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Thriving in the Thirstland: New Stone Age sites from the Middle Kalahari, Botswana

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ABSTRACT

This paper documents the abundance of Stone Age finds in the Middle Kalahari, both through earlier publications and newly documented sites. Results of several decades of Stone Age research are presented through a variety of projects and placed within the context of previous archaeological investigations in the region. We argue for the importance of open-air sites in constructing a more representative picture of prehistoric behaviour in the interior of southern Africa.

1. Introduction

Two decades ago, McBrearty and Brooks' (2000:487) seminal paper introduced their review of Middle to early Late Pleistocene archaeology as follows "Africa is vast, researchers are few, and research history is short." Since then, major developments have drastically changed our understanding of the antiquity of aspects of human behaviour. The continent, however, remains vast, researchers remain few, and investigations continue to focus on areas along its southern tip and the Rift Valley. Massive areas in the African interior and West coast remain largely unknown to Stone Age researchers, where access is still hampered by the natural environment, logistics and/or politics. This creates a conundrum in African Stone Age research: are we documenting the areas where most Stone Age populations lived, or those most accessible to researchers? The plethora of crucial finds emerging from South Africa and the East African Rift Valley areas during the last two decades (e.g. Blegen, 2017; Brooks et al., 2006; Brooks et al., 2018; Brown et al., 2009; d'Errico et al., 2005; Henshilwood and Lombard, 2013; Potts et al., 2018; Schlebusch et al., 2017) demonstrate the variety and complexity of Stone Age peoples. What then, might still lie hidden in areas that have not been investigated? This paper aims to use the Kalahari of northern Botswana as an example to illustrate the potential of under-researched areas commonly overlooked in preference to more well documented regions. This area poses its own set of challenges, including a dearth of caves with deep stratified deposits in the Kalahari sandveld (except Tsodilo Hills, e.g. Coulson et al., 2011; Robbins et al., 2000a; Robbins et al., 2000b). However, it also provides opportunities for archaeological investigation in vast areas with little disturbance from modern infrastructure or construction.

Our intent with this paper is to show that the number of sites in interior areas like the Kalahari is underreported, and consequently, that a continued concentrated focus on coastal and Rift areas may

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not result in a representative reconstruction of the African Stone Age. Many of the open-air sites we report here are short-term and likely single occupation, thereby offering an alternate perspective into Stone Age lifeways than those from caves and shelters with repeated occupation spanning several millennia. To provide context we will first provide an overview of previously published Stone Age finds in northern Botswana. We will then introduce several as yet unpublished sites and scatters from a series of research projects undertaken over the past two decades, illustrating the time depth and landscape variety of prehistory in this region. The combination of these two elements reinforce early observations (e.g., Wayland, 1950) that Stone Age artefacts in the Kalahari are plentiful and represent a great diversity of cultures.

2. Background: Stone Age archaeology in northern Botswana

2.1. Geography & landscape

The area referred to as the Middle Kalahari (Thomas and Shaw, 1991) extends from the Caprivi Strip in the north to the Bakalahari Schwelle, the poorly defined ridge that runs from Gobabis in northeast Namibia to Lobatse in southeast Botswana (Passarge, 1904), in the south. The eastern and western limits of the area are defined by the extent of the Kalahari Group sediments. Much of the landscape of the Middle Kalahari within Botswana is blanketed by a thick cover of Kalahari sands, the uppermost unit of the Kalahari Group sediments (Haddon and McCarthy, 2005). The regional terrain is relatively flat but slopes gently towards drainage features including the Okavango River and Delta, Lake Ngami, the Mababe depression, Makgadikgadi Pans complex and fossil valleys such as the Okwa and Mmone/Quoxo (Nash and Eckardt, 2016; Nash, 2022a). Areas west of the Okavango Delta are occupied by relict late Pleistocene linear dune systems (e.g. Thomas et al., 2000, 2003), and cut by fossil valleys (Nash, 2022a) with high densities of ephemeral pans present across the Bakalahari Schwelle (Thomas and Shaw, 1991).

Very few hills rise above the Kalahari sands, notable exceptions being the Tsodilo and Aha Hills west of the Okavango Delta, the Kgwebe Hills south of Lake Ngami and Ghoha (Gcona) Hills near the Savuti River. Conventional raw material sources for stone tool manufacture are limited to these hills and other areas where the Kalahari sands are thin (e.g. to the south and east of the Makgadikgadi Pans and along the Ghanzi Ridge; Boocock and van Straten, 1962; Mallick et al., 1981; Haddon and McCarthy, 2005). Instead, outcrops of the duricrust silcrete form important sites for raw material acquisition, most notably in and around the Makgadikgadi Basin, along the Boteti River and within fossil valleys including the Okwa and Xaudum (e.g. Nash et al., 2004, 2013, 2016; Nash, 2022b).

2.2. Stone Age research in northern Botswana

As outlined in section 1, it is impossible to separate the Stone Age of northern Botswana from its geographic setting. Early notions that this "inhospitable area" formed a barrier to the migration of "primitive man" were addressed and dismissed as early as 1935 (van Riet Lowe). Regardless of its influence on prehistoric inhabitants, the landscape has however had a major impact on the extent of archaeological research. The flat, open terrain of the Kalahari has few caves, rock shelters or deep stratified sites, thus limiting the standard approach to establishing local chronologies. Vast areas are covered with deep Kalahari sands, and particularly in hydrologically dynamic areas, the local environment can change dramatically over short spans of time. Both the deep sands and the erratic supply of water (including drought *and* flooding) have impacted research in the region. These challenges continue to affect present research projects, where logistics can be a major restrictive factor in areas with limited infrastructure. Environmental obstacles aside, the combined research results from the last decades challenge the notion that this region was peripheral during the Stone Age.

The discipline of archaeology in Botswana has only recently celebrated its 50th anniversary, with its implementation as a field of study at the University of Botswana and the establishment of the National Museum (Campbell, 1998). Prior to this, early classifications had been made on limited collections by van Riet Lowe (1935), the wide occurrence of Early Stone Age (ESA) and Middle Stone Age (MSA) implements and the "great diversity of cultures" in the "Great Thirstland" had been noted by Wayland (1950), and a number of briefer reports were made public (e.g., Bond and Summers, 1954; Cooke and Paterson, 1960a, 1960b; Cooke, 1967; Grove, 1969; Malan, 1950; Wayland, 1944). The following decades saw a preliminary review of extant archaeological collections (Cooke, 1979) and the launch of larger international and national projects, chiefly focused on the western border-adjacent area, Lake Ngami and the Tsodilo Hills (e.g., Brooks and Yellen, 1977; Coulson et al., 2011; Coulson et al., 2016; Nash et al., 2016; Robbins, 1990a; Robbins et al., 1996a; Robbins et al. 1998b; Robbins et al. 2000b; Wilmsen, 1989; Yellen and Brooks, 1989).

There is yet no established chronology for any period of the Stone Age in northern Botswana, and it has been a common practice to borrow nomenclature from neighbouring countries to describe cultural periods, at times resulting in a plethora of poorly defined and now partially abandoned terminology. To provide a backdrop for the addition of new sites, we will here give a brief review of the Stone Age in this area (for earlier overviews, see Burrough, 2016; Cooke, 1979; Hitchcock, 1982; Mitchell, 2002; Robbins and Murphy, 1998; Robbins et al., 2016; Segobye et al., 2001; Walker, 1995, 1998a; see also van Waarden, 1999, 2004). To maintain a focus on publicly available information, we have restricted this overview to published Stone Age sites. Included here is also a small number of locations known for Iron Age/pastoralist finds and/or rock art if they also comprise a Stone Age component. A full listing of these is found in SOM1, and site locations can be seen in Fig. 1. Given the rapid recent expansion of our knowledge of African prehistory, some of the descriptions of the original investigators presented in the following section can now be seen through different eyes. It is worth emphasizing the many unpublished sites registered by the Botswana National Museum, often documented only in reports from contract archaeology projects, are not included in this overview.

2.2.1. Early Stone Age

While the presence of diagnostic tools from the ESA in northern Botswana was noted already in the earliest archaeological reports (e.g., van Riet Lowe, 1935; Wayland, 1950), there has yet to be any focused exploration of this period in the region. This is likely partially due to the rarity of obvious deep stratified sites or other major access points to layers below the deep Kalahari sand cover (Robbins and Murphy, 1998). As yet, no hominin remains have been reported in the Middle Kalahari, although fossil *Papio* bones dating to c. 317 ka have been recovered from !Ncumtsa (Koanaka) Hills (Williams et al., 2012). Intriguingly, a small number of lithic artefacts were located in the same cave system (Pickford, 1990; Pickford et al., 1994). While these have been suggested to be Oldowan (Robbins and Murphy, 1998), this designation seems at odds with Pickford's (1990) single artefact description, of a quartzite flake with several flake scars. Typical Oldowan tools have however been reported in southeastern Botswana, near Oliphants Drift (Cooke, 1979).

Handaxes, also referred to as large bifaces, are fairly common in northern Botswana (Cooke, 1979; Robbins and Murphy, 1998; Wayland, 1950), but have rarely been described in detail (see Fig. 1

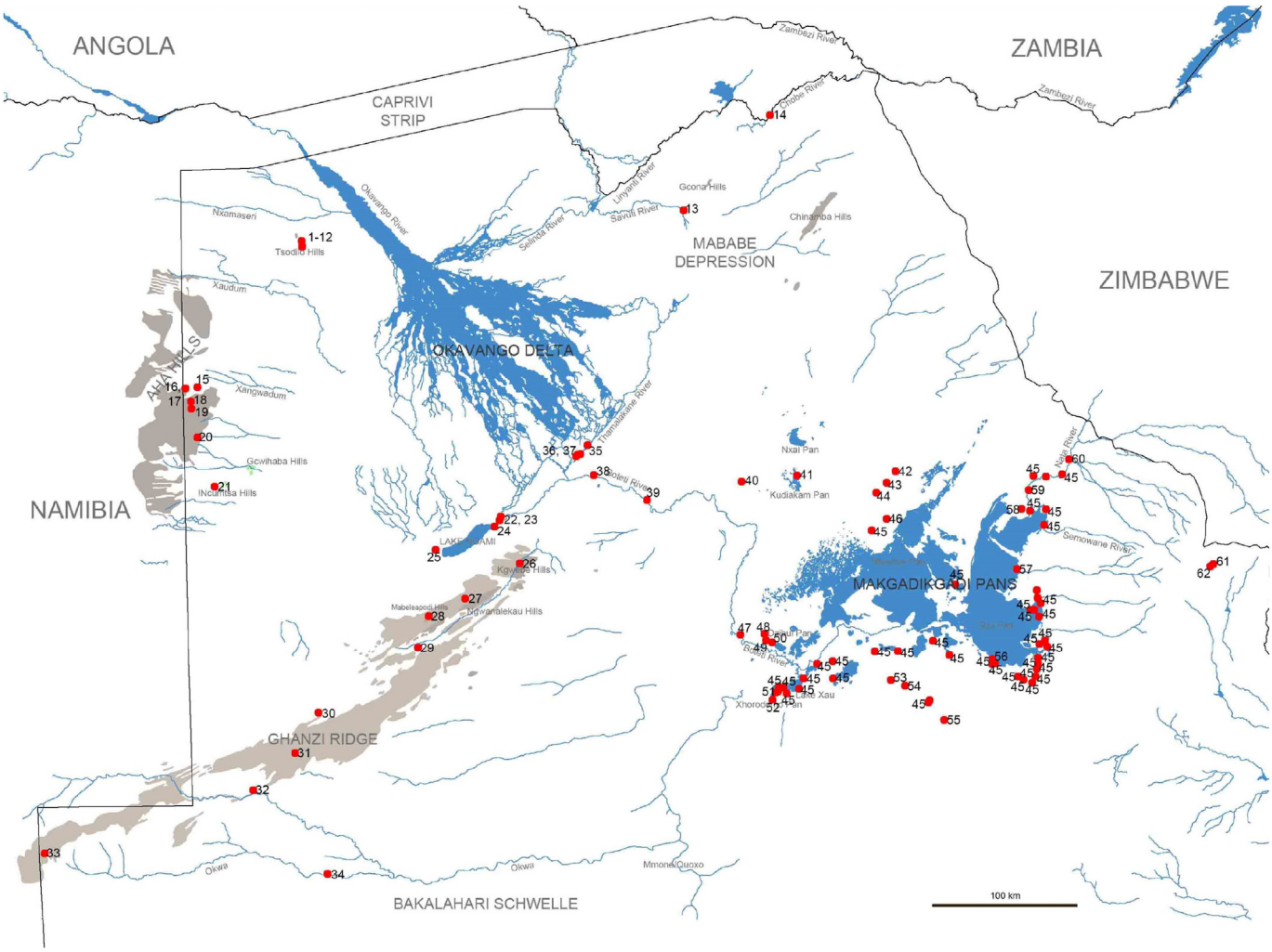

Fig. 1. Map of previously published Stone Age sites in Northern Botswana. Numbers refer to the site listing in SOM1. This does not include any grey literature/theses that are not available online. Numbered sites are listed in the map, unnumbered are too vague/cover too large an area to be precisely located on the map. Key to sites: 1. Rhino Cave, 2. Depression Shelter, 3. Divuyu, 4. Nqoma, 5. Unnamed shelters on Female Hill, 6. Tsodilo Shelter, 7. Tashrani, 8. Kudu Horn Shelter, 9. Ancestors' Cave, 10. White Paintings Shelter, 11. Greenstone Mine, 12. Corner Cave, 13. Savuti, 14. Northeast of Kachikau, 15. Mahopa, 16. ≠Gi, 17. !ubi, 18./dwichu, 19. Xaixai, 20. Gcwihaba Caves 21. !Ncumtsa Hills, 22. Toteng, 23. SW of Toteng, 24. Mogapelwa, 25. Old edge of Lake Ngami, 26. Kgwebe Hills, 27. Ngwanalekau Hills area, 28. Mabeleapudi ridge, 29. Kuke Pan, 30. Gemsbok Pan, 31. Ghanzi, 32. Buitsivango, 33. Mamuno, 34. Okwa River/Tswaane borehole, 35. Matlapaneng, 36. Lotshitshi, 37. Maun, 38. Samedupe Drift, 39. Makalamabedi Drift, 40. Bushman Pits, 41. Kudiakam Pan, 42. Ngxaishini Pan, 43. Northeast of Gweta, 44. Gweta, 45. Makgadikgadi Pans general area (all Stone Age sites from the New Mexico Kalahari Project are listed under this number), 46. Gutshaa Pan, 47. Rakops area, 48. Toromoja, 49. Toromoja I, 50. Gwi Pan West, 51. Xhorodomo Pan, 52. Kedia Hill, 53. Orapa Diamond Mine, 54. Lothlekane Well, 55. Inkowane Pan, 56. South Sua Pan, 57. Tshwane, 58. Nata River delta, 59. Nata, 60. Nata River, 61. Mantenge Shelter, 62. Domboshamba Ruin.

and SOM1 for full listings). These readily identifiable tools have been reported along river valleys, including the !Kangwadum (Xangwadum) (Helgren and Brooks, 1983; Yellen, 1971), Okwa River (Aldiss, 1987) and Boteti River (Cooke, 1979; Denbow and Campbell, 1980; Robbins and Murphy, 1998; Robbins et al., 2016; Wayland, 1950), in association with the margins of Lake Ngami (Cooke and Paterson, 1960a; Cooke, 1979; Wayland, 1950) and the Makgadikgadi Basin (Cooke, 1979), as well as smaller pans such as Gemsbok Pan (van Riet Lowe, 1935) and Ngxaishini Pan (Robbins and Murphy, 1998; Robbins et al., 2016). Faunal remains are rarely preserved at these sites, and Ngxaishini Pan remains the only location where they are found in association with unambiguous ESA artefacts (i.e., handaxes; Robbins and Murphy, 1998; Robbins et al., 2016). An intriguing exception to the otherwise fluvial or lacustrine location of ESA finds has been reported at a quarry near Gweta, north of Ntwetwe Pan (McFarlane and Segadika, 2001), although the illustrated artefacts could be considered compatible with MSA technology. Unfortunately, as yet none of these sites have been excavated or dated. Combined, these reports illustrate the widespread nature of ESA finds in northern Botswana, but perhaps even more strongly the need for more focused research to understand the timing and continuity of hominin occupation in this area.

2.2.2. Middle Stone Age

More widespread than handaxes, MSA artefacts were, until the 1980s, the most widely reported prehistoric finds in northern Botswana. Early investigations were generally limited to surface collections, and considerable effort was devoted to establishing relative chronologies and connections to MSA finds in neighbouring countries. MSA lithics were generally incorporated into emergent South African (Cohen, 1974; Wayland, 1950) or Zimbabwean (Cooke and Paterson, 1960a, 1960b; Cooke, 1967, 1979) industrial schemas such as the Still Bay, Magosian, Tshangulan, Pietersburg and Bambata. These designations were later argued to not be well-established (Campbell, 1998; Robbins and Murphy, 1998) and the focus on classifying industries and their relations shifted to more

site-specific chronological reconstruction and included a wider register of associated scientific disciplines. Most of the published MSA sites in the region (see SOM1) are, in common with ESA finds, reported along rivers such as the Boteti (e.g., Cooke, 1979; van Waarden, 1991; Wayland, 1950) and the Nata (Bond and Summers, 1954; Cooke, 1967), pan edges (e.g., Brooks and Yellen, 1977; Cooke and Paterson, 1960b; Cooke, 1979; Helgren and Brooks, 1983; Robbins, 1987, 1989) or near the margins of palaeolakes (e.g., Cooke and Paterson, 1960a; Cooke, 1979; Robbins and Murphy, 1998). A number of MSA localities have however also been reported in more sheltered environs near hills (e.g., Cooke, 1979; Coulson et al., 2011; Robbins, 1987; Robbins et al., 2000a; Robbins et al., 2000b), and in these cases MSA artefacts were often buried under substantial LSA deposits and not visible on the surface (Robbins and Murphy, 1998).

To date, only three MSA sites from northern Botswana have been excavated and published in detail. The first of these is located by ≠Gi Pan, with a rich lithic and faunal MSA assemblage, thermoluminescence-dated to 77 ± 11 ka. and overlain by an MSA-LSA intermediate industry (Brooks and Yellen, 1977; Brooks et al., 1990; Helgren and Brooks, 1983). The MSA lithic component is dominated by finely made bifacial and unifacial points and scrapers, while the MSA-LSA intermediate industry contains blades but few formal tools (Brooks et al., 1990). Two additional sites are located at Tsodilo Hills: Rhino Cave (Coulson et al., 2011; Robbins et al. 1996a, 2000a) and White Paintings Shelter (Robbins, 1990b; Robbins et al., 2000b). Both of these yielded large lithic assemblages dominated by shaped (extensively retouched) points in bifacial and unifacial variants, which in the case of Rhino Cave has been suggested to strongly resemble the ≠Gi finds, and to have been used in ritualized contexts (Coulson et al., 2011). The MSA layers of White Paintings Shelter provided numerous bone points and harpoons in association with fish bones, as well as a transitional industry between the MSA and LSA (Ivester et al., 2010; Robbins et al., 2000b), considered similar to that of ≠Gi (McBrearty and Brooks, 2000). The 7-m deep excavation at White Paintings Shelter provides the currently most comprehensive Stone Age chronology for the Kalahari, recently re-estimated to encompass 90 ka years (Feathers, 1997; Ivester et al., 2010; Kokis et al., 1998; Robbins et al. 2000b, 2016; Stewart et al., 1991). The MSA sequence and the designation of a transitional industry have since been questioned due to refitting between dated layers (Staurset and Coulson, 2014; see also Robbins et al., 2016). As a result, the integrity of the chronology for these levels at WPS has been disputed. Also at Tsodilo Hills, MSA material has been reported in less detail from Corner Cave (Nash et al., 2016), and possibly at Depression Shelter (Robbins and Murphy, 1998, 2011). A preference for non-local, often fine-grained lithic raw materials like chert and silcrete was noted by the excavators at all the MSA sites listed above. Recently, the practice of long-distance lithic import was confirmed through geochemical provenancing of silcrete artefacts from ≠Gi, Rhino Cave, White Paintings Shelter and Corner Cave to source areas as far away as 295 km along the Boteti River and around Lake Ngami (Nash et al., 2013, 2016). Acknowledging the limited number of focused investigations, it would appear that in contrast to the ESA, MSA people in northern Botswana established specialized sites and accessed resources from a broader landscape (see Chan et al., 2019; Schoville et al., 2021 for discussion; Thomas et al., 2022).

2.2.3. Late Stone Age

This period, often referred to as the Later Stone Age elsewhere in southern Africa, is commonly designated as the Late Stone Age in Botswana (Brooks, 1978; Robbins, 1984; Walker, 1994; Yellen and Brooks, 1989). While ESA and MSA finds were reported relatively early at numerous locations, the number of known LSA sites remained limited until the 1990s (e.g., Segobye et al., 2001; Walker, 1995, 1998a). However, the recent prehistory of northern Botswana had gained international prominence already in the 1960s, through the ethnological documentation of the San/Basarwa (e.g., Biesele, 1993; Cashdan, 1983, 1986; Hitchcock, 1987; Hitchcock et al., 2019; Kent, 1993; Lee, 1968, 1979; Marshall, 1962; Wiessner, 1983; Wilmsen, 1989; Yellen, 1977, 1990), the associated Kalahari debate (e.g., Denbow, 1986; Denbow and Wilmsen, 1986; Eibl-Eibesfeldt and Hitchcock, 1991; Kurtz, 1994; Sadr, 1997; Smith, 2001; Solway et al., 1990; Wilmsen and Denbow, 1990), and the recording of rock art (e.g., Campbell et al., 1994a; Campbell and Robbins, 2010; Campbell, 1970; Walker, 1995, 1998b, 2010a). Northern Botswana is in an unusual position in that LSA material culture and traditions continued until the very recent past (e.g., Robbins, 1984) and interacted with iron-using peoples in ways that remain contested (e.g., Sadr, 1997 and references therein). This has led to the accumulation of a large body of knowledge of Kalahari hunter-gatherer lifeways, giving LSA studies in this area an unrivalled opportunity for reconstructing prehistoric behaviour in drylands. However, this background has also been used to argue that the LSA record solely mirrors recent San heritage (e.g., Walker, 1994, 1995), rather than representing an archaeological period covering 40,000 years of cultural and environmental changes.

LSA sites in the western part of the country were first reported by Malan (1950), but excavations did not commence until the 1970s, in conjunction with the aforementioned ethno-archaeological studies (see Fig. 1). Excavated sites include/Xai/Xai (Xaixai), ≠Gi and Mahopa (Brooks and Yellen, 1977; Brooks, 1978; Brooks et al., 1990; Helgren and Brooks, 1983; Malan, 1950; Yellen and Brooks, 1989), where recovered finds included typical LSA assemblages of bone points, ostrich egg shell (OES) beads, crescents, small scrapers and perforators, but also hearths and hunting blinds. Additional LSA strata were excavated at nearby Gcwihaba Caves, comprising faunal remains, OES beads and a limited lithic assemblage (Robbins et al., 1996b; Yellen et al., 1987). In the following decades, major excavations were undertaken at Tsodilo Hills, at sites including White Paintings Shelter, Depression Shelter and Rhino Cave. Results from this archaeologically rich area include directly dated OES beads older than 30,000 years (Robbins et al., 2000b), use of reversible arrowheads, likely poisoned, 10,000 years ago (Robbins et al., 2012), early exploitation of fish (Robbins et al., 2000b) and highly calorific mongongo nuts (Robbins and Campbell, 1990), as well as indications of LSA specularite mining (Murphy et al., 2010; Robbins et al., 1998a). White Paintings Shelter and Depression Shelter provided dated strata reflecting environmental changes covering the entirety of the LSA (e.g., Brook et al., 2003; Ivester et al., 2010; Robbins, 1990a; Robbins et al., 2000b; Robbins et al., 2016). Interestingly, LSA finds were also recovered at Tsodilo Hills sites such as Corner Cave and Ancestors' Cave, with its' rich oral history (Campbell et al., 1994b; Coulson et al., 2016; Robbins and Murphy, 2011).

Additional major LSA sites were excavated near Lake Ngami, close to Toteng and Mogapelwa. Here, late LSA strata yielded faunal remains, bone points, OES beads and pottery together with lithic assemblages including segments, backed points, drills and convex end scrapers (Huffman, 1994; Robbins, 1984; Robbins et al. 1998b, 2008, 2009). A late LSA burial was also excavated in the 1980s near Gwi (Dzibui) Pan by the Boteti River (Helgren, 1984). Additional minor LSA investigations include sites near Savuti (Campbell, 1970; Robbins, 1987), in the Ghanzi District (Thebe, 2011; Walker, 2009), at the edge of Sowa (Sua) Pan (Walker, 1991), in Nata (Cooke, 1967) and in the North East District (Walker, 1994, 2010b). As yet, although there are dates associated with sites there are no overarching published typologies or an overall chronology available for

the LSA of northern Botswana (but see Yellen and Brooks, 1989: Figs. 3 and 4 and Burrough et al., 2022: Fig. 10), although similarities to the South African Wilton have been noted across northern Botswana (e.g., Brooks and Yellen, 1977; Cooke, 1967; Helgren and Brooks, 1983; Helgren, 1984; Malan, 1950; Robbins, 1984; Robbins et al., 1996a; Robbins et al., 2000b; Yellen et al., 1987; Yellen and Brooks, 1989). Generally, the published sites appear to cluster in similar environs as those from the MSA; chiefly located along rivers, pan and lake edges, and at the base of hills (see Fig. 1 and SOM1).

3. Recent investigations: Stone Age surveys in northern Botswana 1999–2017

3.1. Details of surveys

In recent years a number of research projects in northern Botswana have incorporated initial archaeological surveys of archaeologically unmapped areas. This has resulted in the documentation of a multitude of sites and scatters, of which a few were known through brief reports or word of mouth, and a large number, which were completely unknown. Some of these surveys have overlapped and revisited archaeological sites to meet new standards for documentation. Here, we will present survey results from three of those projects: The University of Tromsø and the University of Botswana *Collaborative Program for San/Basarwa Research and Capacity Building* (1999–2006), the University of Brighton-led *Kalahari Silcrete Provenancing Project* (2011) and the University of Oxford-led *Landscape Archaeology of the Kalahari* project (2016–2018). Our goal is to ensure that these survey data, presently only available in archive reports, becomes accessible for research. The combined project listings of over 200 sites and scatters (see SOM2 and Fig. 2) collates vital data for the setting of Stone Age localities in various Kalahari landscapes and are intended to provide a starting point for future focused investigations. It should be emphasized that most of these data, resulting from initial surface exploration of archaeologically unrecorded areas, should not be considered a systematic or unbiased reconstruction of prehistoric use of the region as a whole. However, these initial observations confirm how widespread Stone Age occupation was in this area, indicating that the 'Great Thirstland' was not as inhospitable as its name implies.

The results from the three projects featured here use as their foundation the work of pioneer researchers and local enthusiasts. While the majority of the sites listed below were documented for the first time, some have been examined on several occasions. For example, Samedupe (on the Boteti River) was first noted by Neville Jones (as reported by Wayland, 1950), resurveyed and surface collected in the 1980s by Denbow and others, and later further documented by all three projects discussed in this paper. Consequently, we wish to express our gratitude to Stone Age researchers including Alison Brooks, John Yellen, Nick Walker, Larry Robbins and especially the late Alec Campbell, upon whose considerable experience and extensive knowledge of the landscape these recent surveys build. As yet, there have been no systematic Stone Age surveys (compare Banning et al., 2006; Banning et al., 2017) in northern Botswana. However, in-depth surveys were conducted as part of early ethnoarchaeological investigations in the Dobe area (Brooks and Yellen, 1987; Yellen and Harpending, 1972) and the recent documentation of northern Ntwetwe Pan (see below and Staurset et al., 2022a). As yet, there has been no negative testing for subsurface features in this region. The sites described here were located following specific goals set by the respective projects, which normally focused on distinct facets of Stone Age lifeways. Only a few of the sites have been tested or excavated, while the majority document exclusively surface finds, or those emerging from eroding cut faces.

The three projects whose results are described here had individual mandates and focused on different archaeological periods and geographic areas. The multidisciplinary *San/Basarwa Project* combined research on the cultural, historical, linguistic, economic and legal situation of the San (Saugestad, 2002). The archaeological component targeted the LSA with an emphasis on the Okavango and its adjacent waters. It also included an essential capacity building component, comprising the collaboration with and training of University of Botswana students, National Museum staff and Tsodilo Museum guides. Following surveys, a small number of sites were test excavated (see SOM2 for specifics). The single field season *Kalahari Silcrete Provenancing Project* aimed at mapping silcrete outcrops in north-western Botswana for the purposes of establishing a comparative geochemical database for provenancing MSA artefacts. This necessitated an archaeological examination of silcrete outcrop areas to determine whether there were any traces of Stone Age use. The resultant mapping covered a large geographic area but was limited to ancient and current rivers and lakes. Finally, during two field seasons (2016–2017) the *Landscape Archaeology of the Kalahari* project aimed to investigate the interaction between major hydrological shifts and Stone Age mobility and landscape use in the Makgadikgadi Basin. Its main archaeological focus was the MSA of northern Ntwetwe Pan. This project also included full excavation of a selection of sites (see descriptions in Staurset et al., 2022a,b; for dating Burrough et al., 2022). Combined, these projects covered large sections of northern Botswana, although as can be seen in Fig. 2, substantial areas of this region, in particular those away from lacustrine and fluvial landforms, remain to be investigated archaeologically.

3.2. Survey methods and biases

Archaeological surveys in northern Botswana are generally framed both within the experience of individual researchers regarding where sites are likely to be situated, and by logistical constraints determining their accessibility. In many cases, archaeologists have been introduced to sites by residents, through the sharing of local knowledge, oral histories, or the collection of curios. Common practice is to interview local inhabitants, often using samples of archaeological artefacts to overcome linguistic barriers. On a number of occasions, local expert knowledge of the landscape provided leads to areas archaeologists initially deem unworthy of investigative focus. When in the field, surveys are commonly restricted to landscape features that have previously proven to show traces of prehistoric use. These can reflect attractive areas during the Stone Age, with easy access to water, lithic raw material sources or prominent landscape features such as hills (or baobabs). These three features, especially in combination, are rare in northern Botswana, which is one reason for the predominance of areas such as Tsodilo Hills in the published literature. However, preferred survey areas also include deflationary or erosional settings with easy access to layers beneath the Kalahari sand cover, such as pans, rivers, erosion gulleys, animal burrow pits and modern quarries. This is particularly important when investigating the earlier Stone Age periods, as these tend to be more deeply buried (e.g., Robbins and Murphy, 1998), whereas LSA sites are often covered by less deposit. The latter can commonly be found at slight rises in the flat Kalahari landscape, where the ashy, loose soils generated by prehistoric use become a preferred habitat for burrowing animals and generate the growth of local sage (otherwise known as *mokodi*, species *Laggera decurrens* and *Pechuel-loeschea leubnitziae*). This method of survey can often be highly productive for discovering sites. One example is the San/Basarwa 2002 field season, which followed roads and rivers in the Okavango area, where Stone Age finds were located at 80 of 85 surveyed locations (Coulson and

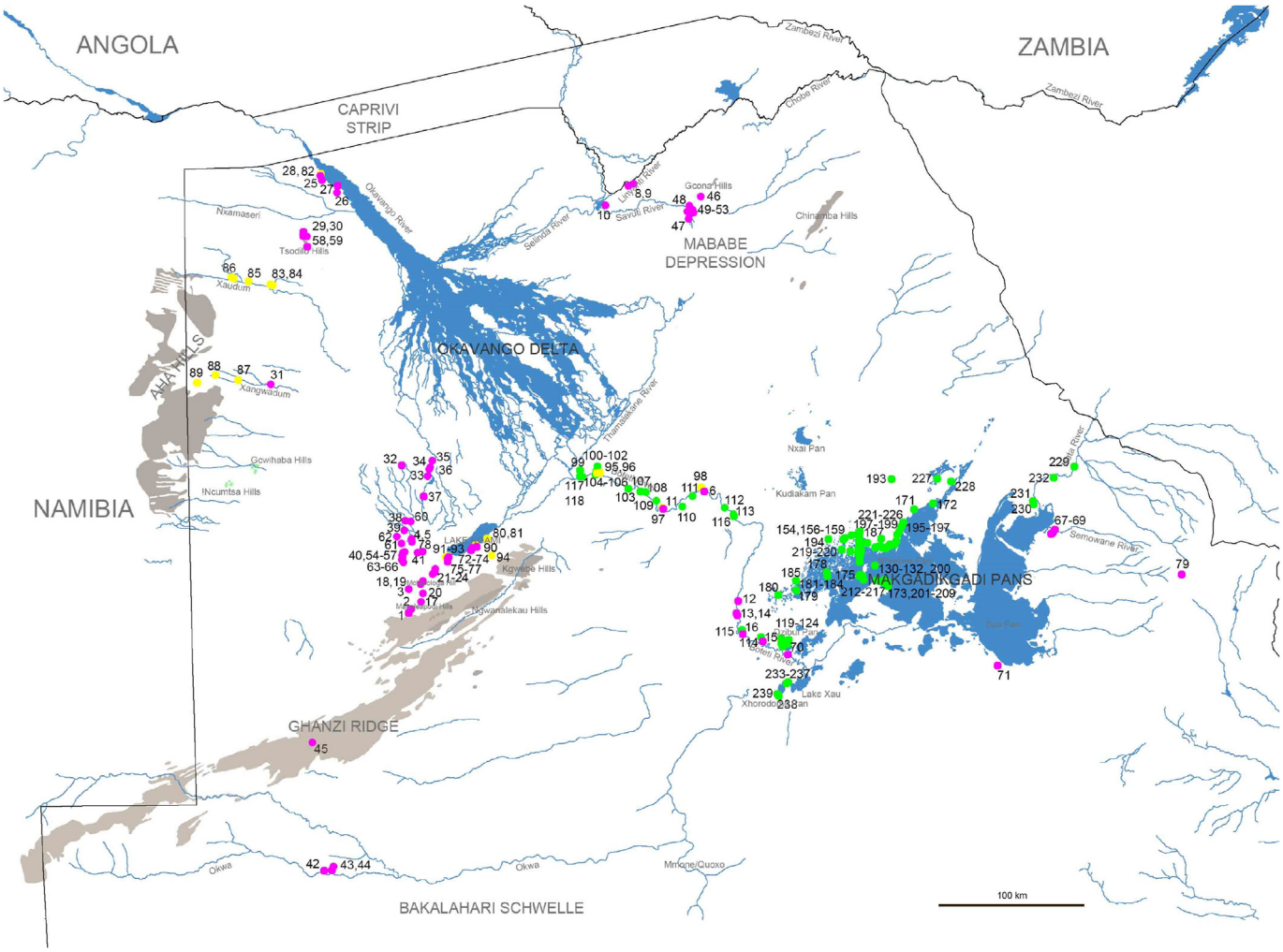

Fig. 2. Map of newly-discovered Stone Age sites and scatters in northern Botswana. The Collaborative Program for San/Basarwa Research and Capacity Building (1999–2006) (purple), the Kalahari Silcrete Provenancing Project (2011) (yellow) and the Landscape Archaeology of the Kalahari Project (2016–2018) (green). The numbers refer to the site listing in SOM2. Numbers between 126-228 not listed on the map are located in dense swathe, shown in green, in north Ntwetwe Pan. Key to sites: 1-2. Southwest of Lake Ngami, 3. Small pan, southwest of Lake Ngami, 4. Magoagoa cattle post, 5. Flats north of Kareng, 6. Banks of Boteti River, 8. Kings Pool Camp, 9. Airstrip, south of Kings Pool Camp, 10. Access road to Duma Tau Lodge, 11. Makalamegi, along Boteti River, 12. Seokwane 3, 13. Seokwane, 14. Seokwane 12, 15. Rakops (East), 16. Rakops (North), 17. West side of new road – north of Kuke Gate, 18–19. Motabologa Hill, south of Sethitwa, 20. South of Motabologa Hill, 21. Along A3, south of Lake Ngami, 22–24. On A3, 30 km south of Sethitwa, 25. Shakawe, 26–27. West bank of Okavango Panhandle, 28. Quarry, near Shakawe airstrip, 29–30. LSA scatters, Female Hill, 31. On road to Nokaneng and east of Xangwa, 32. North of Tsau, 33. On old Thaoge watercourse, 34–36. North of Tsau, 37. South of Damara, 38. Old quarry near Makakung, 39. South of Makakung, 40. East of Kareng, 41. Eastern edge of Dautsa Flats, 42–44. Okwa Valley, 45. D'qae Qare San Lodge, 46. Quarry Hill, 47. Hills near Savuti Channel, 48. Saddle between Kudu Hills, 49–53. Near Bushman Hill Paintings, Savuti, 54. Washout, near Kareng, 55–57. Near Kareng, 58–59. Test excavation, 'Canoe' grooved stone, Female Hill, 60. Near Makakung, 61–62. North of Kareng, 63. South of Kareng, 64. Dautsa, 65. East of Dautsa, 66. Test site, Dautsa, 67–69. Semowane River course, 70. Near excavated site, south of Dzibui (Gwi) Pan, 71. Escarpment road south of Sua Pan, 72. Near Bothatogo, 73. Plateau south of Lake Ngami, 74. South bank of Lake Ngami, 75–77. West of Lake Ngami, near Bodibeng, 78. KNG5, near Kareng, 79. LSA finds, Molatu rock art site, 80–81. East of Bothatogo, 82. Shakawe quarry, 83–85. Xaudum valley, 86. Nxaunxau, 87. Xangwa village, 88. Dobe, 89. Dobe Pan, 90. South margin of Lake Ngami, 91–93. South margin of western end Lake Ngami, 94. Tale Pan, 95. Samedupe Drift, 96. West of Samedupe Drift Bridge, 97. Makalamabedi, 98. Motopi, 99. BOTE01, 100. BOTE02, 101. BOTE03, 102. BOTE04, 103. BOTE05, 104. BOTE06, 105. BOTEFS01, 106. BOTEFS02, 107. BOTEFS03, 108. BOTEFS04, 109. BOTEFS05, 110. BOTEFS06, 111. BOTEFS07, 112. BOTEFS08, 113. BOTEFS09, 114. BOTEFS10, 115. BOTEFS11, 116. BOTEFS12, 117. BOTEFS13, 118. BOTEFS14, 119. DZI01, 120. DZI02, 121. DZIFS01, 122. DZIFS02, 123. DZIFS03, 124. DZIFS04, 125. DZIFS05, 126. MAK01, 127. MAK02, 128. MAK03, 129. MAK04, 130. MAK05, 131. MAK06, 132. MAK07, 133. MAK08, 134. MAK09, 135. MAK10, 136. MAK11, 137. MAK12, 138. MAK13, 139. MAK14A, 140. MAK14B, 141. MAK14C, 142. MAK14D, 143. MAK14E, 144. MAK14F, 145. MAK14G, 146. MAK14I, 147. MAK14J, 148. MAK14K, 149. MAK14L, 150. MAK14M, 151. MAK14N, 152. MAK14O, 153. MAK15, 154. MAK16, 155. MAK17, 156. MAK18, 157. MAK19, 158. MAK20, 159. MAK21, 160. MAK22, 161. MAK23, 162. MAK24, 163. MAK25, 164. MAK26, 165. MAK27, 166. MAK28, 167. MAK29, 168. MAK30, 169. MAK31, 170. MAK32, 171. MAK33, 172. MAK34, 173. MAK35, 174. MAK36, 175. MAK37, 176. MAK38, 177. MAKFS01, 178. MAKFS02, 179. MAKFS03, 180. MAKFS04, 181. MAKFS05, 182. MAKFS06, 183. MAKFS07, 184. MAKFS08, 185. MAKFS09, 186. MAKFS10 (Sweetwater Pan), 187. MAKFS11 (Christian Pan), 188. MAKFS12, 189. MAKFS13, 190. MAKFS14, 191. MAKFS15, 192. MAKFS16, 193. MAKFS17 (Gweta Quarry), 194. MAKFS18, 195. MAKFS19, 196. MAKFS20, 197. MAKFS21, 198. MAKFS22, 199. MAKFS23, 200. MAKFS24, 201. MAKFS25, 202. MAKFS26, 203. MAKFS27, 204. MAKFS28, 205. MAKFS29, 206. MAKFS30, 207. MAKFS31, 208. MAKFS32, 209. MAKFS33, 210. MAKFS34, 211. MAKFS35, 212. MAKFS36, 213. MAKFS37, 214. MAKFS38, 215. MAKFS39, 216. MAKFS40, 217. MAKFS41, 218. MAKFS42, 219. MAKFS43, 220. MAKFS44, 221. MAKFS45, 222. MAKFS46, 223. MAKFS47, 224. MAKFS48, 225. MAKFS49, 226. MAKFS50, 227. MAKFS51, 228. MAKFS52, 229. NAT01, 230. NATFS01, 231. NATFS02, 232. NATFS03, 233. XORFS01, 234. XORFS02, 235. XORFS03, 236. XORFS04, 237. XORFS05, 238. XORFS06, 239. XORFS07. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

Walker, 2002; Sletmo, 2007). However, a drawback with this intuitive approach is that it reinforces previous positive results and can lead to a circular pattern of investigation that does not necessarily reflect prehistoric landscape use.

One feature of the modern landscape that strongly affects the documentation of Stone Age sites warrants further discussion: gravel quarrying. The scarcity of stone outcrops in northern Botswana has led to modern gravel extraction at the same locations

where prehistoric peoples acquired lithic raw material. This has resulted in the destruction and/or repositioning of archaeological material, a practice that the Botswana National Museum is attempting to prevent. It has also led to artefacts, especially from the ESA and MSA, being processed as materials for road or building construction. Consequently, struck lithic material can now be located along the verge of main roads and in built-up areas such as driveways, parking lots and house foundations. Surprisingly, this material has often been transported for several hundreds of kilometres; for example, gravels from Bodibeng near Lake Ngami can now be found in villages and along road networks across Ngamiland. Moreover, companies building larger tourist complexes frequently import stone and gravel from neighbouring countries, thus potentially introducing lithic material from regions even further afield. This means that extra care must be taken when registering sites, to ensure (as far as possible) that the archaeological material is of local origin.

The Kalahari landscape itself also introduces constraints and biases on archaeological surveys. Northern Botswana covers a vast area with a low population density and a limited road network, resulting in large undrivable areas. Archaeological surveys will be further constrained by various logistical considerations, including the availability of water and provisions, petrol and road surface conditions, as well as access to tracts of land in areas restricted by mining, military installations or private concessions. The landscape itself can pose further challenges, including flooding, extensive bushfires, and abundant wildlife. The dynamic nature of Kalahari sediments can result in concealment and revealing of sites between field seasons, particularly in wetlands such as the Okavango and periodically flooded areas of the Makgadikgadi Pans. These provisos aside, due to its sparse contemporary population northern Botswana encompasses vast areas that are virtually undisturbed by modern construction and thereby ideal for archaeological research. In the following section we will demonstrate how numerous Stone Ages sites have been located in these areas, despite archaeological investigations being limited due to the factors listed above. The new sites will be discussed according to their respective cultural periods. All surveys reported here were focused on the Stone Age; occasional minor Iron Age/pastoralist finds are also included. A distinction is made here between sites, meaning concentrations of clearly delineated extent, with artefacts exhibiting a consistent state of preservation; and scatters, signifying spreads of archaeological material that are ex situ, mixed and/or comprise artefacts with varied levels of weathering and condition (see also Staurset et al., 2022b).

3.3. Newly-discovered Early Stone Age sites

As summarized above (section 2.2.1), the overall location pattern of diagnostic ESA tools in northern Botswana appeared to cluster along rivers, shorelines, and pans. The majority of the handaxe sites presented here are also located in areas where fluvial action has revealed deposits beneath the sand cover, such as the edges of Lake Ngami and the Boteti River (see Figs. 2 and 6a). However, ESA material has now also been documented next to Motabologa Hill, an elevated location relative to the surrounding landscape, comprising generous outcrops of lithic raw material. Proximity to toolmaking materials (i.e., silcrete or quartz) also characterises the substantially increased number of locations now documented along the Boteti River and southern edge of Lake Ngami. A site near Ghanzi, however, was located in a large, flat area featuring a thin sand cover but no discernible outcrops or fluvial channels. While we still do not fully understand the geographic patterning of ESA occurrences in this region, the association with permanent sources of water and/or lithic raw material is striking. This correlation could however be attributable to hominin mobiliary range (e.g., Ambrose, 2012; Stout et al., 2005), or the higher levels of erosion in these areas uncovering artefacts from deeper strata.

The greatest concentrations of ESA material we documented are distributed along the southern edge of Lake Ngami on the Kunyere fault scarp, particularly around Bodibeng and Bothatogo. Here, ESA and MSA scatters cover several areas encompassing hundreds of square meters. These artefacts are in various phases of production and frequently located adjacent to silcrete outcrops and quartz gravel trains (see Figs. 3 and 4). As mentioned in section 3.2, the Bodibeng area has unfortunately been used for extensive gravel extraction, leading to size sorting, redistribution and/or destruction of lithic artefacts. Another major quarry site with materials from all Stone Age periods was documented at the base of Motabologa Hill, southwest of Lake Ngami. This hill is very noticeable in the surrounding landscape, both due to its height and because a large section has been mechanically removed for road construction materials (see SOM2). As seen in Fig. 3B, this location comprised clusters of well-made cordiforms, ovates, picks and manufacturing debris in excellent condition. In comparison, continued surveys along the Boteti River documented smaller and more random scatters of ESA material. These again tended to be associated with outcrops of silcrete, found either in the bottom of the river, along its eroded margins, or in modern quarries situated above the banks. While the ESA material from Lake Ngami and Motabologa Hill comprised a variety of lithic raw material types, the Boteti River handaxes appear to be limited to silcrete visually identical to local outcrops (see Fig. 3E). This pattern is replicated at a small quarry site located near the north-western margin of Ntwetwe Pan inside the shorelines of the palaeolake (MAKFS49), where a series of roughouts and production debris from handaxe manufacture was found in direct association with a silcrete outcrop (see Fig. 3G).

On a final note, four large bifaces have previously been reported from a local collection, attributed to the Makgadikgadi Pans (collected by Jack Bousfield, see also Burrough, 2016). Recent examination (by contributors SC and SS) confirm that these are produced in tabular silcrete visually identical to local outcrops in Ntwetwe Pan. They display deep removal scars on both faces, patches of weathered outer surface, and the edges remain sinuous; consistent with them being classified as roughouts. The bifaces were likely abandoned in production due to fault-line breakage at the tips and/or bases, and some excessively deep removal scars (see example in Fig. 3H). Although their exact original location is unknown, this production stage where the raw material block can be reduced by as much as 90% of its weight, normally took place at the raw material source (e.g., Baena Preysler et al., 2018; Newcomer, 1971). With the exception of these unusual artefacts and one initial-stage biface roughout recovered near site MAK33, we located no ESA material near the Ntwetwe Pan floor. In all likelihood, this is because the Pan at that time was more permanently underwater, and connected to the Zambezi system (McFarlane and Eckardt, 2006; Moore et al., 2012, see also Burrough et al., 2022). In summary, there remain more questions than answers regarding the ESA of northern Botswana. However, the correlation between rock outcrops, landforms and handaxe finds offer intriguing possibilities for future research into landscape use and hominin mobility in this region.

Fig. 3. Examples of Early Stone Age finds from northern Botswana, all in silcrete unless otherwise noted. A. Amygdaloid handaxe roughout southwest of Lake Ngami. B. Handaxes in various stages of production from Motabologa Hill, southwest of Lake Ngami (artefacts were oriented for photography but not repositioned) Scale is 16 cm. C. Biface roughout from Bodibeng, south of Lake Ngami. D. Heavily weathered handaxe from modern quarry near Bothatogo, south of Lake Ngami. Made in basalt (?) E. Handaxe from site BOTE01, a quarry near the Boteti River. Abandoned in production. F. Large flake with early bifacial work from Motopi, Boteti River. G. Handaxe roughout from site MAKFS49 near Ntwetwe Pan, both faces. H. Large handaxe roughout and sinuous profile from undocumented location in Makgadikgadi Pans (collected by Jack Bousfield).

3.4. Recent surveys into the Middle Stone Age

The aforementioned pattern of MSA artefacts documented close to rivers, lake and pan edges, and the bases of hills (section 2.2.2) also characterized the recent surveys (Fig. 6b). However, one major difference was the added documentation of MSA land use of the current Makgadikgadi Basin pan floor. Riverine MSA scatters were documented along many of the current and fossil watercourses in northern Botswana: the Okwa, the Boteti, the Okavango, the Xaudum and the Xangwadum (Fig. 2). Extensive MSA scatters were, like their ESA counterparts, located near Bodibeng and Bothatogo on the fault scarp that bounds the southern edge of Lake Ngami. As mentioned above, these are unfortunately heavily disturbed by quarrying activities. At the edge of nearby Tale Pan scatters of MSA artefacts had also eroded into the pan floor. Several tentative MSA locations were documented further south along the Ghanzi ridge, as was an extensive quarry site at the base of Motabologa Hill, located separately from the previously mentioned ESA material (see section 3.3). Another hillside location was documented near Savuti, revealed by modern gravel extraction below the aptly named Quarry Hill. Surveys in the southwest of the Makgadikgadi Basin, added several new MSA locations at smaller pans like Xhorodomo (Makadikadi) and Dzilbui (Gwi), comprising wide scatters formed along the margins of the pan. In addition, extensive MSA sites and scatters were documented and excavated in northern Ntwetwe Pan. These are included in Fig. 2 but otherwise detailed in Staurset et al. (2022a, 2022b).

As noted with regard to ESA finds (section 3.3), there is a correlation between most MSA sites and permanent sources of water (rivers, lakes, pans) and sources of lithic raw material (including hills). One likely contributor to this pattern is the attraction of resource rich environments but increased stratigraphic visibility and geographically focused archaeological research interests could have influenced this association.

As would be anticipated with exposed archaeological deposits in this environment, we located no MSA sites with preserved faunal remains. The discussion of MSA occupation of this area therefore continues to be restricted to lithic materials. In terms of raw material usage and typology, most of the new surveyed sites and scatters confirm the previously documented preference in northern Botswana for varied and non-local lithic raw materials, and for a limited toolkit dominated by highly retouched points made on blanks from prepared cores. The most common raw material is silcrete, with massive to tabular outcrops found associated with rivers, dry valleys, lakes and pans across the region (Nash et al., 2004, 2013, 2016; Nash, 2022a, 2022b; Webb and Nash, 2020). More fine-grained, glassy materials and quartz were also utilized, but unlike silcrete these are almost exclusively limited to cobbles. Most of the sites we surveyed fall within the same general typological categories as those previously excavated in northwest

Fig. 4. MSA finds from recent surveys in northern Botswana, all in silcrete unless otherwise noted. A. Prepared flakes, end scraper and one unifacial point abandoned in production from Xaudum (SOM2 #84). Artefacts in silcrete, glassy chert and quartz. B. In situ debris from Shakawe quarry. C. Unifacial déjeté point from Shakawe quarry, near the Okavango River. D. Discoidal core from Bothatogo, south of Lake Ngami. E. Discoidal core from Boteti River, site BOTE01. F. Weathered points and bifacial roughouts from Gweta quarry. G. Prepared flake, Levallois core and single platform core from Xhorodomo (Makadikadi) Pan.

Botswana (see sections 3.1 and 3.2). This includes the use of discoidal and Levallois concepts for the production of blanks, which are then shaped by invasive retouch on one or both faces into symmetrical points (examples in Fig. 4 and illustrations in Staurset et al., 2022a, 2022b). Side and end scrapers could also be found, but additional tool forms beyond those were rare. However, one area deviates from some of these trends: the Makgadikgadi Basin, adjacent pans on its northern edge, and the northern section of the Boteti River before it cuts through the Gidikwe Ridge. Here, the lithic raw material is exclusively silcrete, which visually correlates with local outcrops (see also Nash et al., 2022). Levallois and discoidal reduction strategies are common, but laminar single-platform cores can also be found. The toolkit is virtually restricted to outsized points that rarely display traces of curation or resharpening (Staurset et al., 2022a). Why the archaeological record of these areas diverge could be attributable to several factors, such as different periods of occupation, local lithic raw material, cultural traditions or mobility patterns. Regardless, the presence of archaeological material at all these locations indicate that MSA people inhabited a wide range of landscapes types with varied resource availability.

3.5. Newly-discovered sites from the Late Stone Age and pastoralist period

While found associated with broadly the same landscape features as the earlier periods, LSA sites and scatters are more widespread and numerous (see Figs. 2 and 6c). Typical environs include river channels (the Okwa, the Xaudum, the Xangwadum, the Okavango and subsidiaries, the Boteti, the Nata and the Semowane) and the edges of Lake Ngami and numerous smaller pans across the region. Generally, upon locating ESA or MSA sites, LSA finds would also be present. The recent surveys in northern Ntwetwe Pan proved to be an exception. Here, MSA surface materials were plentiful, while LSA scatters were only visible near elevated areas such as dunes and islands. This distribution reflects the age of the landscape surfaces and landforms on which the archaeology is located and is further discussed in Burrough et al. (2022). Further south in Ntwetwe Pan, LSA finds were more common and often located in conjunction with material attributable to pastoralist or Early Iron Age (EIA in SOM2) populations. Location notwithstanding, a LSA preference for colourful, glassy lithic raw materials appeared universal, and rendered artefacts from this period highly visible (examples in Fig. 5). As noted in section 3.2, these sites are commonly located near the surface, in loose sandy deposits on slight rises in the flat, surrounding Kalahari landscape. These conditions contribute to post-depositional disturbance, particularly bioturbation from burrowing animals, termite mounds, trampling and animal husbandry. For example, burrows from larger animals often redeposit LSA materials at the surface, thereby increasing archaeological visibility while simultaneously decreasing site integrity.

Fig. 5. Examples of LSA and pastoralist archaeological material from recent surveys in northern Botswana. A. Crescents (some with impact fractures) from Makakung, west of Lake Ngami. All in glassy chert. B. Shaft straightener from Dautsa Flats, west of Lake Ngami. C. Lugs and pointed-bottomed pot base fragment, from Dautsa Flats, west of Lake Ngami. D. Sample flakes in chert, silcrete and quartz from gravel train site KNG5, near Kareng. E. Microblades and section of microblade core, likely from the same chert cobble from MAK6, northern Ntwetwe Pan F. Ostrich eggshell from MAK6, northern Ntwetwe Pan. G. Part of mended, undecorated pastoralist pot from site MAK1, Ntwetwe Pan. H. Pestle from site MAK37, southern Ntwetwe Pan.

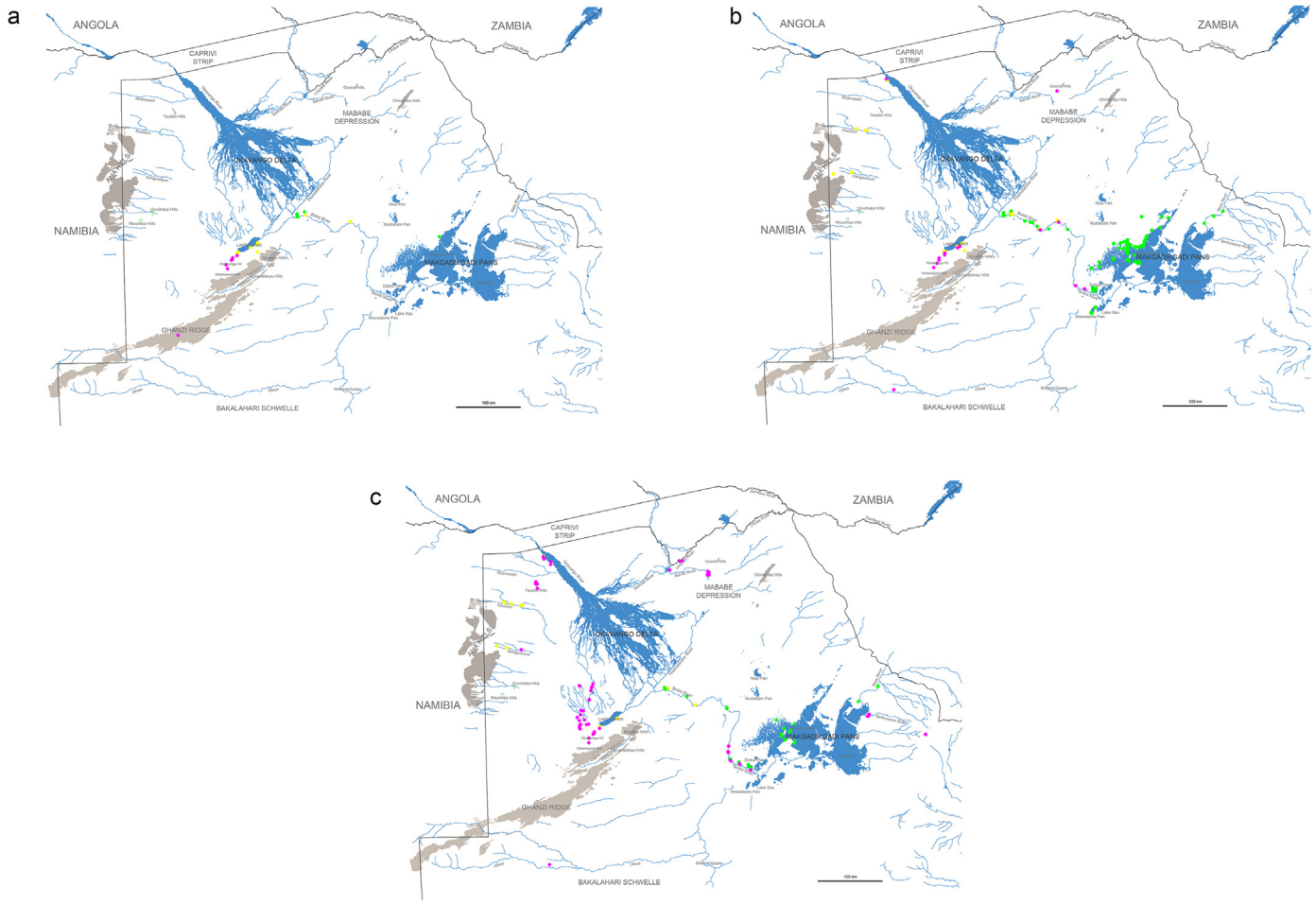

Fig. 6. Overview of newly-discovered a) ESA, b) MSA and c) LSA and pastoralist sites from recent surveys in northern Botswana. The Collaborative Program for San/Basarwa Research and Capacity Building (1999–2006) (purple), the Kalahari Silcrete Provenancing Project (2011) (yellow) and the Landscape Archaeology of the Kalahari Project (2016–2018) (green). Details of sites in SOM2. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

As noted previously (section 2.2), there are dates associated with sites but no overarching regional chronology or cultural industries for the LSA of northern Botswana and therefore no local sequence within which to frame the recent finds. However, the presence of well-preserved faunal material and pottery at many of these locations indicate origins in the later stages of the LSA. The archaeological assemblages from these surface sites are remarkably consistent, and comprise microlithic tools and debris, OES beads, shaft straighteners, and fragments of pointed-bottomed pots with lugs (see Fig. 5). Colourants and bone tools have not been recovered. In common with the earlier Stone Age periods, lithic materials still comprise the majority of finds. However, the selection of raw material changes dramatically in the LSA, where the preferred choice now is small cobbles and pebbles of fine-grained, glassy quality chert and quartz. These appear in a wide variety of colours, specks and bands and can occur in large quantities in gravel trains and pans throughout Ngamiland (Fig. 5D). The small nodules were ideally suited for microblade reduction strategies, which form the basis for the production of assorted microlithic tools including crescents, distally retouched points, awls, and occasionally geometric inserts. A potential affiliation with the South African Wilton has yet to be resolved, but as can be seen in Fig. 5, there are distinct similarities. Three sites located during the surveys were tested. Two of these were located west of Lake Ngami: Makakung and Kareng. Charcoal from the largest concentration at Makakung was radiocarbon dated to 2280 ± 60 BP (2231 ± 76 cal 14C years BP), while nearby Kareng was somewhat older at 3545 ± 40 BP (2783 ± 65 cal 14C years BP). Samples from both sites, (Pta-9358 and GrA-27223) were submitted for measurement by N.J. Walker in 2004. These will both be further discussed in a forthcoming publication (see also Eymundsson, 2008; Friis, 2007). The third site, MAK6, was located in northern Ntwetwe. Test excavations in 2016 of an extensive LSA spread at the base of a dune was curtailed due to erosional disturbance. Sediments from the sand mound from which these LSA artefacts were eroding were dated to between 1.28 ± 0.2 ka and 330 ± 20 years (Burrough et al., 2022; Burrough and Thomas, 2013).

In addition to Stone Age sites, occasional traces of pastoralist activities were also recorded during the surveys of Ntwetwe Pan. With the exception of one undecorated pot, recovered from site MAK1 on the top of a dune in northern Ntwetwe Pan (see Fig. 5G), all of these were located in the south-central area. This area comprised both expansive beach-like spreads of combined LSA and pastoralist lithic material, but also occasional sites comprising the unmodified, large, crude flakes characteristic of pastoralist lithic production, thick sherds of undecorated pottery, OES beads, whetstones, grindstones and pestles (see Fig. 5H). No faunal material was registered. As noted above, the overall correlation between lacustrine landscape features and Stone Age sites persists in the LSA (and these few pastoralist locations) throughout northern Botswana. However, the more differential distribution of sites within Ntwetwe Pan (MSA to the north, LSA/pastoralist to the south) may provide opportunities for investigating how Stone Age

sites were situated in relation to hydrological changes and raw material sources.

4. Concluding remarks

Our intent with this paper was to demonstrate the potential of interior areas like the Middle Kalahari in providing a more representative reconstruction of the southern African Stone Age. An overview of previously published works in Northern Botswana yields a broader range of reported sites than commonly considered. These include ESA handaxe finds in lacustrine contexts, specialized MSA sites where resources were accessed from a broader landscape, and the plethora of LSA remains in a wide range of environs. In recent years, targeted research projects have increased the number of known Stone Age sites by more than 200 new archaeological sites (Fig. 6). Still, these projects have barely 'scratched the surface' of the potential of this landscape. With but a handful of exceptions, there are too few excavated sites sufficient to form local chronologies. As a result, we still cannot tie the Middle Kalahari Stone Ages firmly to wider regional contexts and industries. These are not weaknesses or oversights of the various research projects but a reflection of the challenges of this environment.

One of those challenges is vehicle access. The obvious bias for field surveys is the road/track constraint to investigating this vast open landscape. In more concentrated areas, such as the Western Okavango, Chobe and Moremi where a network of tracks provide tourist access, there are considerably more archaeological sites. It is worth repeating that in a single field season one research project reported Stone Age finds at 80 of 85 surveyed locations. The enormous potential for discovering untouched sites away from roads and settlements in this landscape has only begun to be realized.

The possibilities of the under-researched tracts of Northern Botswana are illustrative of a great many areas in Africa that demonstrate the current archaeological record does not reflect Stone Age occupation. As has been argued in this paper the Great Thirstland is undeserving of its reputation as an inhospitable wasteland. Recent investigations confirm early observations (e.g., Wayland, 1950) that Stone Age artefacts in the Kalahari are indeed plentiful and represent a great diversity of cultures. Time and diligence will correct this imbalance and allow the interior of southern Africa to assume its rightful role in contributing to our knowledge of its early inhabitants.

Research permits & grant numbers

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Author contributions

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Appendix A. Supplementary data

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