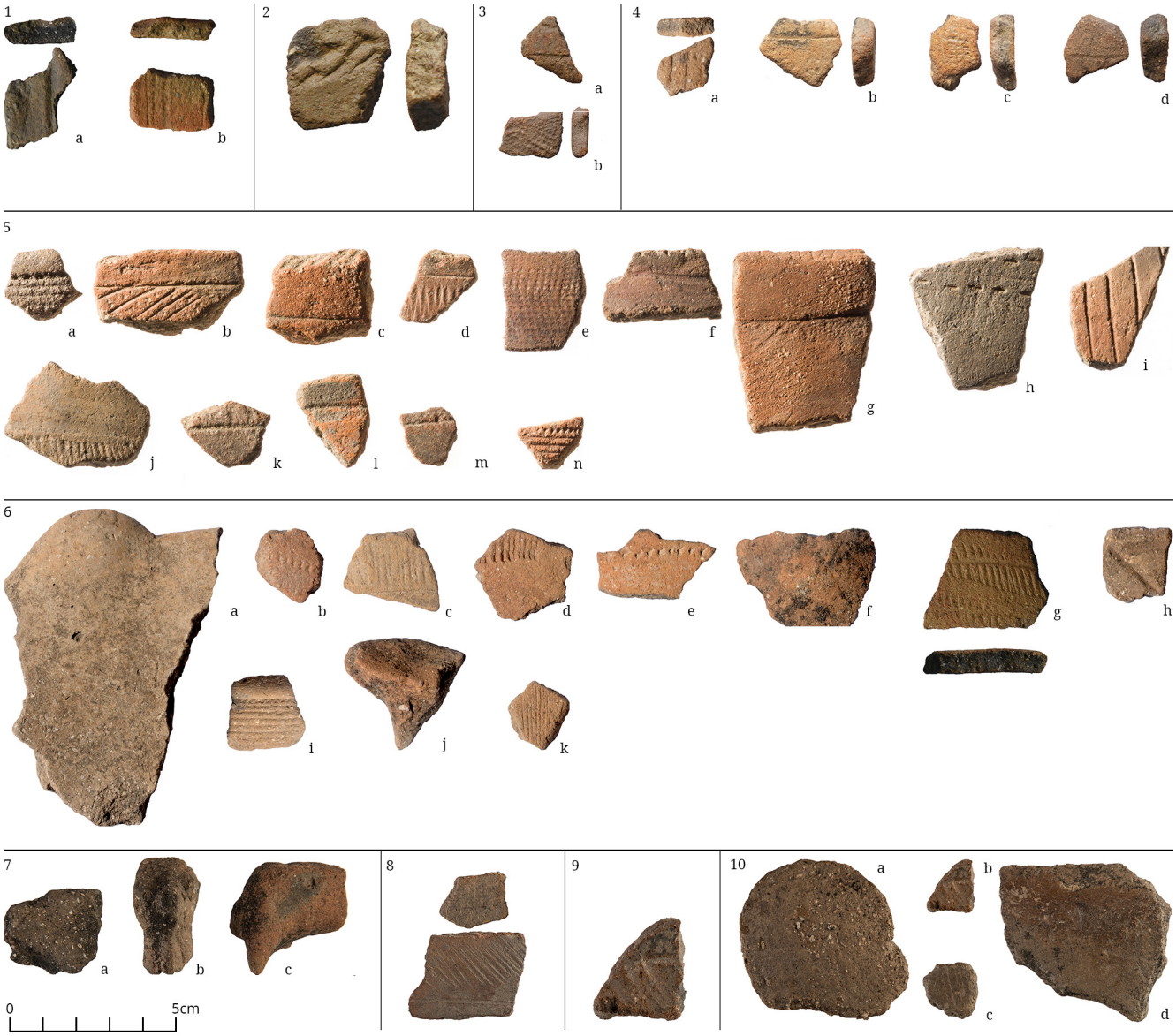


Fig. 8: 1a–b: Two potsherds from Site S18, a: amorphous shape, b: vertical incised lines. 2: Potsherd from Site S20 with triangular impressions. 3a–b: Potsherds from Site S23, a: incised lines, b: mat impression. 4a–d: Selected potsherds from Site S34 with similarities to the potsherds from S1. 5a–n: Selection of potsherds from the surface of site S40, diverse decoration styles. 6a–k: Selected potsherds from S42 with diverse decoration types. 7a–c: Bovine figurines (clay) from site S42. 8: Pottery sherds from Units 2 and 3. 9: Pottery sherd from Unit 6. 10a: Pottery sherd sample P01, Find No.: S40_A-I-5.1, 120 cm below surface, TL age: 2.5 ± 0.17 ka*. b: Pottery sherd sample P05, Find No.: S40_A-I-6.1, 145 cm below surface, TL age: 3.71 ± 0.32 ka*. c: Pottery sherd sample P07, Find No.: S40_A-I-6.5, 145 cm below surface, TL age: 3.22 ± 0.24 ka*. d: Pottery sherd sample P10, Find No.: S40_A-I-8.1, 166 cm below surface, TL age: 0.27 ± 0.04 ka*.

least 20 m. In addition to a stone lid for a small vessel, there are finds of mat-impressed potsherds that are combined with other local quartz-tempered fabrics.

22 The stelae field site S12 is located on the eastern fringes of the depression (Fig. 5, for details see Fig. 30). The area measures 20 x 20 m and is divided by a small creek (Fig. 9). It consists of a group of seven irregular shaped stelae. The largest stela measures 77 cm in height (Fig. 10).

23 Whereas other built features were not found, potsherds of presumably Early Aksumite date were abundant in between the stelae. While some bone fragments might point to a cemetery, a number of querns and grinding stones might indicate a change in use of this area.

24 Sites S13–S22 are either single granite boulders or granite boulder groups. S13 is a granite hill southeast of the stelae group measuring c. 150 x 200 m. Some sherds

Fig. 9: Stelae field at Site S12.

of undetermined date were found on the eastern and south-eastern slope. Site S14 is another granite boulder group, measuring c. 100 x 200 m, which revealed some pottery sherds of mostly undetermined date. Sites S15 to S22 (Fig. 5) have different sizes ranging between 10 x 20 m and 40 x 300 m. Potsherds were found at all sites (minimum amount per site >2), but the majority is yet of undetermined date. S16 revealed some potsherds with mat-impressed fabrics, in S18 an example with fine vertical incised lines was found (Fig. 8, 1a–b) and S20 revealed a bodysherd with triangular impression decoration (Fig. 8, 2).

25 Site S23 is a hill south of the city of Rama on the western side of the main road. The hill is surrounded by agricultural fields, has extensions of c. 300 x 100 m and is 30 m high. Agricultural terraces are located on its eastern slope. One potsherd of decorated fine ware (Fig. 8, 3), comparable to finds from S1 and S3, was found in the fill material of these terraces; it most probably belongs to residual assemblages. Stone constructions, which are due to their grade of erosion, surface texture of the interior and sherds of recent pottery assumed to be of rather recent or sub-recent date, are found on top of the hill and on the western slope. A massive square stone structure (1.74 x 1.9 m) and two small adjoining rooms (2 x 1.24 m, 1.5 x 1 m) made of vertical slabs can still be

Stela no.	1	2	3	4	5	6	7
Height in cm	21	52	57	77	16	23	34
Width in cm	44	34	20	63	27	32	31
Thickness in cm	16	16	25	26	16	20	19

Fig. 10: Dimensions of each stela in S12.

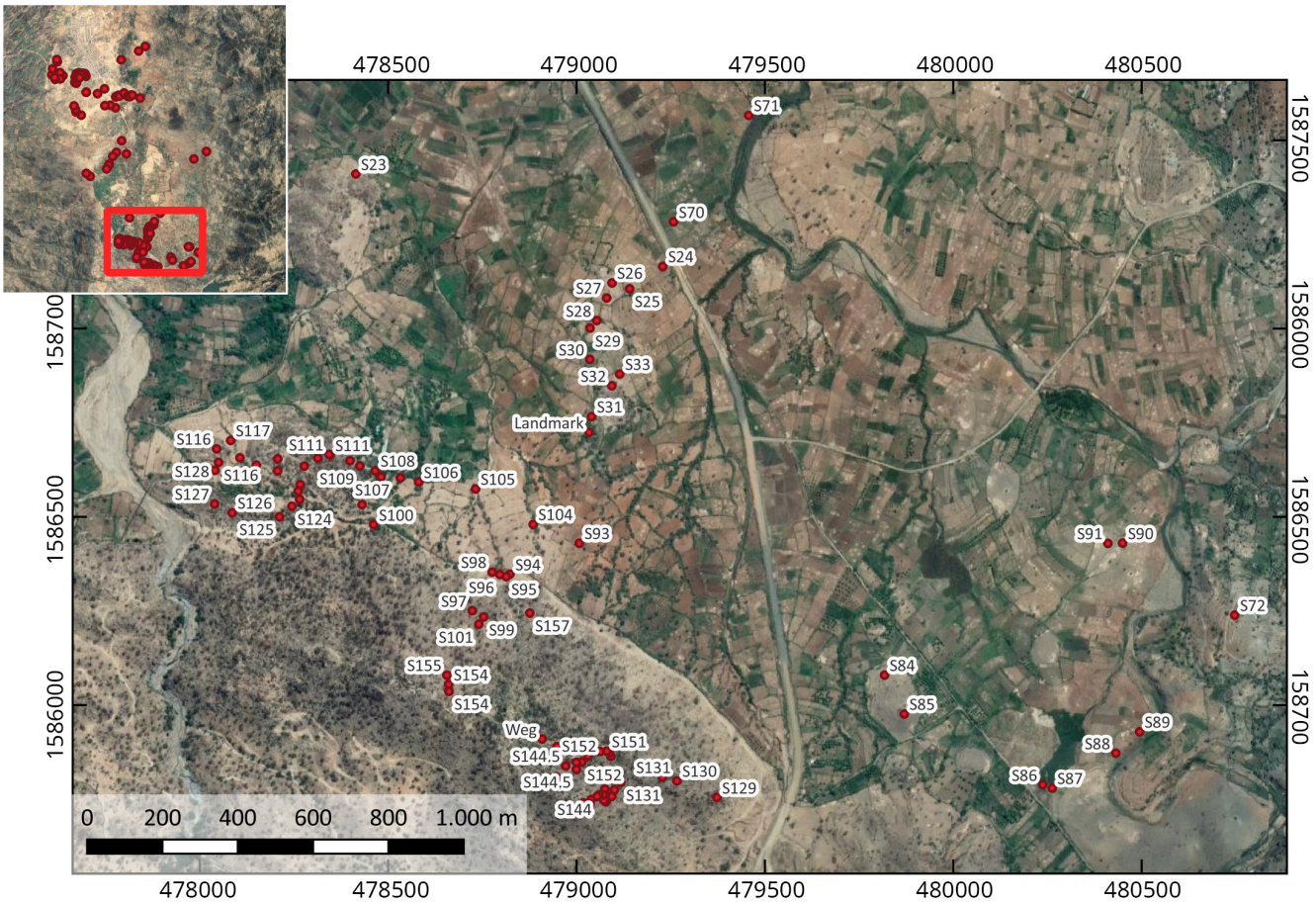


Fig. 11: Map of the southern part of the survey area showing the sites mentioned in the text. Please refer to Figs. 32, 33, 34 for a closer view of the depicted find clusters. Coordinate system UTM 37N.

Fig. 12: Site group S24–S33. Here Aksumite settlement S30: circle of granite blocks (view from south).

Fig. 13: Hill west of Rama village (S36–S44) with smaller hills (S34–S35) in the front; view from southeast.

seen well on the highest point of the hill and may therefore perhaps have been used for landscape surveillance. At a distance of 10–40 m, three huts were recorded, each of them measuring about 3.5 x 2 m. The masonry of each hut is still preserved some courses high. The huts did not provide any indication of dating, potsherds were not found.

26 The sites S24–S33 (Fig. 11) are located on the western side of the main road, southwards of Rama town. They belong to a larger Aksumite settlement site southeast of S23 (Fig. 12). The majority of potsherd scatters (each site an amount of up to >10) were found in the fields S24, S25, S27 and S29 that altogether extend over a length of at least 440 m (N–S). Each site is connected with groups of granite boulders with extensions of up to 150 x 100 m for each group. Many yet undated potsherds (amount of >30) were discovered at a circle of granite blocks each measuring about 3 x 4 m (S30) that seem to have been intentionally placed there, perhaps in the Aksumite period. Another group of granite boulders forms a natural oval of about 15 x 40 m (S28). Here, a large variety of shapes and vessel types can be observed, such as storage jars with handles (e.g. S24, S29 and S31), footed vessels (S25), herringbone-decorated Aksumite wares (S29, S32) and mat-impressed vessels (S30). Also flakes of obsidian were found on the surface (S29, S30). The area seems to be bounded by the northern slope of hill S33 (c. 200 x 100 m). It is somehow surprising that a stone formation southwest of S33, at a distance of about 200 m, bears no traces of any human presence since this feature is very similar to S1 (Wentah) with two large boulders stacked on top of each other (height c. 7 m).

27 In the hills to the west of the city of Rama, the group of sites S34–S44 was found (Fig. 5, Fig. 13). Both S34 and S35 are granite hills (S34: c. 100 x 40 m, h: c. 10 m; S35: c. 200 x 30 m, h: c. 15 m). Whereas S35 revealed single sherds of uncertain date, many potsherds (amount of >30) were found on top of the hill of S34 – some of them with fine impressed decoration similar to the finds of S1 (Fig. 8, 4a–d) and therefore possibly pre-Aksumite. Sites S36–S44 are grouped on top of and near a prominent granite hill, which borders the western fringe of Rama town. The hill measures c. 330 x 310 m

Fig. 14: View along the stone wall along the ridge on top the hill at site S39.

and has a height of c. 50 m. A presumably post-Aksumite site, the group of findspots S36–S39 of about 300 x 50 m was identified in the upper third of the slope of the hill. It extends across the northeastern and northern slope with a concentration of smaller stones (20–35 cm in diameter) that belonged to entirely ruined stone huts (S37). A large number of potsherds were recorded; six of them are decorated with incisions. The state of the ruins does not allow measuring the sizes of the dwellings. Seasonal rainfalls have washed some of this material down the slope where it was recorded at two spots (S36, S38). Site S39 is located on top of the hill (Fig. 14); it is a heavily eroded fortification wall of max. 1 m width is preserved to a height of 70 cm. It runs along the top of the hill in a straight course for 50 m from south to north. It turns at a right angle to the east where it can be followed for another 10 m. A few potsherds of probably post-Aksumite date were found within this structure.

28 One of the hills is called Gual Kor Nebri (S40), called “hill of the small leopards” by the local population. The hill has a kind of ring shape and encloses a plateau of accumulated sediment below the hilltop (Fig. 15). The plateau is a flat area of c. 50 x 50 m with a subtle slope to the north. The soil is weathered and eroded from the surrounding hills. A lot of potsherds were found on the surface (amount of >50) at site S40 (Fig. 8, 5a–n). The decoration on many of these potsherds is identical to that on sherds found at the Wentah (S1, see below, discussion). The seasonally cultivated field is surrounded by a high summit with remnants of the early modern age fortification (S39) and three slightly elevated hilltops to the south and west (S41–S43). Some sherds similar to the finds of S40 were found on these hilltops (each site with an amount of >10). Remains of a stone hut on the southern fringe of the field yielded, on the other hand, pottery of probably much more recent (last centuries?) date, since both fabric and ware are very similar to modern pottery still in use in the villages of North Tigray.

Fig. 15: Overview of Site S40: the plateau surrounded by hilltop granite boulders.

3.3 Survey 2019

29 In 2019, the archaeological survey in the Rama area was continued. The surveying areas were first divided into sections east and west of the main road leading into the village of Rama, and then defined in terms of topographic aspects – such as deep gullies, river and stream courses, rock mounds and mountain slopes. Closed plantation areas as well as private property, but also artificial canals for field irrigation were used for the survey area selection. Further points of interest were predefined by the study of aerial imagery. During the 2019 season, a total of 101 sites was recorded (S46-S157, for details see Fig. 29, Fig. 30, Fig. 31, Fig. 32, Fig. 33, Fig. 34).

30 Site S40 was revisited and, as was the case in autumn 2018, numerous potsherds with incised and impressed decoration were found especially on the southern fringe of the field. Predominantly body sherds and rims were found this time; they display impressed patterns on the body as well as on the rim zone. Such decorations are well attested in the 4th–1st millennium BCE. Parallels to the Sudanese lowlands, as already assumed on the basis of the 2018 assemblage, were identified. Contact between the Rama area and the Sudanese lowlands appears probable. Therefore, a test sounding of 3 x 3 m was excavated during the 2019 season (see chapter 4). While resurveying S40, the surrounding sites were also resurveyed (see Fig. 5). Site S42 displayed potsherd assemblages (Fig. 8, 6a–k) and obsidian flakes and, in addition, three fragments of animal figurines made of clay were recorded. One of them resembles the baked clay figurines that were found in autumn 2018 on the surface of site S1 (Fig. 7, 7a–c). The other two were considerably larger and seem to differ stylistically from the first find.[24]

24 Close parallels of these Zebu-like features are attested in Aksumite contexts, e.g. in Yeha and Matara / Eritrea (JE 3355), see Anfray 1967, 44 Fig. 7.

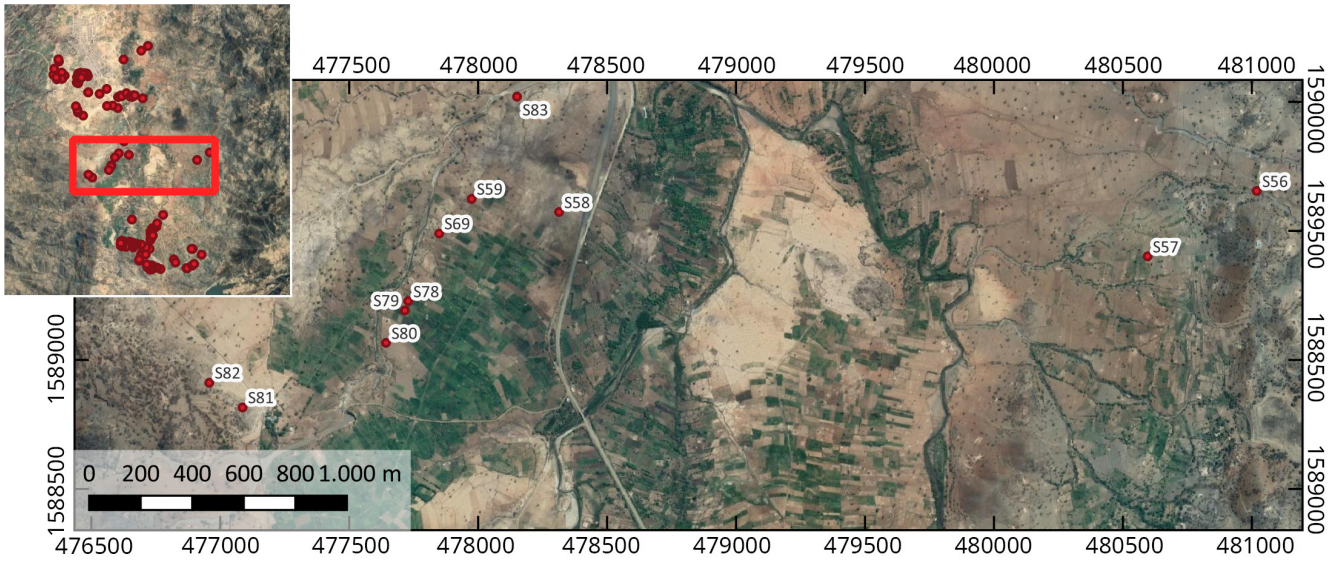


Fig. 16: Map of the central part of the survey area showing the sites mentioned in the text. Coordinate system UTM 37N.

31 Sites S46–S50 were found in an area of modern cultivated fields and scattered granite boulders south of Rama town (Fig. 5, for details see Fig. 29). Each of the sites is defined by finds and potsherd scatters (with amounts of 2 – >15) of uncertain date. Along the foot of the hills on the western fringes of the Rama valley, sites S51–S53 and S60 are located (Fig. 5). S53 can be attributed to the Aksumite Era based on surface pottery. The area, which consists mainly of cultivated fields, is characterized by granite boulders, acacia and shrub vegetation – some of these granites show modern graffiti. Site S51 is a field with quite a high abundance of pottery. Rims, body sherds, handles and bases of vessels were found. The other spots (S53.2–S55, S61–S63, for details see Fig. 31) on this track yielded only small quantities of heavily fragmented pottery sherds (with amounts of 2 – >10). South-east of the village of Rama, on the eastern side of the main road and amongst modern agricultural fields, there were very few sites. Only two sites were recorded (S70–S72) that revealed a few sherds each (with amounts of 1–8), one obsidian chip was found at site S72.

32 The survey in the central Rama area covers an area eastwards and westwards of the main road. The eastern part is predominantly flat, difficult to access because of large plantations and extended corn fields and crossed by numerous irrigation canals; the number of sites found was extremely low. Two sites were defined (S56, S57) that constitute a small pottery scatter each. Whereas S56 displayed three body sherds of reddish fine ware, in S57 one single body sherd of beige-greyish ware was found (Fig. 16). None of the sherds had decorations and, because of the recent cultivation of the area, it can be assumed that the sherds are modern. In the western part the landscape is characterized by a widely branched system of gullies and crop cultivation land. Small and medium-sized pottery scatters were found (with amounts of 1–3 and >10), some findspots consist of single sherds only. The surveyed route comprised the site numbers S58–S59, S69 and S78–S83 (Fig. 16). The majority of the found pottery assemblages consist of coarse undecorated body sherds of reddish and greyish ware, several handles and numerous rims. Due to their ware, colour and fabric a rather sub-recent dating is presumed.

33 The south-eastern part of the Rama area is characterized by heavily eroded schist hills and mountains, a deep river valley with swampy banks, agricultural areas, modern degradation of surfaces and irrigation systems. On the crest of the hills and mountains and on the slopes, no finds were recorded at all. At the foot of the hills, the sites S84–S91 were defined (Fig. 11, for details see Fig. 32). They mainly comprise less than ten pottery sherds per spot. Whereas S84 and S85 are located on a flat hilltop near a sub-recent ruin of a small rectangular hut, S86 and S87 were found on the fringe of

a dried-up pond. Sites S88 and S89 were defined next to a river, and S90 and S91 are located in the plains between the mountains and the main road.[25]

34 In contrast to the vast scenery on the south-eastern fringes of the valley, the southwestern part of the Rama depression is gentler. The area is densely covered with acacias, shrubs, single or groups of granite boulders and cultivated fields. On the southwestern fringes of the valley, the highest granite mountain of the valley is located. The mountain is a prominent landmark when entering the Rama basin from the south; the entire valley can be seen from the mountain top. The mountain and its slopes are covered with granite boulders and are densely covered by granite rocks, cobbles and by trees and shrub vegetation. The mountain is elongated and has several peaks and plateaus that were systematically surveyed.

35 The soil at the foot of the mountain consists of beige-reddish coarse sand washed down from the slope, and the fallow land displays reddish clayey sand with grass vegetation. Here at the foot of the hill, the site numbers S94–S103 were defined (Fig. 11, for details see Fig. 33); the sites and find spots comprise various potsherd scatters with different sherd densities (with amounts of 3 – >30) that were obviously washed downhill. The assemblages predominantly consist of body sherds and handles, made of fine and coarse ware. Sites S97, S99 and S101 are located on the eastern slope of the mountain. S97 is a small terrace with predominantly recent potsherds, 3 sherds were collected. Site S99 consists of two circular stone formations, approximately 1 m in diameter and 20 cm in height. Although it is clear that these were set intentionally, no pottery was found; neither are there any indications to help date these findings nor can a function be determined. S101 is a larger, more or less plain area on the slope, covered by several boulders and rocks. The site yielded a high number of potsherds of which seven pieces were collected. However, it has not been possible to date these sites yet. The area between the crop fields in the north and the mountain in the south is densely covered with acacia trees, shrubs and bushes, single granite boulders and low hills of granite boulder groups. More than a dozen of potsherd scatters were recorded, and the site numbers S93 and S104–S117 were defined. Of special interest is site S93, which is located to the west of the main road on fallow land with acacia vegetation. The assemblage consisted of five obsidian flakes as well as four body sherds and two handles. The sites S104–S117 displayed mostly body sherds, rims, bases and handles (with amounts of 1 – >25). The majority of the potsherds were made of grey and reddish ware. The find situation clearly reflects a higher find density on the hills and the slopes than on the flat areas that are partly used for crop cultivation.

36 In the same area at the northern foot of the granite mountain, sites S121–S128 were found in the vicinity of an irrigation canal (Fig. 11, for details see Fig. 33). Whereas the majority of these sites revealed single pottery sherds or small scatters only (amounts of >7), site S123 showed a huge number of decorated and undecorated pottery sherds of rims, handles, bases and bodies (amount of >40). It is not certain whether the potsherds are “in situ” or were relocated during the construction of the canal. Although only three sherds from each site were collected, the potsherd densities that were found at sites S126 and S127 were quite high as well (amounts of >25). Variously sized potsherd scatters were frequently discovered on the western and northern slope of the aforementioned granite mountain.

37 Site numbers S129–S157 were defined at the south-westernmost fringes of the Rama depression, they were recorded both on narrow terraces and also on the steep slopes (Fig. 11, for details see Fig. 34). The majority of the potsherd scatters was

25 Site 92 was defined during an excursion to a neighbouring valley and was found south of the village al-Hissa on a mountain top. A cultivated, freshly ploughed field revealed a handle and two body sherds of undetermined date.

found on the various peaks of the mountain, which are characterized by flat terrain. Large numbers of coarse and fine ware potsherds were found, mostly body sherds but also rims, bases and handles (each site with an amount of 4 – >20). Many of the sherds show incised geometric decoration patterns of lines, dots and a combination of both. At site S157, several obsidian flakes were found (RS19–38). Because of the extension of the scatters (ranging between 3.0 m and 135.0 m in diameter), the find density and the topographic setting, it cannot be excluded that the sites might reflect settlements, although of yet unclear date.

38 At sites S144 and S151, located at the highest points on the mountain, extended fields of scattered potsherds were found (each with an amount of >15). The assemblages contain rims, body sherds, bases and handles, many of them decorated. Although yet undated, it is presumed due to thickness, ware, fabric and decoration that the assemblages are of quite recent origin. At site S152, a charcoal accumulation of about 3.0 m length was discovered in situ underneath the topsoil. It was found together with a high number of potsherds (amount of >10) and a piece of iron slag. However, a ^{14}C dating of one of the charcoal pieces revealed that the site dates to the 19th century CE.

4. Excavation at Site S40 "Gual Kor Nebri"

4.1 Geography

39 Site S40 is situated within a bowl-shaped hill that is located to the southwest of the village of Rama. The hill is strongly rounded, with a diameter of c. 350 m, and rises up to 50 m from the floor of the Rama depression. Outcropping rocks in the hills of S40 correspond to coarse-grained granodiorite, diorite tonalite and granite (Tadesse 1999). Geomorphologically, the hill of S40 can be addressed as an inselberg; spheroidal weathering of the plutonic bedrock confirms this hypothesis (Fig. 17). However, we are aware that inselbergs are forms resulting from erosion and denudation processes while the Rama depression is an aggradation form.

40 The inner circle of the hill is a small basin with a diameter of c. 70 m in east-west direction and c. 50 m in north-south direction. The basin has two outlets, one to the west and one to the east. The orientation of these outlets corresponds to the orientation of nearby tectonic fault lines (Fig. 18). Major strike directions in the area are displayed in Fig. 18, emphasizing the tectonic influence on the development of the outlets. The main strike direction recorded in the area is north-northeast to south-southwest (~25°–30°), corresponding to the thrust faults to the east of the depression (Fig. 19). The second most common strike direction is east-southeast to west-northwest (~115°–125°), corresponding to the lineaments to the west of the region and the orientation of the outlets of S40 (Fig. 17).

41 The rocks at the study site showed signs of spheroidal weathering and exfoliation (Fig. 20). The enclosed shape of the bowl-like hill results in a very small source area for the sediments found in the inner basin (where the section of S40 was located). The parent material of the site of S40 can only originate from in situ weathering of the bedrock or from slope wash from the immediately surrounding slopes. Thus, the material is expected to be geochemically very homogeneous, although grain sizes may differ throughout the section owing to changing transport capacities during the slopewash events. Furthermore, an aeolian dust influx from farther away can be expected, as dust transport was observed everywhere in the region (Fig. 20). Based on several 1 m drillings (Pürckhauer soil auger) within the inner basin, the grain sizes are mostly in the range of coarse- to medium-sized sand, with relatively high silt contents.

Fig. 17: Photograph of the inselberg in October 2019. Viewing direction is from east to west.

Fig. 18: White line: outline of S40 hill; white dashed line: outline of inner basin; grey line: fault dissecting the hill. CORONA satellite image of the hill of S40. Image recorded in December 1967 during CORONA mission KH-4A.

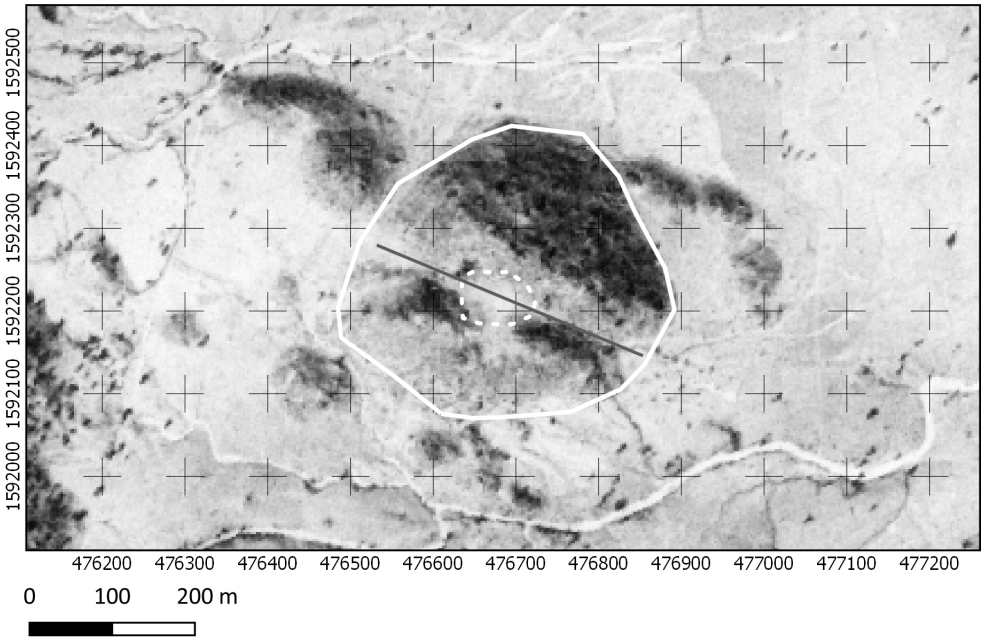
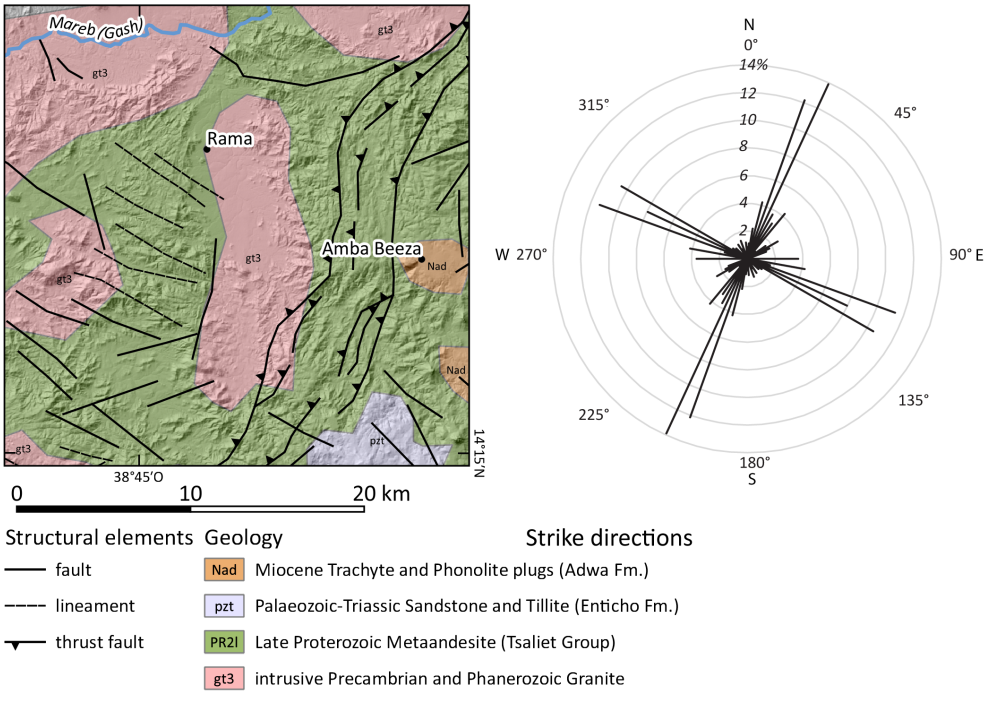


Fig. 19: Main tectonic strike directions and map extent used for calculation. Geology simplified after Geological Map of Ethiopia 1:2 M (1998). Structural Elements after Geological Map Sheets of Ethiopia 1:250 k.



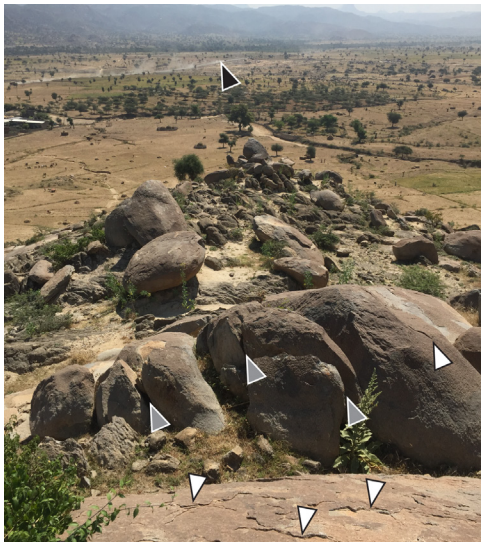


Fig. 20: Weathering characteristics at the study site S40. White arrows: Exfoliation patterns in the weathering rind of the blocks. Grey arrows: cracks dividing larger blocks. Black arrow: active dust transport.

Fig. 21: Overview of the plateau and the location of sounding S40, view to the south.

Fig. 22: Excavation of S40, top of Unit 3, view into the trench towards north.

4.2 Excavation

42 A sounding of 3 x 3 m was excavated (S40-A; Fig. 21); it was carried out in eight work steps (Unit 1–Unit 8, artificially separated) using a local measurement system.

43 The topsoil layer, which consists of cultivated land and ploughed soil, was designated as Unit 1 (S40 A-I-1). The soil of Unit 1 is of pale brown colour; it is hard sandy loam of crumbly consistency and contains weathered diorite rocks. Unit 1 covers the entire 3 x 3 m extension of the trench and was removed to a depth of 10–20 cm. Traces of ploughing could be found in the upper soil layers. The surface of Unit 1 showed a scatter of pottery sherds with impressed and wolf teeth decoration as well as some obsidian chips. These finds were also the reason for the location of the trench. Unit 2 (S40 A-I-2) was defined underneath Unit 1. The soil is loamy with a high amount of sand, has a hard crumbly consistency and is the first soil layer underneath the plough horizon. The colour of the soil is pale brownish-reddish and the diorite rocks in the soil show different grades of erosion. Furthermore, quartz chips and a few obsidian flakes were mixed with the soil. Unit 2 was excavated with a depth of 20 cm; small pottery sherds were found sporadically. The soil continues in the unit below, which is defined as Unit 3 (S40 A-I-3). Similar to Unit 2, the soil of Unit 3 consists of sandy loam, is hard and crumbly and of pale brownish-reddish colour. It contains weathered diorite rocks,

quartz and obsidian chips as well as very few pottery sherds. Unit 3 was excavated with a depth of 30–40 cm; cultural layers could not be defined (Fig. 22, Fig. 8, 8).

44 The consistency of the soil remains unchanged in the next excavated layer, Unit 4 underneath (S40 A-I-4). Unit 4 is the same compact, sandy loamy soil with weathered diorite rocks as in the layers above. Finds were not recorded in Unit 4, but a root hole with a diameter of 8–9 cm and remains of roots were found in this Unit; the roots were sampled.

45 Underneath, soil layer Unit 5 was defined (S40-A-I-5). It is sandy loam of loose consistency and was excavated with a depth of 30–40 cm. Whereas the eastern half of the trench has a darker brownish colour, the western half is pale brownish and shows areas of whitish weathered diorite rock. The layer Unit 5 shows a root hole with a diameter of 10 cm and a depth of 10.2 cm. Remains of a root from this hole were recorded in situ and sampled (Sample number S40-A-I-5.1 and S40-A-I-5.4). Several pottery sherds (S40-A-I-5.6, S40-A-I-5.2, S40-A-I-5.3) and one lithic flake (S40-A-I-5.5) were collected.

46 Layer Unit 6 is located below Unit 5 and was excavated with a depth of approximately 20–25 cm. Unit 6 consists of the same sandy loamy soil as the precedent layers; the soil is moist and compact but not hard, the amount of sand in the soil is high. The western and north-eastern part of the trench is brownish because of the high percentage of loam. The south-eastern corner has a pale brownish-whitish colour, which originates from the increasing amount of intact and weathered diorite rock. In a narrow area along the north-western section, the soil has a mixed colour of reddish-brown and white. A few pottery sherds were found and recorded (Fig. 8, 9), four sherds were sampled for TL dating (S40-A-I-5.1, S40-A-I-6.1, S40-A-I-6.5, S40-A-I-8.1) (Fig. 8, 10).

47 After finishing the removal of Unit 6, the next soil layer underneath was defined as Unit 7. Unit 7 was excavated with a depth of c. 20–25 cm. Changes in the consistency or colour of the soil were not detected; the soil remains loamy sandy, is crumbly and contains weathered diorite rocks. The colour variations in the trench originate from different densities of diorite rocks. Whereas the western part contains a high amount of loam and is therefore brownish, the eastern half shows increasing amounts of whitish diorite rocks and quartz and has a pale greyish-whitish colour. Throughout the mainly pale brownish-greyish soil in the trench, several darker spots appeared during the ongoing excavation, which could be defined as root holes that had been filled with soil. Several fine fibres of seasonal roots were found in Unit 7, and samples were taken for radiocarbon dating (P18, P27, P14; see section micro-archaeological analyses). A high number of weathered stones were found in the eastern part of the trench; the pale greyish colour is mixed with reddish loam, which sits in the gaps in between the rocks. Unit 7 revealed no finds).

48 Underneath Unit 7, soil layer Unit 8 was defined (S40-A-I-8) and excavated with a total depth of c. 10–15 cm. The soil remains unchanged and consists of sandy loam intermixed with rocks and chips of weathered diorite. It is characterized by a pale brownish to greyish colour with reddish-brown loam inclusions. In the south-eastern part of the trench, the density of diorite rocks increases. While the condition of the rocks improves with increasing depth, there are fewer traces of erosion and the hardness of the soil is divergent. Near the eastern section of the trench, Unit 8 revealed two small pottery sherds (S40-A-I-8.1): one is made of a greyish ware, the other one has a brown polished outer surface. Both sherds were sampled together with their surrounding sediment in order to carry out TL dating.

49 After finishing the excavation of Unit 8, it was decided to downsize the excavation area to a sounding measuring the length of the trench of 3.0 m by a width of 0.8 m along the eastern section. This area was excavated as Unit 9 with the aim to reach the virgin soil. In this area the excavated soil is pale brownish whitish and consists mainly of weathered diorite rocks and a lower amount of loamy soil. The weathered

rocks were found disintegrated into diagonal slabs, and in between the gaps reddish loamy soil was found. A higher density of rocks was found in the north-eastern and south-eastern corners of the trench. Although the state of weathering of the rocks improves with increasing depth, the parent rock was not reached. In this layer Unit 9, which sits more than 1.60 m below the topsoil, a single pottery sherd was found at local level 97.20 cm (S40-A-I-9.1); however, the undisturbed parent material was not reached.

50 Because of time restrictions and the political circumstances, the excavation of S40 ended when work in Unit 9 was completed. The trench was completely backfilled.

51 All four sections of the trench were recorded, drawn and studied. The sections display a sequence of layers that were built up by natural erosion and sedimentation events; anthropogenic layers could not be identified although pottery sherds were found in each layer. The soil shows slight differences in colour with increasing depth; sandy loamy brownish soil in the upper parts changes to pale brownish greyish in the lower parts, which can be explained by a higher density of weathered and unweathered diorite rocks (Fig. 23, 1–4; Fig. 24).

52 The excavation of the site of S40 revealed a limited number of finds that consist mainly of singular potsherds and obsidian flakes.

4.4 Micro-archaeological analyses

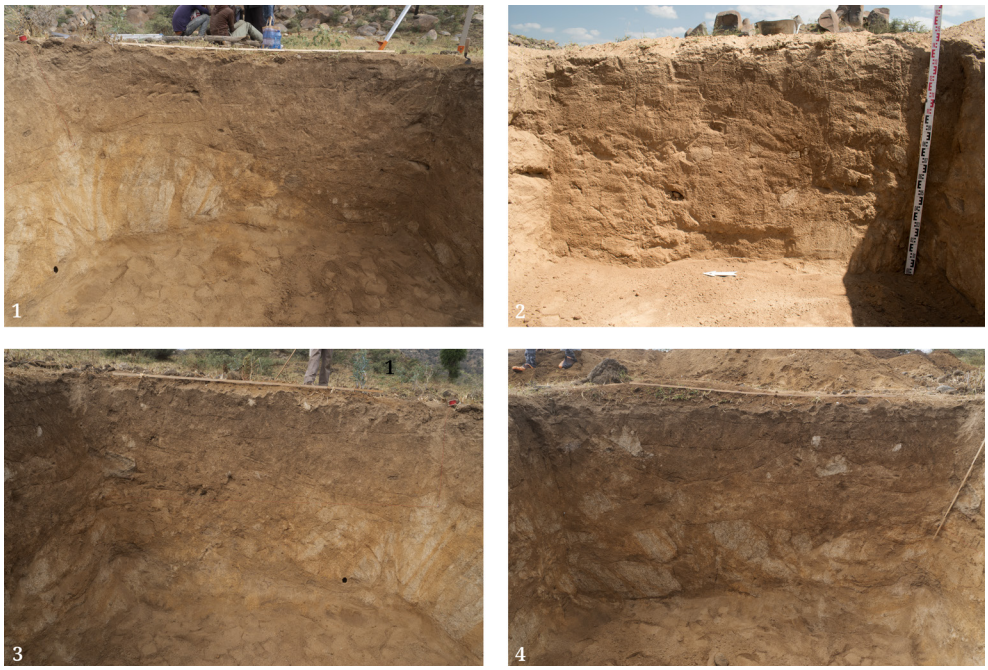
53 In order to better evaluate the nature of the human occupation, sediments of the S40 trench were studied for their micro-archaeological characteristics. Additionally, a natural exposure profile at the valley floor, 400 m northeast of the S40 site, was also sampled as a reference (Fig. 27). Following Stoops (Stoops 2003), micromorphological analysis was performed on two sediment samples extracted from the S40 site eastern profile (Fig. 23, 2) and on two additional samples from the reference profile. Grain size analysis, total, organic, and inorganic carbon, as well as mineralogical data (using X-Ray Diffraction) were extracted from samples taken along both profiles.[26] Pottery sherds were dated using thermoluminescence (TL, chapter 4.5); however, with the absence of datable sedimentary material, two roots at the S40 site were additionally sampled for ^{14}C dating (performed at the Poznan Radiocarbon Laboratory). The first is a large, dry and double truncated root (4 cm in diameter and 12 cm in length), found layered horizontally with no apparent channels, at a depth of 90 cm. Its position, dusty cover and size may suggest the root was part of the original deposition. A second, smaller (<1 cm in diameter) root, at the upper levels (c. 30 cm), was sent for radiocarbon dating in order to evaluate the time of the biogenic rooting activity.

54 The S40 profile was sub-divided into 3 sedimentary units based on changes in colour and texture (Fig. 25). Macro- and micromorphological observations of sharper contact between the uppermost and middle units (1–2) suggest erosion of unit 2, or of a missing unit, occurred prior to the deposition of unit 1. The middle and lower units (2–3) exhibit a diffuse contact between them, which is interpreted either as a post-depositional, gradual sedimentary change (soil formation) or a result of agricultural activities (ploughing).

55 In unit 1, coarse sand and gravel-sized semi-angular grains are mostly quartz and feldspars, while fine sands and silts consist in addition to biotite and micas. The angular forms of the coarse grains indicate that they are likely results of in situ bedrock weathering. The pronounced lack of clay-sized grains and amorphous organic features suggests that soil development is very limited (Fig. 26, a–b). This uppermost unit exhibits elongated semi-rounded voids indicating bioturbation (Fig. 26, b). In units 2–3, infilled

26 For methods, see Becker – Knitter – Nykamp et al. 2020; Nykamp – Knitter – Schütt 2020; Vogel – Märker – Rellini et al. 2016.

Fig. 23: 1: View towards the northern section showing the sequence of layers and the increasing number of pale greyish Syenite rocks. 2: View towards the eastern section showing the soil layers and two holes from micromorphological sampling. 3: View towards the southern section showing the sequence of layers and the increasing number of pale greyish Syenite rocks. 4: View towards the western section showing the soil layers.



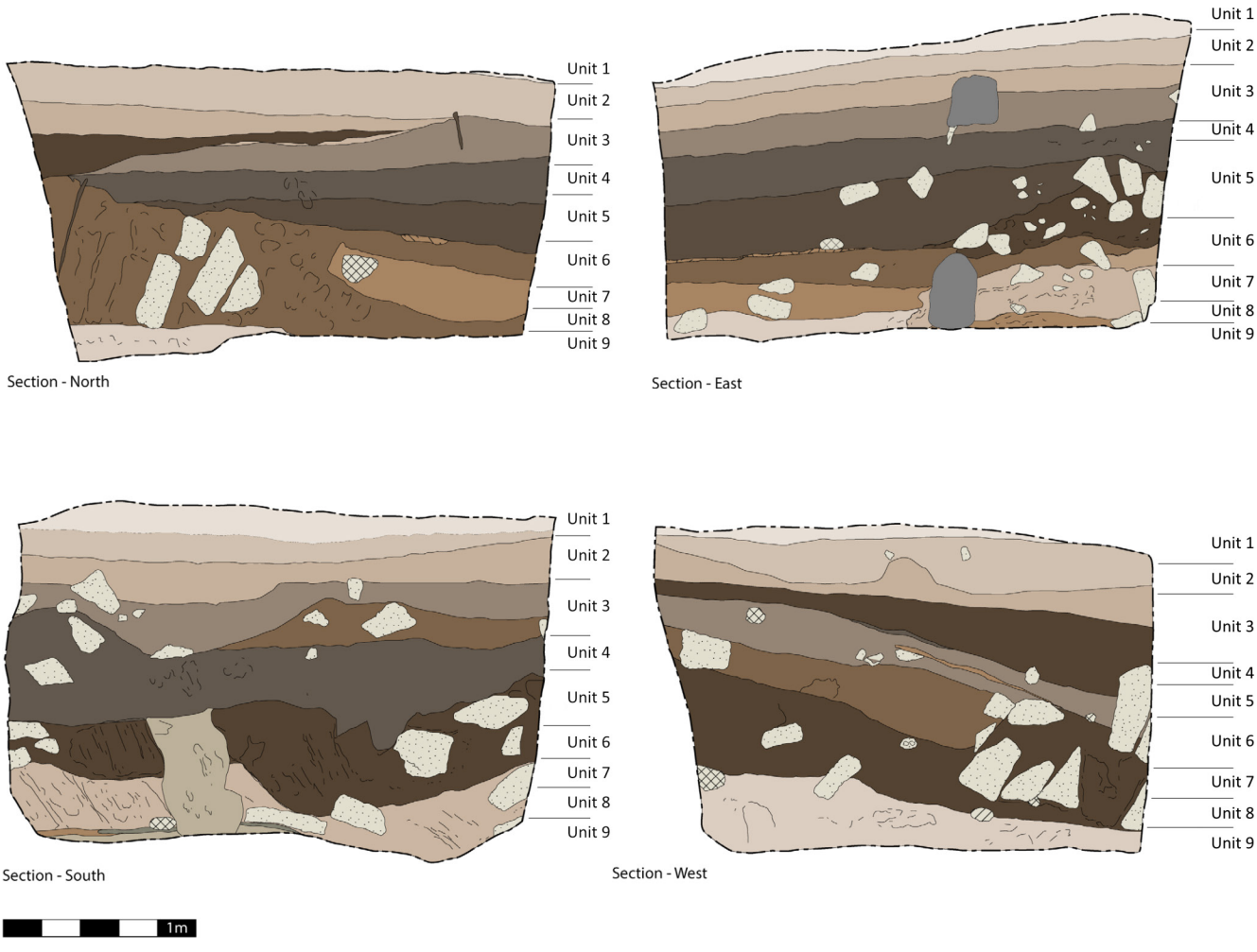


Fig. 24: Drawings of all four sections of trench S40. Scale 1:20 (note: excavation not by geological layers).

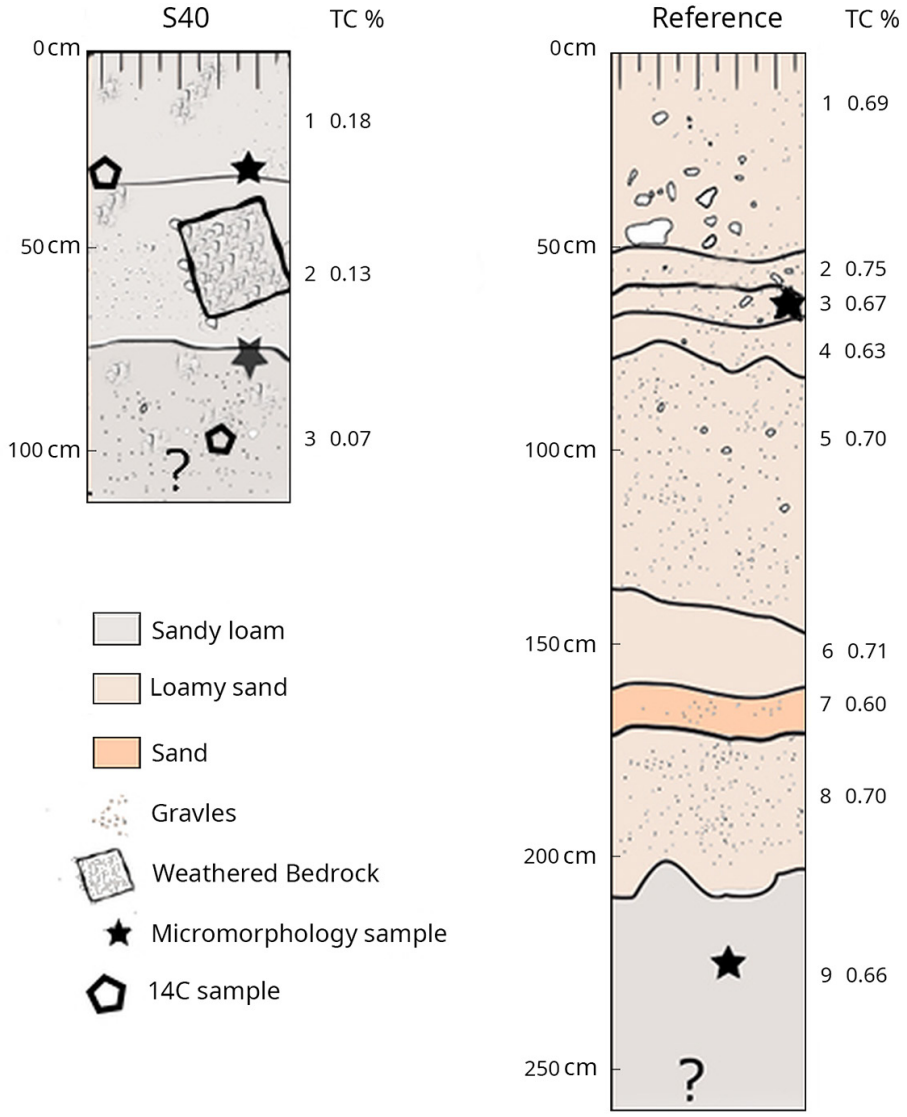


Fig. 25: The S40 (left) and reference (right) profiles. Numbers represent sedimentary units. Total Carbon (TC) is presented. Black vertical lines from the surfaces represent early stages of soil formation.

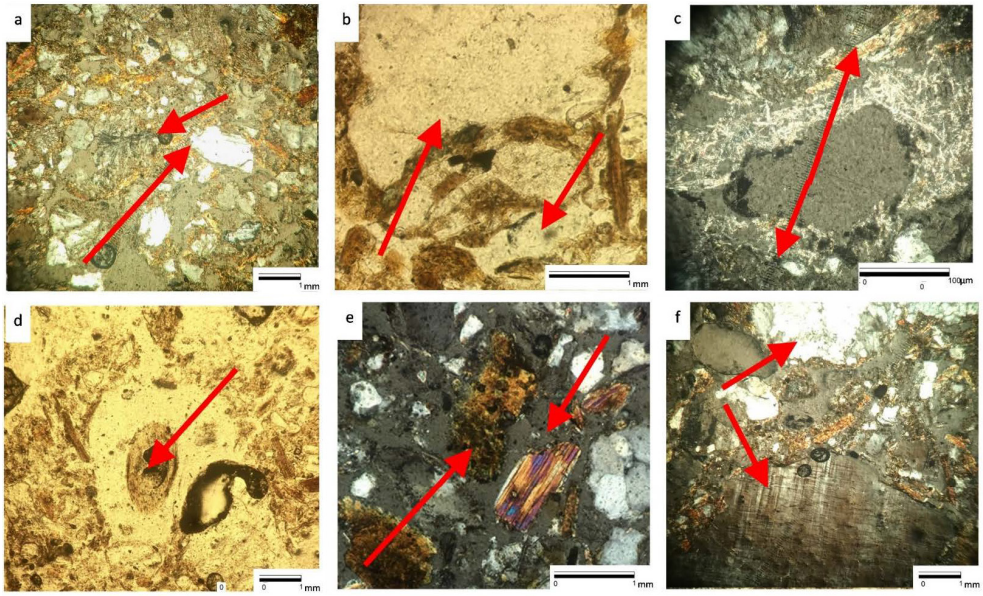


Fig. 26: a. S40 unit 1, in cross polarized light (XPL), showing the general structure of the uppermost unit, arrow facing up – quartz, arrow facing down – feldspar. b. S40 unit 1, in plane polarized light (PPL), arrow facing up – large quartz grain, arrow facing down – semi-rounded void. c. S40 unit 3 (XPL), calcite needles with void likely of organic origin, arrows showing feature's borders. d. S40 unit 3 (PPL), arrow – root in the centre of a void. e. Reference profile unit 3 (XPL), arrow facing up – amorphous aggregate, arrow facing down – muscovite mica. f. Reference profile unit 9 (XPL), arrow facing up – quartz, arrow facing down – feldspar grain. Notice the fine material between the grains.

No.	Sample ID CLL	Lab ID	Mineral	Protocol	Depth [cm]	Palaeodose Plateau (°C)	Palaeodose (Gy)	Dose rate (Gy/ka)	TL-age (ka)	Mean TL age (ka)	Mean TL age (BCE/CE)
1	P1-A	C-L5087	Polymineral fine grain	MAAD	120	280 – 400	9.6 ± 0.52	4.03 ± 0.17	2.38 ± 0.17	**2.5 ± 0.17**	**500 ± 170 BCE**
2	P1-B	*C-L5088*		MAAD		280 – 400	10.57 ± 0.51	4.03 ± 0.17	2.62 ± 0.17		
3	P5-A	*C-L5089*	Polymineral fine grain	MAAD	145	280 – 370	12.99 ± 1.08	3.45 ± 0.17	3.77 ± 0.36	**3.71 ± 0.32**	**1700 5 ± 320 BCE**
4	P5-B	*C-L5090*		MAAD		280 – 380	12.58 ± 0.70	3.45 ± 0.17	3.65 ± 0.27		
5	P7-A	*C-L5091-1*	Polymineral fine grain	MAAD	145	280 – 400	13.46 ± 0.62	3.97 ± 0.19	3.39 ± 0.22	**3.22 ± 0.24**	**1270 5 ± 240 BCE**
6	P7-B	*C-L5091-2*		MAAD		300 – 400	12.09 ± 0.80	3.97 ± 0.19	3.04 ± 0.25		
7	P10-A	*C-L5092-1*	Polymineral fine grain	MAAD	166	280 – 400	0.97 ± 0.10	3.62 ± 0.17	0.27 ± 0.03	**0.27 ± 0.04**	**1680 5 ± 40 CE**
8	P10-B	*C-L5092-2*		MAAD		300 – 400	0.98 ± 0.12	3.62 ± 0.17	0.27 ± 0.04		

Fig. 27: Thermoluminescence results of site S40. Note that the samples are in stratigraphic order and that the lowermost sample gave the youngest age.

channels and root residues as well as a needle fibre calcite (recrystallization of a likely biogenic origin) indicate that bioturbation and partial mineralization have occurred in the lower part of the profile (Fig. 26, c–d). Other than the above-mentioned needle fibre, which may be related to husbandry, no indication of intense human activity is evident (e.g. micro-pottery sherds and flint, ash layer, building material). The overall low TC (<1% of mass; Fig. 25), with almost undetectable levels of organic carbon (<0.01% of mass), indicates similarities in carbon ratios along the profile. However, the data does reveal a relative increase in carbon content towards the surface, which may suggest surface related carbon dynamics.[27]

56 The reference profile was subdivided into nine sedimentary units, with micromorphological samples taken at units 3 and 9 (Fig. 24). The structure of unit 3 is dominated by coarse sands and fine gravels with little fine material. Among the dominant minerals are quartz, feldspar, pyroxene, biotite and muscovite mica. The sub-angular to semi-rounded shapes of these grains suggest either a colluvial origin or a high energy flow along a short distance (Fig. 25, e). The lowermost unit (9) is mostly composed of fine gravel-sized semi-rounded feldspars and sand-sized biotite. The abundance of fine matrix between the larger semi-rounded grains suggests a fluvial deposition of medium energy (Stoops 2003; Stoops – Marcelino – Mees 2018).

57 Mineralogical data indicates that the two profiles share similar characteristics, as expected from their close vicinity, because of common bedrock source material. Minerals found along both profiles correspond to the published mineralogical data on the surrounding plutonic bedrock cover (Tadesse – Hoshino – Suzuki et al. 2000, see chapter 5.1). Total carbon contents are very low and relatively homogeneous within the profiles (1%> of mass), with total carbon at its peak at the uppermost units of both the S40 and the reference profiles. The S40 profile differs in lower carbon, both organic but mainly inorganic, with higher values towards the surface. This could indicate that the increased carbon content is a result of recent agricultural practices and soil formation rather than past activities. Grain size analysis revealed that the S40 sediments are composed of sandy loam while the reference profile contains mainly loamy sands but also sand and sandy loam, with the reference profile containing c. 5–15% gravel (Fig. 24). The observed differences between S40 and the reference profile are related to bioturbation and chemical weathering in S40 and the sedimentary transport sequence of the reference profile.

58 Radiocarbon dating (^{14}C) revealed that both roots are modern. For the upper root, this is the result of active modern rooting while for the lower, larger, dusty and truncated root, this could be a result of bioturbation. However, as observed channels did not exceed 5 mm in diameter (although a thin section reveals two dimensions only),

27 Bajnóczi – Kovács-Kis 2006; Stahlschmidt – de Tapia – del Carmen Gutiérrez-Castorena 2019; Stoops – Marcelino – Mees 2018.

this 'modern' root might in fact be a representative sample of the deposition. In this case, the entire deposition should be considered a mix of recent agricultural or depositional activities with older accumulations. This recent redeposition scenario is supported by the reversal of the TL ages with the lowermost sample (166 cm) having the youngest (0.27 ± 0.04 Ka BP) age (Fig. 27). The site's location on an isolated hill, with grains showing no sign of transportation, suggests that the older (first and second millennia) dated sherds (Fig. 27) are either from a nearby origin on the hill or that all significant, micro-residues bearing activities were eliminated as the site was redeposited. In summary, micromorphological observations, complemented by ^{14}C and TL dating, grain size analysis, carbon distribution and mineralogical data suggest that the S40 profile is a result of recent natural redeposition and/or agriculture practices rather than in situ past human activities.

4.5 Thermoluminescence dating of four pottery fragments from the S40 site

59 Samples for thermoluminescence (TL) dating were taken from four sherds (P1, P5, P7 [Gamma 7], P10 [Gamma 8]) and their surrounding sediment from the lowest excavated layers (S40-A-I-6; S40-A-I-8). The results of the analyses, performed at Cologne Luminescence Lab (CLL), Institute of Geography, University of Cologne by A. Zander, are listed below (Fig. 27).

60 Two datings using the TL multiple aliquot additive dose protocol were performed on each of the four samples (Fig. 8, 10a–d) to identify any contamination that may have resulted from the sampling process. Any light-exposed material from the surface of the sherds could reduce the age if it got into the sample during drilling. The deviations between the results of the individual samples are within the error ranges in each case. Accordingly, the sampling can be regarded as successful. The sediment dose rate was determined by gamma spectrometry, the internal beta dose rate of the sherds by beta counting.

4.6 Archaeological remarks on the dated sherds

61 Neither architectural structures nor structural remains were recorded; the excavated layers consist of clayey-sandy alluvial sediments and weathered diorite (see Fig. 23). As a possible proxy for settlement activities, the sediments were tested for their settlement phosphate contents at several depths, but no settlement phosphate could be detected. This reflects either the absence of settlement activities or the settlement phosphate is mobile in this coarse- to medium-grained granitic weathered detritus and has been washed out.

62 In terms of geomorphological studies, it is quite clear that the sediments, from which the samples were taken, are not in situ but were washed into the basin from the surrounding hills. A redeposition of the material is also indicated by the lowermost sample, which yields the youngest sub-recent age. Although further analyses are required, the inclination of the layers as visible in the eastern and western sections might indicate sediment transport originating to the south of S40 (Fig. 28). Hence, the surveyed sites S42 and S43, located on three shallow hills at the southern slope, might be considered the sites of origin. At these spots, some sherds similar to the finds of S40 were found. Also the remains of a stone hut were recorded on the southern fringe of the field, but this yielded pottery of predominantly sub-recent date. Sites S37 to S39 are also in close proximity to S40, located on the highest point of the rock formation that encloses the plateau of S40. However, S37 is a post-Aksumite site of about 300 x 50 m, which was identified in the upper third of the slope of the hill. It extends across the north-

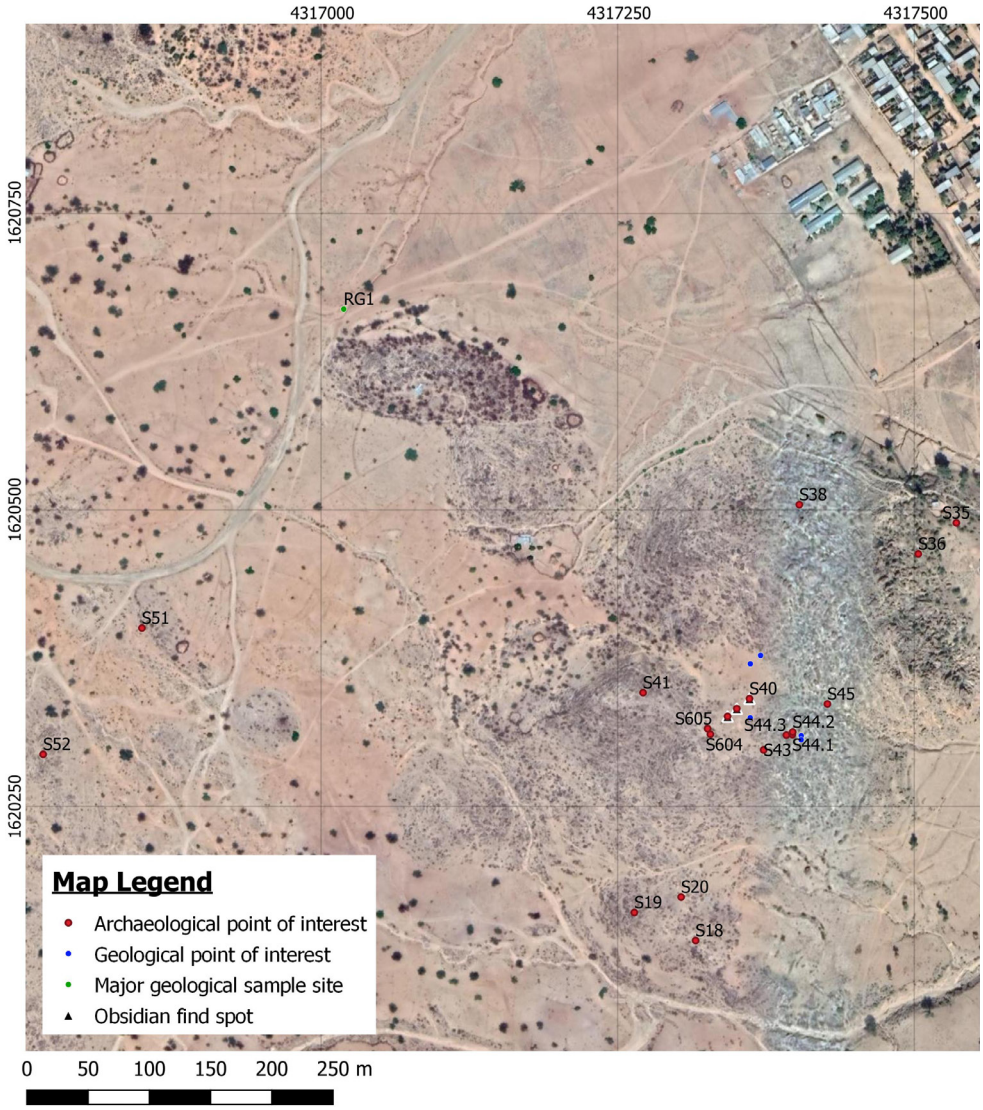


Fig. 28: Map of findspot S40 and surrounding sites from where the sherds were possibly redeposited. Coordinate system UTM 37N.

eastern and northern slope with a concentration of smaller stones measuring 20–35 cm that belonged to entirely ruined stone huts. S38 displays an extended area with a large number of potsherds, some of them decorated with incisions but still undated. The state of the ruins does not allow measuring the sizes of the dwellings. The seasonal rainfalls have washed some of this material down the slope where it was collected at site S38. Site S39 is a fortification wall of max. 1 m width. It is preserved to a height of 70 cm on top of the hill; a straight course runs 50 m south-north, turning at a right angle to the east where it can be followed for another 10 m. Few potsherds of probably post-Aksumite date were found within this structure. A very steep slope gives a view of a plateau field westwards, which yielded S40.

63 S44 and S45 are located at the eastern outlet of the plateau of S40. A grinding stone was found in the depth contour, clearly washed down from the plateau.

64 Taking the already known sites at the inselberg into consideration, it has to be stated that further studies are required to reveal whether the above-mentioned sites might also be the origin of the redeposited material at S40 and which role anthropogenic impact had on the accumulation of the deposits. Further studies on the find assemblages are in progress.

5. Results and Discussion

65 First conclusions regarding the pattern of the distribution of finds and features can be drawn on the basis of the 2018 and 2019 seasons. The collection of some surface pottery finds does not have identical parallels in Ethiopia or in the Sudan. Several survey points (especially S1, S3, S40 and S43) attest the presence of fine pottery vessels with elaborate and impressed decoration, that might resemble Sudanese and Nubian styles (see Jesse – Nowotnick 2022). The few sherds dated by TL from site S40 support the hypothesis that this formation could represent in parts a pre-Aksumite occupation phase of presumably the 2nd / 1st millennium BCE in the Rama region.

66 According to the current state of research, the pottery finds come from local production. Many details cannot point to a closer date: Shaping techniques that make use of a mat can be observed from 2nd millennium BCE to about 500 CE (see Jesse – Nowotnick 2022, Cat. No. 18). The examples yielded from the Rama Survey in S3 (Fig. 7, 4c–d) and S23 (Fig. 8, 3b) may be compared with similar inventories from Handessi Phase (Handessi B, Southern Eastern Sahara, 2nd millennium BCE, https://arachne.dainst.org/entity/6064210) or of 2nd millennium BCE of the Kerma Culture. Nevertheless, no precise dating can be deduced from this technological aspect, as Sudanese cemeteries from the Meroitic Period testify (1st–2nd century CE), see David – Jadot – Routhiau et al. 2021, 199, Fig. 6. The same is valid for the pottery with back-mouthed/black-topped firing effect (Fig. 8, 5l).

67 Some bowl fragments from S1 bear notches on the rim top (Fig. 7, 1p). Such fragments can be found in Sudanese Mahal Teglinos (K1) from contexts of the Gash-Group, as well as from Middle Nubian formations (as C-Group and Pan Grave) from Egypt and later until the 1st millennium BCE (vgl. Manzo 2020, Fig. 9.d sherds from Mahal Teglinos (K1); Manzo 2017, Fig. 22.b; Fattovich 1989, Fig. 5.1–3); this peculiar detail is also attested from the Ethiopian highlands e.g. from Yeha in 10th–4th century BCE (see Jesse – Nowotnick 2022, Cat. No. 22). Cord Roulette/Roulette impressions and twisted cord roulette can be found on pottery fragments found in S40 (Fig. 8, 5a und j) as well as S3 (Fig. 7, 4c; for decoration descriptions see Jesse – Nowotnick 2022, Cat. No. 18 and 22). Such fine fabrics have a long tradition in the Middle Nile region and cannot be taken as reliable indicator for a precise dating. Densely applied patterns of fine impressions are well attested till the Meroitic Period (e.g. David – Jadot – Routhiau et al. 2021, 203, Fig. 9). Body sherds with diagonal hatched friezes from S1 (Fig. 7, 1j), match with parallels of the "Yemeni Bronze Age types" within the Gash Culture e.g. from Mahal Teglinos (K1) (Manzo 2017, Fig. 23) and are therefore known in 2nd millennium BCE and can appear in earlier contexts in the 4th–3rd millennium BCE (Raue 2018, 518 No. 239, Taf. 75, Abb. 40.11). Also in this case, Meroitic contexts prove for the long life of such features (David – Jadot – Routhiau et al. 2021, 203 from tomb GRF4 and GRF67).

68 Nevertheless, some markers seem to be more specific. The undecorated rim-zone is a typical marker of the 2nd millennium BCE in Middle Nubian cultures of the Nile Valley and neighbouring regions (e.g. Raue 2018, Taf. 186–192), also represented in the surface material of S40 (Fig. 8, 5 b–c, f–g, l). Another hint to the 2nd millennium BCE is given by the triangular impressions in the rim zone (in combination with incised lines or without) from S1 (Fig. 7, 1r) and in S20 (Fig. 8, 2a). This decorative use of such impressions can be found from the Eastern Sahara to the Red Sea as early as the 3rd millennium BCE (e.g. Raue 2018, 494, No. 110, Taf. 57, Abb. 34). A more precise comparison leads to site SEG14 in the Eritrean-Sudanese lowlands in contexts of the Gebel Mokram Group of the first half of the 2nd millennium BCE (Manzo 2012, 78, 95, Fig. 11).

69 Of utmost interest is the use of dent-du-loup/Wiegeband-decoration executed by denticulated or straight tools as attested in S1 (Fig. 7, 1a), S3 (Fig. 7, 4a), S40 (Fig. 8,

5d) and S42 (Fig. 8, 6c). The execution of such patterns can be found in S40 in surface material, in the lower strata (Fig. 8, 8) and as highly polished fine wares among the sherds dated by Thermoluminescence to the 2nd millennium BCE from the excavation in S40 (Fig. 8, 9).

70 These assemblages have no exact parallels in the corpus of the Middle Nile Region or in the Sudanese Lowlands. Furthermore, they bear little in common with the following later pre-Aksumite collections of the Ethio-Sabaean period as is documented in Yeha[28], and other places of northern and central Tigray. According to the current state of knowledge, the assemblages are also alien to the Aksumite and post-Aksumite Period.

71 A very remarkable combination was encountered at site S1 – Wentah: in a very limited area of max. 20 x 15 m, three figurines of mammals, probably bovines, were found on the surface. Such figurines do not seem to be found in context at prehistoric sites of the Tigray. On the other hand, such figurines are found in the Sudanese cultures, especially in the 2nd millennium BCE.[29] Such figurines appear regularly in settlement contexts because of the wide variety of meanings of cattle (ancestry cult, rebirth, fertility). While the absolute dating will be subject to future work, the cultural setting of decorated wares in one context with such a sign of cultural behaviour definitely shows a link to the north-eastern Sudanese territories. Finding three bovine figurines in such a limited space at Wentah (S1) might lead to an interpretation as a place of worship and a deposition of votive objects. A final conclusion awaits further excavations at this site.

72 The data obtained so far can provide limited information on settlement patterns. No settlements per se have yet been found in the Rama Valley that can be dated into the 2nd millennium BCE, but rather evidence of material culture from the 2nd millennium BCE. Stylistically, these point mainly to Sudan areas. Surveys and remote data reconnaissance suggest that the valleys were perhaps not of interest for this period, but rather the mountainous regions. Further studies are necessary here. The evidence from the Aksumite period points to a more closely meshed use of the region, post-Aksumite evidence points to predominantly agricultural use of the research region:

73 Evidence for an Aksumite presence was found in the Rama valley at sites S24–S33. It was detected in the higher altitudes of the valley where a perennial small creek made agriculture possible. In the north, only the areas closer to the river allow for year-round agriculture. The settlement S24–S33 is located in the southern, more fertile area of the valley; at its north-western edge it is marked by granite boulders. A comparable settlement might be located at the foot of the stelae field S12 where comparably favourable conditions are met.

74 In terms of a post-Aksumite presence, it can be postulated that the valley probably played an important role for migrations and invasions throughout its history. The settlement S39 close to Rama sheds a vivid light on this aspect. High and protected close to a dominant hilltop, it guarded the mid sector of the Rama depression. For this reason, no houses of this settlement face the rear, western side.

75 As yet no indications of the material culture of an Ethio-Sabaean phase in the pre-Aksumite period have been discovered in the material from the 2018 and 2019 surveys. Decisive markers of other archaeological formations are still missing. For example, the black polished incised wares of the post-Aksumite Period have not been discovered at any of the findspots. Surprisingly, no import wares have been observed yet and the stylistic relations to more distant areas are transformed in the local material production.

28 Köster 2021, 392–412. Fig. 17–10; Japp – Köster 2020, 346–381. Personal Communication with M. Köster: Comparisons could be defined amongst the pottery assemblages from the Deep Trench in Yeha which revealed material from the 2nd millennium BCE though (Köster 2021, 398. Köster forthc.)

29 See recently Uhlschmidt 2023, 151–160.

76 In terms of dating, the results of the 2019 survey are awaiting a study season that was postponed because of COVID-19 pandemic circumstances and the war in Tigray. All in all, most of these visited places in the valley of Rama only had few finds and thus hardly any indication of former settlement places. Especially the western part of the valley, which was first inhabited in modern times according to reports by locals, seems to have been used only as pasture land. Therefore, the pottery found here can probably be traced back to shepherds and farmers who carried out their work here. In the east, on the other hand, the number of finds increases. It seems that they are mostly (post-)Aksumite products; whether the quantity of finds speaks for settlement sites is questionable. Although the number of sites on the hills is higher than in the plains, and although these sites display larger quantities of potsherds, they still do not represent enough data to prove permanent places of prehistoric human residence. One should therefore assume that the entire inner depression has always been used as pasture and arable land, as well as a junction between present-day Eritrea and the southern areas of the Tigray region. The earlier settlements, such as S24–S30 and S53, were possibly at the fringes, entrances and/or exits of the valley and maybe also underneath the modern village of Rama. In association with the study of ancient trade routes, these areas might have been strategically important points. If one moves from north to south (or the other way around) and wants to spare oneself the arduous way over the mountains of the surrounding countryside, hardly any other, simpler way leads in those directions. Thus these places would be predestined to serve e.g. as a trading or transshipment center. However, this is only a hypothesis and the actual situation would have to be investigated by further surveys and excavations.

77 The assumption that the Rama area functioned as a "route of interaction" in the 2nd millennium BCE, connecting the Sudanese lowlands via the Mereb River through the Rama area to the highlands in Tigray, gained considerable support from these new data. For the first time a material culture of that period can be proven by other methods than stylistic comparisons of pottery sherds. Especially the pottery sherd sample P07 (S40-A-I-6.5) bears similarities not only with the material culture of the eastern Sudan regions. Its date corresponds to the Mokram Group / Middle Kassala Phase in the Sudanese lowlands (Compare Manzo 2017, Figs. 37 and 38). Furthermore, this fragment links to pottery finds from a sondage in Yeha, about 40 km southeast of the Rama area, that were ^{14}C-dated to about 1200 BCE[30]. Thus, the network of the Late Bronze Age trade that connected the Egyptian and Sudanese Nile Valley with the Kassala Region in the lowlands seems to have indeed extended well towards the east along the Mereb River. Further research will consolidate these first steps in a terra incognita.

6. Acknowledgements

78 The field work seasons in the region of Tigray (Ethiopia) have been achieved due to great support by the Tigray Culture and Tourism Bureau (TCTB, Ms. Birkit Gebremedhin) in Mekele and the Ethiopian Heritage Conservation Authority (Mr. Abebew Ayalew), formerly Authority for Research and Conservation of Cultural Heritage (Dr. Mulugheta Fesseha) in Addis Ababa.

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30 Pers. comm. Marlene Köster. See also Köster 2021, 398.

Robert Busch, Frank Kutz and Philipp Hoelzmann. Thanks to P. Collet for the drawings of S40 (Fig. 23).

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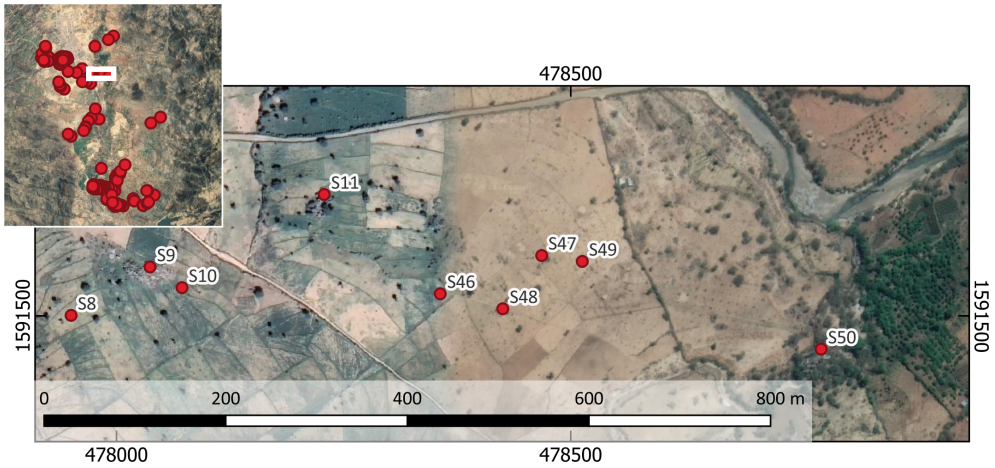


Fig. 29: Map of the Sites S8 - S11 and S46 - S50, to the southeast of the town of Rama. Coordinate system UTM 37N.

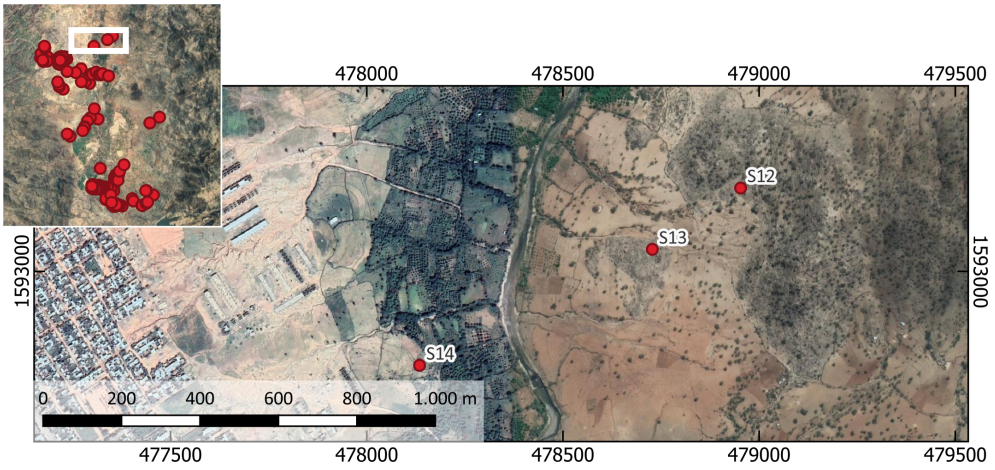


Fig. 30: Map of Site S12 and other sites in the vicinity, directly east of the town of Rama. Coordinate system UTM 37N.

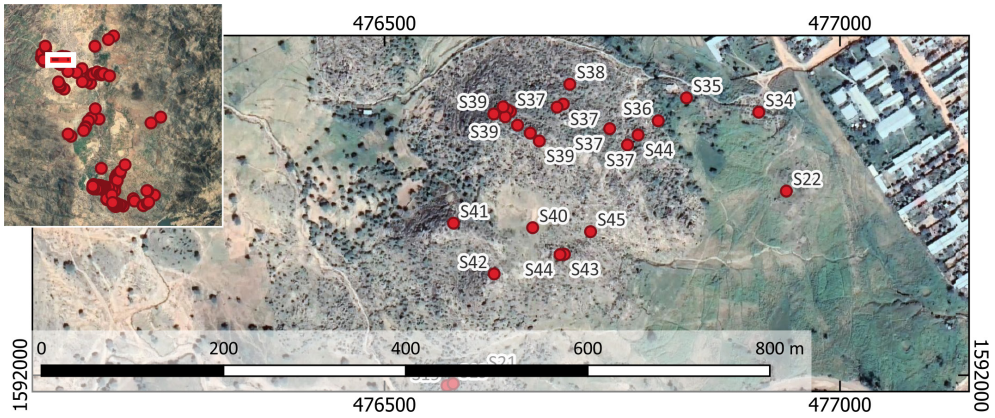


Fig. 31: Map of Sites S51–S63, western fringes of the town of Rama. Coordinate system UTM 37N.

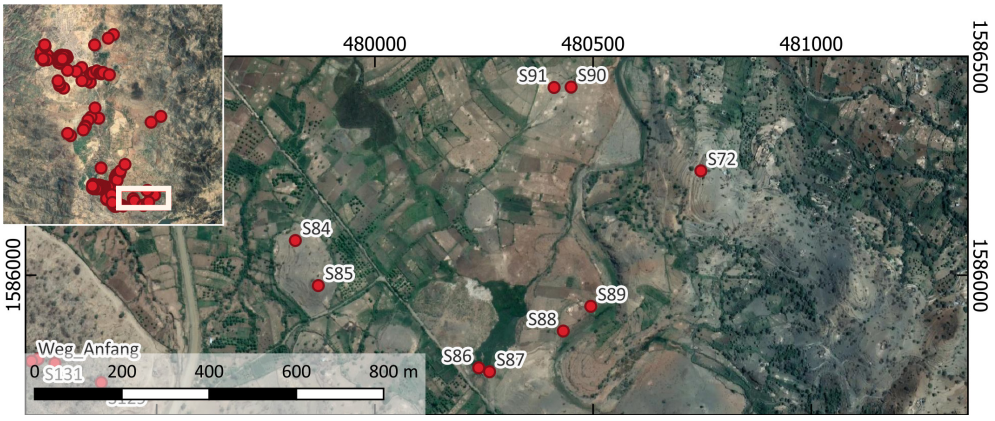


Fig. 32: Map of Sites S84–S91, southern fringes of the Rama survey area. Coordinate system UTM 37N.

Fig. 33: Map of Sites S94–S127, southernmost fringes of the Rama survey area. Coordinate system UTM 37N.

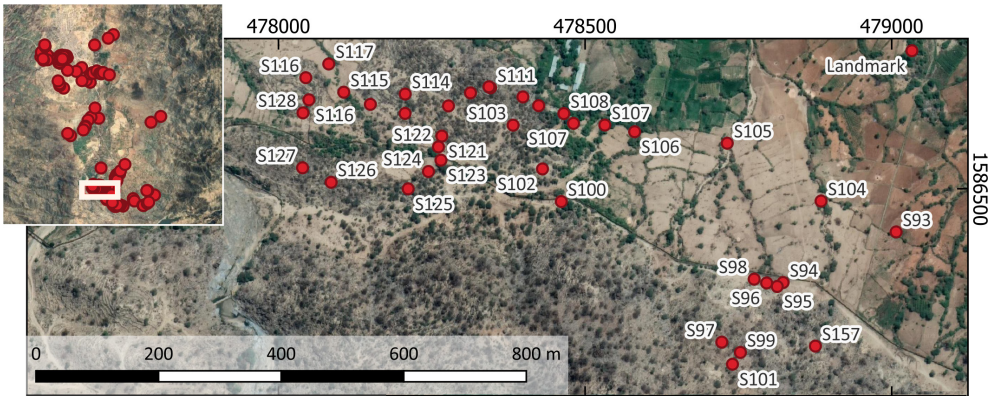
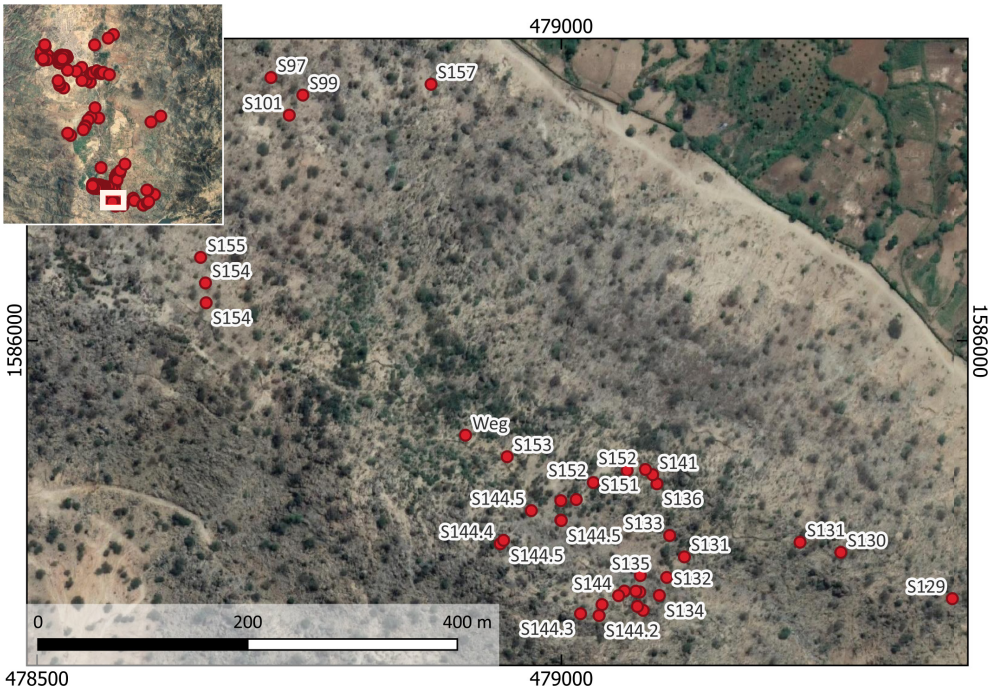


Fig. 34: Map of Sites S129–S157, south-westernmost fringes of the Rama survey area. Coordinate system UTM 37N.



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