The archeolinguistics of Kalahari Basin area languages*

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Key-words

Bantu, contact, food production, foraging, Kalahari Basin area, Khoe-Kwadi, Kx'a, pastoralism, Tuu

Abstract

This chapter studies the early population history of southern Africa with linguistics as the primary vantage point. It is tied to the Kalahari Basin area (KBA) - a linguistic convergence zone of Tuu, Kx'a and Khoe-Kwadi - three families formerly subsumed under the spurious "Khoisan" concept. KBA languages and their speakers are assessed by the four major disciplines dealing with the reconstruction of population history: cultural anthropology, linguistics, genetics, and archeology. A particular focus is population contact both among the core KBA groups and with other colonizers, notably diverse Bantu groups. Major findings are that a) foragers had a dynamic history before the advent of non-foragers, b) the expansion of food production was not propagated by a single population package but was a complex, richly layered process, and c) first Bantu speakers may not have entered the KBA as fully-grown farmers, possibly even preceding the first pastoralists.

1 Introduction

The languages and their speakers in the focus of this article were originally referred to by the derogatory labels "Hottentot" and "Bushman" (Planert 1905, Westphahl 1962b, etc.) denoting groups known today as (pastoral) "Khoekhoe" (earlier **Khoi**khoi) and (foraging) "**San**", respectively.[1] Schapera (1930) used for these languages the new term "**Khoisan**", coined by Schultze (1928) for capturing only the phenotypical similarity between herders and foragers in the South African Cape, and intended a language family. Since there is in fact population diversity in all respects, including linguistics, we follow Güldemann and Stoneking (2008) and restrict "Khoisan" to the biological profile it was created for (see §2.3), which importantly rarely characterizes entire populations. The languages at issue are, pace Greenberg (1950, 1963), better captured by the concept "**Kalahari Basin area**" (henceforth **KBA**, cf. Güldemann 1998), which excludes Sandawe and Hadza in Tanzania traditionally included in "Khoisan". The KBA must not be confused with any geographical concept revolving around the Kalahari but is far larger, comprising southern Angola, all of Namibia, Botswana, South Africa, Lesotho, and Swaziland, and peripherally also such countries as

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[1] "Khoekhoe" is the herder autonym, while "San" is the generic exonym for their foraging neighbors.

Zambia, Zimbabwe, and Mozambique. In addition to this geographical restriction, we apply a temporal constraint: our frame is the Holocene, due to time-depth limits in linguistics - the anchoring discipline here. We do not deal with deeper history, although KBA languages and their speakers draw attention even regarding early human evolution (cf., e.g., Güldemann and Stoneking's (2008) linguistic and genetic discussion).

In line with the four-field approach of American anthropology (see Beck Kehoe 1998, Hicks 2002), the KBA languages are treated here according to the four major disciplines dealing with the reconstruction of population history, namely cultural anthropology (§2.1), linguistics (§2.2), genetics (§2.3), and archeology (§2.4). We finally unite the four disciplines in our synopsis of the Holocene population history in the KBA (§3).

2 The Kalahari Basin in the “four-field approach”

2.1 Cultural anthropology

Cultural anthropology set the scene for the earliest assessment of KBA history by grouping indigenous peoples simplistically into three types differing in culture and language, and conceptualizing them as distinct population layers. They are in the order of age in the area: foraging San, pastoral Khoekhoe, and farming Bantu. Various factors also created a further dichotomy of Bantu vs. all other groups. Since the first records from the 17th century reported that non-Bantu groups in the Cape region shared phonemic clicks, a biological phenotype, and the absence of agriculture, these disparate features were conceptualized as a package of extreme "otherness" vis-à-vis "more civilized" people and were then transferred inadequately to all non-Bantu groups of southern Africa. This "Khoisan" concept has been reified despite the recognition of the internal forager-herder distinction attested early on.

In fact, the KBA hosted many ethnic entities whose subsistence and cultural features did/do not converge in one of the above three prototypes. For example, there are ethnically mixed food-producing peoples (cf., e.g., Mossop (1935) on the 18th-century *Gyzikwa* encountered by H. J. Wikar), colonial-frontier communities amalgamating individuals of diverse backgrounds (cf. Kallaway (1980) on the *Dansters*, and Steenken (1997) on so-called *Baster* groups including the *Griekwa*), foragers attached to food-producers as clients (cf. Silberbauer and Kuper (1966) on the *(Ba)Lala*), and rural migrant labor ethnicities (cf. De Jongh (2012) on the *Karretjie people*). Since such non-prototypical groups are often tied to the dramatic changes during colonial history producing cultural contact and amalgamation, they tend not to be projected into the deeper past. However, Bollig's (2004) discussion on African peripatetics makes clear that such groups are not merely a colonial phenomenon. A particular problem in the KBA is the historical interpretation of foragers with so-called "low-level food production" (B. D. Smith 2001), e.g., Khwe with farming practices (Köhler 1986) or G‖ana-G|ui with small-stock husbandry (Ikeya 1993).

At the same time, some historical models suggest that subsistence-related identities, especially involving foraging, are fluid (cf. Elphick's (1977) "herder-forager" cycle) and the result of socio-economic niche specialization (see Barnard 1992b, Smith 1996, Sadr 1997 etc. on the "Kalahari debate"). However, despite intensive contact and attested transitions on the individual or communal level, anthropological research (Schapera 1930; Marshall 1976; Lee 1979; Silberbauer 1981; Hoernlé 1985; Barnard 1992a, 2002, 2007), historical records (Ten Rhyne 1686; de Grevenbroek 1695; Kolb 1731; Maingard 1935), and archeology (Smith et al. 1991; Smith and Lee 1997; A. Smith 2001; Mitchell 2016b) converge to the effect that a) the forager-herder divide is a substantial one arising from distinct modes of production and ideologies revolving around ownership concepts and social relations, and b) modern foragers continue(d) to a considerable extent ancient KBA traditions. That foraging has a marginalized status today results from a long-standing competition with pastoralist and farming food production (cf. Güldemann, McConvell and Rhodes 2020). Under European colonial regimes since the 17th century this culminated in genocidal extinction in parts of the KBA on a previously unknown scale (Szalay 1995, Adhikari 2010). Table 1 outlines basic cultural features concerning the forager-herder distinction (the reader is referred to Bostoen, Coutros and Schlebusch (this volume) for some discussion on Bantu food-producers.)

Foraging	**Pastoralism**[2]
women gather dependable plant food; men hunt meat, which is less dependable but ideologically central	sheep and cattle herding with sheep partly having ideological importance, strong foraging component
nomadic for seasonally variable plant food in a group territory	transhumant for water and grazing in a communally owned group territory
small family bands	larger tribe-like groups
strongly egalitarian, no fixed hierarchies or customary leadership	wealth-defined hierarchy, chief presiding over tribal council as the real governing body
no ownership of wealth like animals etc., which contradicts sharing ethics	mostly primogeniture inheritance, herds stay with patrilineal family, women own hut and belongings inside
mostly monogamous	possibly polygamous

Table 1: Some key distinctions between non-Bantu herders and foragers

Since both foraging and herding groups continually moved their residential space to find food and/or maintain ties within and across nuclear social units, their technology was organic and light-weight. For archeology, this implies low visibility except at locations of repeated occupation like caves and coastal sites with good marine resources. While foragers

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[2] The information largely refers to the Khoekhoe, the only group with extensive ethnographic data.

were linguistically diverse and inhabited the entire area, just three locations attest for herders, all speaking languages of Khoe-Kwadi - one of three KBA lineages (§2.2.1):
a) Kwadi in the Angolan Moçâmedes desert (Estermann 1956, Guerreiro 1971),
b) Deti and possibly other Shua groups in the northeastern Kalahari whose depth of pastoralist history is, however, unclear (Livingstone 1851: 23-4, 1858: 72-3),
c) Khoekhoe groups across the western KBA, i.e., the South African Cape and Namibia.

Kinship organization is among the domains of cultural anthropology investigated in the KBA in great detail, culminating in Barnard and Boden (2014). Importantly, this research shows that such cultural traits can have a large-scale spatial signature independent of other population features (Boden, Güldemann and Jordan (2014) on sibling terminology). This indicates that population contact and associated changes in cultural practices have been important for the history of the entire KBA.

2.2 Linguistics

Language as one central cultural trait is the conceptual starting point of this article. First observations by Europeans about the linguistic KBA landscape go back to the late 17th century. However, a full picture concerning language documentation and description is only now emerging (Güldemann 2018c) and will remain incomplete, as the languages of many ethnographically attested groups became extinct before being recorded. Such cases exist across the KBA and affect almost half its territory.[3] They often figure under the generic exonyms "San" and "(Ba)Twa" used by Khoekhoe and Bantu food-producers, respectively. There is thus the real possibility that the KBA hosted until recently more than the three known lineages (see §2.2.1). After long-standing uncertainties, the classificatory picture of extant languages is clear (see Güldemann 2008b, 2014a) and is treated here under the basic linguistic classification types: genealogical (§2.2.1), typological (§2.2.2), and areal (§2.2.3).

2.2.1 Language families

Westphal (1956, 1962a, b, 1971) offered robust first-hand evidence against Greenberg's (1950, 1963) hypothesis that KBA languages form the southern branch of a larger "Khoisan" family. However, only since the studies by Sands (1998) and Güldemann and Vossen (2000) it is more widely appreciated that specialists reject Greenberg's hypothesis. Despite the discovery of new languages, the current picture in the KBA essentially replicates the findings by D. Bleek (1927, 1929, 1939/40) who classified San languages into three independent groups, which anticipate the three families recognized today.

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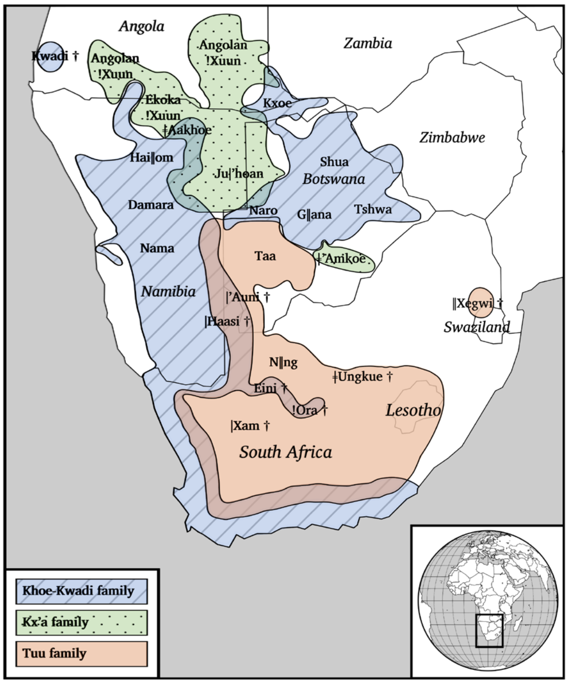
[3] Examples are the Tjimba around the Namibia-Angola border (Hitzeroth 1976), the Tjaube in the Kavango area (Hartmann 1987), the San of the Namib desert (Guenther 2005), and the Soaqua or Sonqua at the Cape (Parkington 1984).



† extinct
* moribund

Khoe-Kwadi
- *Kwadi†*
- *Khoe*
  - *Kalahari Khoe*
    - *East:* Shua, Tshwa
    - *West:* Kxoe, Gǁana, Naro
  - *Khoekhoe:* Cape Khoekhoe†, !Ora-Xiri*, Eini†, Nama-Damara, Haiǁom, ǂAakhoe

Kx'a
- *Ju:* !Xuun, Juǀ'hoan
- *ǂ'Amkoe**

Tuu
- *Taa-Lower Nossob*
  - *Taa*
  - *Lower Nossob†:* ǀ'Auni, ǀHaasi
- *!Ui:* Nǁng*, ǀXam†, ǂUngkue†, ǁXegwi†

Figure 1: The three linguistic lineages of the KBA and their subclassification

Bleek's "Southern" San group is the modern Tuu family. It was severely affected by European colonization and resulting language death. The Lower-Nossob group and the !Ui branch, except for moribund N‖ng, are extinct completely (Traill 1997, 2002, 2007), so that the Taa complex is the only surviving member. As modern reliable data will remain restricted, linguistic reconstruction is seriously hampered but not impossible (Güldemann 2005, 2018a). Basic conclusions and hypotheses of recent research are as follows. The major branches in Tuu are Taa-Lower Nossob and !Ui; lexical affinities that motivated to classify the poorly known Lower-Nossob varieties as !Ui are better viewed as resulting from language contact with N‖ng (Güldemann 2014b). All better known Tuu languages like Taa, N‖ng, and |Xam, are dialect clusters that are surprisingly homogeneous despite their large geographical extent. This suggests that these groups expanded in the not so distant past, although the causes remain unknown. The Taa complex seems to originate in its western domain in Namibia (Naumann 2014), while the source area of |Xam and N‖ng appears to have been the eastern !Ui zone between Vaal and Orange (Güldemann 2018d). The resulting distant homelands imply a relatively long separation between Taa-Lower Nossob and !Ui, which is compatible with their considerable linguistic differences and the recent re-contact in the southern Kalahari between Lower Nossob and N‖ng.

The second KBA family Kx'a emerged from joining D. Bleek's "Northern" San group, the large Ju language complex, with ǂ'Amkoe, a geographically separate and by now moribund dialect cluster in southeastern Botswana only discovered in the 1970s (Traill 1973) and known at the beginning as (Eastern) ǂHoan. Assumed to form a family by Westphal (1974), Sands (2010, talk of 2003), most importantly Honken (2004), and

Güldemann (2004a), Heine and Honken (2010) finally offer probative phonological and lexical reconstructions. Research on ǂ'Amkoe is still preoccupied with documentation, while comparative Ju studies are more advanced (cf., e.g., Snyman 1980, 1997; Sands 2010; Lionnet 2014; Heine and König 2015). Like Tuu, Kx'a is composed of two units which are internally homogeneous despite a large geographical extent (even if Ju may comprise more than one language) but whose separation is not of recent vintage.

Khoe-Kwadi, the third KBA family, is in many respects the most complex one. Greenberg (1950) first established the Khoe family by joining the languages of the pastoral Khoekhoe with D. Bleek's "Central" San group called today Kalahari Khoe. Specialists substantiated this hypothesis by ever more detailed historical-comparative work on Proto-Khoe (cf., e.g., Maingard 1961, 1963; Köhler 1962, 1971; Voßen 1984, 1988, 1991, 1997, 2011; Elderkin 2004, 2013, 2016, 2017). Kwadi, spoken in southeastern Angola but by now extinct, was researched in the 1960s by E. Westphal. His data allow morphological and lexical reconstructions establishing the larger Khoe-Kwadi family (Güldemann 2004b, Güldemann and Elderkin 2010, Güldemann and Fehn 2014). It is the largest KBA family in terms of geography and number of languages, which is matched by its structural diversity. The adjacency of the Khoekhoe and Kalahari branches of Khoe is recent and due to the spread of the pastoral Khoekhoe from South Africa into Namibia.

Both lexical comparisons (Güldemann and Loughnane 2012) and reconstructions of pronominal systems (e.g., Güldemann 2018b: 104-6) indicate that further research may reduce the lineage inventory - this in a geographically unexpected way. Güldemann and Elderkin (2010) take up an earlier hypothesis that Khoe-Kwadi in the KBA is genealogically related to Sandawe of distant Tanzania. Moreover, it still merits investigation whether Tuu and Kx'a form an ancient family.

2.2.2 Language types

KBA languages are morpho-syntactically split into two basic types with the Khoe-Kwadi family separated from "Non-Khoe", which subsumes Tuu and Kx’a (Güldemann 1998, 2013). Basic features distinguishing the two are given in Table 2. The profile of Non-Khoe is partly quirky for African and worldwide standards. In contrast, the Khoe-Kwadi type has a specific affinity with East African languages (Heine and Vossen 1981, Güldemann 2013), which echoes the family's possible genealogical link to Sandawe.

Feature	**Non-Khoe**	**Khoe-Kwadi**
Transitive word order	SV(O)	S(O)V
Dominant argument alignment	neutral	accusative
Non-semantic default flagging	yes	no*
Verb serialization	yes	no
Verb compounding	yes	no*

Verb derivation morphology	no	yes
Head position in noun phrase	initial (except genitive)	final
Adposition	preposition	postposition
Clusivity	yes	no*
Semantic basis of gender assignment	animacy	sex
Gender-agreement class ratio	≥ 1	< 1
Number marking on noun	irregular (no dual)	regular (with dual)
Number-sensitive lexical suppletion	yes	no

Note: * exceptions due to language contact with Non-Khoe

Table 2: Typological split of Non-Khoe vs. Khoe-Kwadi (Güldemann 1998, 2013)

2.2.3 Language contact and convergence areas

Population contact and accompanying multilingualism are pervasive across the KBA. In a number of cases this led eventually to language shift and death, contributing to the decrease of linguistic diversity. However, contact also accounts for isoglosses across language boundaries. Such shared features allowed the establishment of a couple of genealogically diverse convergence areas in the KBA and it can be expected that more such cases come to light after a more comprehensive linguistic documentation and historical analysis.

Güldemann (2002, 2006) treats the strong substrate impact of !Ui (Tuu) in pastoral Khoekhoe (Khoe-Kwadi) varieties of the Cape, explaining the structural distinction between the latter and Kalahari Khoe. Traill and Nakagawa (2000) is a first discussion of a contact zone of Central Kalahari San groups (cf. also Traill (1980, 2001) on evidence for convergent sound structure). Table 3 illustrates lexicon shared by languages from all three lineages.

Meaning	**G|ui (Khoe-Kwadi)**	**ǂ’Amkoe (Kx’a)**	**Taa (Tuu)**
‘cheek’	*n|ṵ́bī*	*n|ʊ́ʕβí*	*n|ṵ́bī*
‘lip, beak’	*ts’úm̄*	*(d)zʊ́’ám̀*	*dzúm*
‘breath’	*‖hṹĩ̄* ‘breathe’	*‖hōèn*	*‖qhô’ã*
‘elbow’	*ǂxobi*	*ǂxúbí*	*ǂxúbu-xù |nàn*
‘wound’	*chúī*	*tyùī*	*thúa*

Table 3: Body part terms shared by G|ui, ǂ’Amkoe and Taa in the Central Kalahari

The contact of the Taa complex (Tuu) with Naro and G|ui (both Kalahari Khoe) and ǂ’Amkoe and Ju|'hoan (both Kx'a) partially involves their replacement suggesting Taa's encroachment onto the area from the southwest. In turn, Naro appears to expand from the east, whereby language shift from southeastern Ju|'hoan to Naro is an ongoing process (Pratchett 2017). Fehn (2016) assumes Kx'a substrate interference in the Kalahari Khoe language Ts’ixa much further east. Thus, the overall impression is that Kx'a languages are the earliest linguistic layer of the core KBA region. The expansion of Kalahari Khoe and Taa thus explains partly the geographical separation of Ju and ǂ’Amkoe, even though its age remains unclear.

The typological split of KBA languages notwithstanding (see §2.2.2), the area also displays numerous linguistic isoglosses in phonetics-phonology, morphosyntax, and lexical structure (Güldemann 1998, 2013; Güldemann and Fehn 2017). The areal KBA concept thus replaces Greenberg's hypothesis of a South African “Khoisan” family. While shared features are evenly distributed in Tuu and Kx'a, Khoe-Kwadi has a special status in that it shows a northeast-to-southwest adaptation cline to the KBA profile. Güldemann (e.g., 2006, 2008a, 2019a, 2020) models the family as having expanded from the northeast whereby Pre-Khoe incorporated a Kx’a substrate and subsequently Pre-Khoekhoe a Tuu substrate. Thus, language contact seems to explain why Khoe-Kwadi is morpho-syntactically overall more diverse than the non-genealogical Non-Khoe group. While Bantu languages are today spoken in the geographical area of the KBA and partly show contact interference from KBA languages, they are overall not part of the areal linguistic concept.

There is also a considerable amount of lexicon shared across the KBA and earlier works (e.g., Traill 1986) viewed it as potentially supporting deep genealogical relationships. Recent studies (e.g., Sands 2001, Honken 2006, Güldemann and Loughnane 2012) outline different contact patterns capable of explaining cross-areal links even in historically stable vocabulary (cf. Table 3 on body parts). Rampant local bi-lateral loans aside, densely shared lexicon across the KBA is due to the early Kx'a and Tuu substrates in different stages of Khoe-Kwadi and multiple parallel borrowing from widely distributed and prestigious varieties of pastoral Khoekhoe on the part of San languages.

The typological and possible genealogical link of Khoe-Kwadi to East Africa outlined above partly motivates Güldemann's (2019b) proposal of "High Africa" as a linguistic macro-area that formerly joined the KBA and East Africa and was submerged in its center by the Bantu expansion. Güldemann (1999, 2010) argues that contact and substrate features in Bantu itself and phonological areal typology provide further support for this hypothesis.

2.2.4 Linguistic-cultural reconstruction

The lexical reconstruction within the 'words-and-things' approach is central for inferring prehistoric culture and ecology. In the KBA, this research is still in its early stages, requiring better documentation of all relevant languages (cf. Sands, Chebanne and Shah 2017).

While proto-forms for Kx'a and Tuu remain restricted, neither the lexicon of modern languages nor available reconstructions (cf. Heine and Honken (2010) for Kx'a) suggest anything else but a long forager tradition of its speakers, which belies revisionist positions within the Kalahari debate that this subsistence is secondary and induced by external pressure (cf. Wilmsen 1989). A foraging subsistence also applies to speakers of many Khoe languages in both linguistic and non-linguistic terms but, as argued below, it is questionable that Proto-Khoe-Kwadi speakers were foragers.

Vocabulary for domestic animals and related terminology in the KBA has been researched for a long time. Against the stereotype that KBA languages are tied to foraging, Voßen (1997, 2007) reconstructs terms for animal husbandry for all historical stages of Khoe, including Proto-Kalahari Khoe, which only comprises San languages. Güldemann (2008a) and Güldemann, Fehn and Naumann (2015) analyze updated and more complete cross-KBA lexical sets for the four relevant domesticates 'dog', 'goat', 'sheep', and 'cattle'. Their inclusion of Kwadi data (cf. already Westphal 1965) changes the picture even more. Assuming its relatedness to Khoe, a solid Khoe-Kwadi reconstruction for 'sheep' is *guu. Yet more remarkably, except for the !Ui branch of Tuu, all other KBA and Bantu languages borrowed this word; Nguni even has two reflexes, *im-**vu*** going back to Proto-Nguni and *i(li)-**gu**.sha* from later Khoekhoe contact (Doke, Malcolm and Sikakana 1958: 434). All this suggests that early Khoe-Kwadi speakers were not foragers but the source of sheep herding in the KBA on multiple independent occasions.[4]

The linguistic history regarding cattle remains equivocal. Languages in the KBA use mostly reflexes of one of the following forms:

a. *-gòmbè (= Proto-Bantu, across Bantu in the KBA),
b. *gume/i (Kx'a and Tuu except |Xam of !Ui),
c. *goe (Kwadi and West Kalahari Khoe of Khoe-Kwadi)
d. *(gu)be (East Kalahari Khoe of Khoe-Kwadi)
e. *goma- (Khoekhoe of Khoe-Kwadi)
f. *-k^{h}omo (Southeast Bantu in addition to/replacing the a.-form)

Since the a.-form is Pan-Bantu and all other forms can be derived from it by a sound changes, it appears that Bantu groups are the ultimate source(s) of words for cattle in the KBA. The central puzzle yet to be resolved arises from the common idea that the Southeast Bantu form under f. was borrowed from Khoekhoe (e.g., Maingard 1934, Louw 1957).

There are more linguistic details indicating that the spread of animal husbandry in the KBA was not due to a simple herder-to-forager transfer but rather a multifarious network of multiple independent and complex exchanges in various directions. For example, since southern Tuu languages have specific terms for 'sheep' and 'cattle' (see Güldemann, Fehn and Naumann 2015), their encounter with herding may well have been independent from that further north. Also, Güldemann (2008a: 106-11) shows that lexical resources of foragers were recruited for the expression of herding practices, which suggests that once interaction with pastoralists was established some foragers became active agents in pursuing this subsistence.

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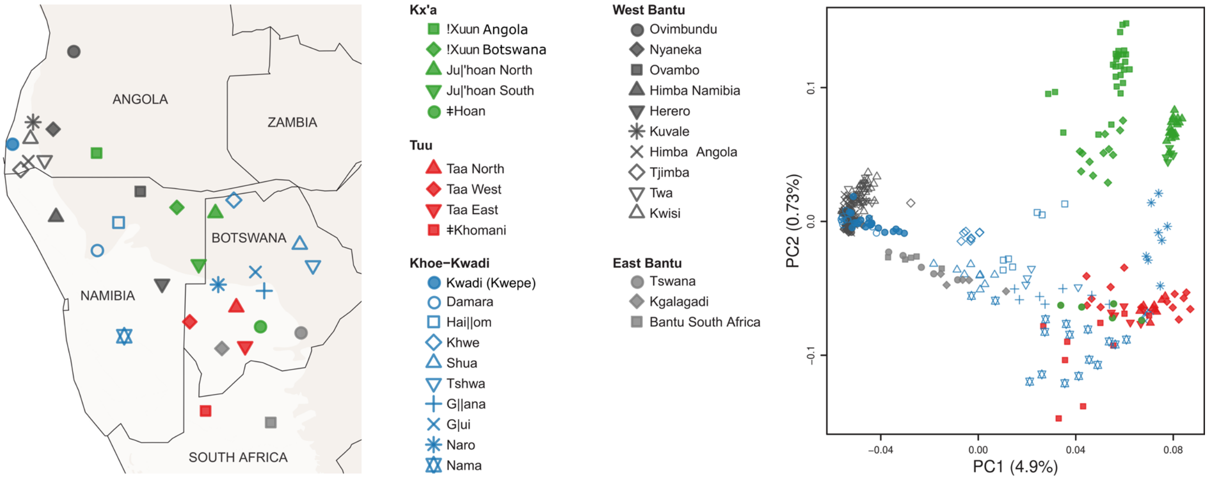
[4] A similar picture holds for 'goat' and Bantu: virtually all KBA languages have a loan reflex of Proto-Bantu *-bʊ́dì or some other minority Bantu form. Khoekhoe pastoralists even called the Bantu-speaking Tswana *b(i)ri.kwa/na* 'goat people' (Maingard 1933).

2.3 Genetics

Studies of human morphology (e.g., Morris 2002, 2003, 2005; and Morris and Ribot 2006) and sero-genetics (e.g. Nurse, Weiner and Jenkins 1985; Jenkins 1986) established the cornerstones of biological diversity in the KBA. However, due to colonial prejudice and racism such research was also accompanied until recently by some of the most embarrassing attitudes and activities of Western scholarship as underlined by Skotnes (1996) and Hudson (2004). We focus on population genetics being central to modern biological anthropology.

2.3.1 Autosomal data

The populations speaking KBA languages are characterised by the greatest level of diversity seen in modern human populations. This is to a large extent due to admixture with other populations, notably eastern African pastoralist, Bantu, and most recently European groups (see §2.3.5). Excluding the admixed DNA portion, their genetic diversity becomes comparable to estimates in other African populations (Schlebusch et al. 2020).



Notes: A) Locations of sampled KBA groups including Bantu; B) PCA on genome-wide SNPs

Figure 2: Population structure in the KBA (after Figure 1 in Oliveira et al. 2023)[5]

Figure 2 shows the PCA for KBA populations including Bantu groups. Regarding the central first component, Bantu groups on the left side are separated from Kx'a and Tuu groups on the right side. The latter reflect most closely the autochthonous genetic ancestry tied to the KBA, for which we use the term Khoisan in line with Güldemann and Stoneking (2008). Crucially, groups speaking languages of Khoe-Kwadi, the third KBA family, are scattered across the entire range of PC1. Looking at the extremes, Naro and G|ui are located within Kx'a and Tuu groups as opposed to the Damara and Kwadi within West Bantu populations.

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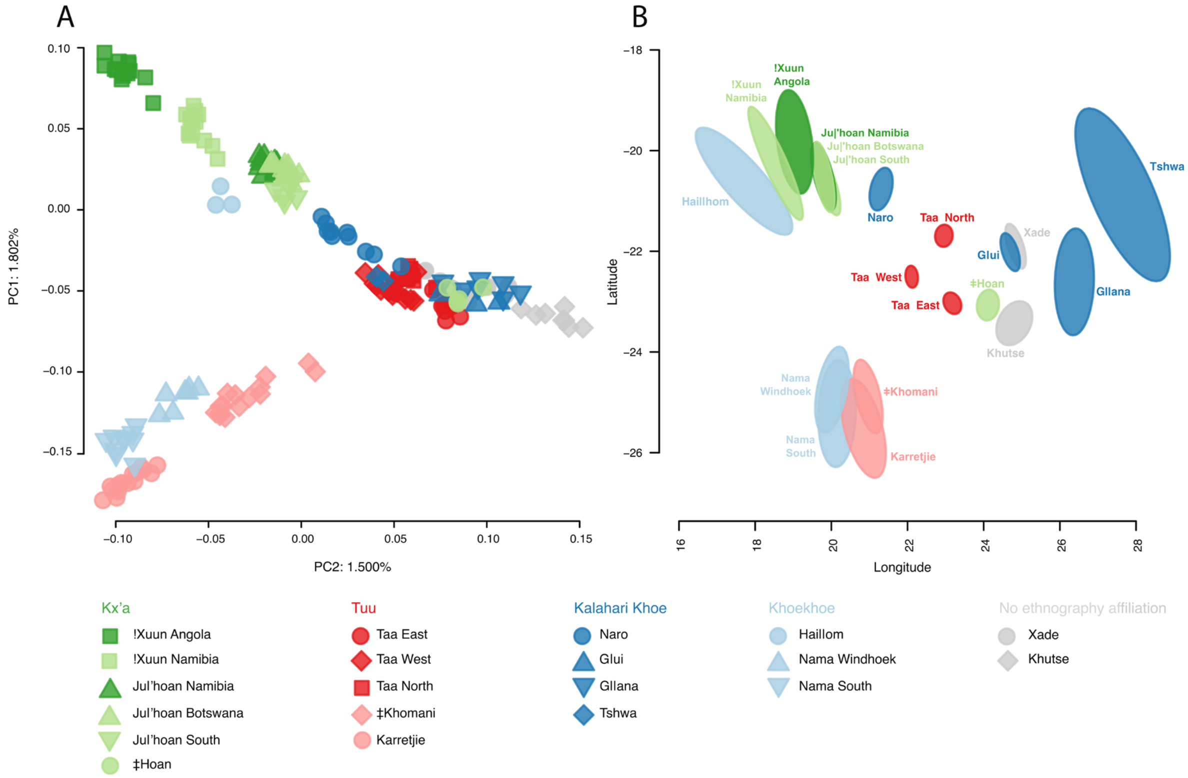
[5] In this figure and in Figures 3 and 6 we color-code language groups in line with Figure 1: blue = Khoe-Kwadi, green = Kx'a, grey = Bantu~non-KBA, red = Tuu. The ǂKhomani and Kwadi-Kwepe no longer speak the heritage languages underlying their family assignment in Figure 2.

Other Khoe-Kwadi groups cover the middle ground, namely Khoe, Shua and Tshwa[6], or align mostly with the Khoisan profile on the right but comprise individuals approaching the profile on the left, namely G‖ana, Nama, and Hai‖om. This indicates a historically very loose connection between linguistic Khoe-Kwadi affiliation and genetic profile (see §3.2.2).

Figure 3 reflects the analysis of the genomic fragments uniquely assigned to Khoisan-related ancestry free of recent admixture. A basic PCA yields a tripartite structure:
a) "Northwestern": San speaking Ju (Kx'a), and Naro and Hai‖om (both Khoe-Kwadi)
b) "Southeastern": ǂKhomani and Karretjie, formerly San speaking respectively N‖ng and |Xam (Tuu), and Nama pastoralists (Khoe-Kwadi)
c) "Central": San speaking Kalahari Khoe (Khoe-Kwadi), ǂ'Amkoe (Kx'a), and Taa (Tuu).
The picture correlates with geography, not linguistic affiliation and subsistence, emerging most likely through isolation by distance (Montinaro et al. 2017, Vicente et al. 2019).



Notes: A) PCA without recent admixture of KBA individuals; B) Geo-genetic map under an isolation-by-distance model

Figure 3: PCA of KBA individuals without recent admixture (after Figure 2 in Vicente et al. 2019)[7]

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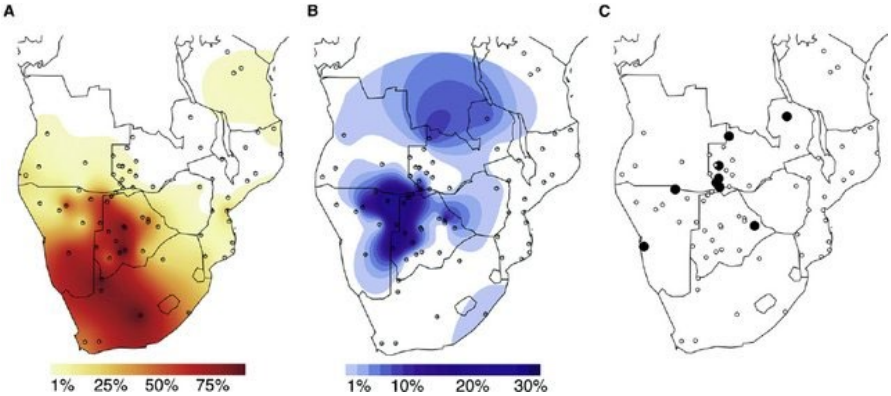
[6] Formerly referred to by the now improper term "Black Bushmen", the special status of these groups has been recognized for a long time (Cashdan 1986).

[7] According to Schlebusch (2010) and Vicente et al. (2019) the samples in red without ethnographic affiliation, the Xade San must have been G|ui, and the Khutse San most likely ǂ'Amkoe possibly intermingled with G|ui (cf. Nakagawa 2006).

2.3.2 mtDNA

Some of the deepest-rooting mtDNA clades of the global phylogeny, namely L0d and L0k[8], are found in high frequencies in KBA-language groups and Bantu in contact with them (Coelho et al. 2009; Schlebusch et al. 2009, 2013; Quintana-Murci et al. 2010; Barbieri et al. 2013a, 2013b, 2014b; Oliveira et al. 2018). Since these lineages are largely limited to the area (see Figure 4), they are considered autochthonous; their presence in other groups indicates gene flow from Khoisan populations.



Notes: A) L0d; B) L0k; C) presence of sub-lineages L0k1b and L0k2 in southern Africa

Figure 4: Distribution of mtDNA haplogroups (Figure 1 in Barbieri et al. 2013a)

Figure 4 shows that L0d (Panel A) is more common and has a broader distribution in the KBA than L0k (Panel B). While L0d predominates in South Africa, Namibia, and Botswana, L0k has its highest frequency in the Namibia-Botswana border zone (Henn et al. 2011; Schlebusch et al. 2013; Barbieri et al. 2013a, 2014b). The specific sub-lineages L0k1b and L0k2 (Panel C) are stongest in Bantu groups of Zambia suggesting that they incorporated extinct Khoisan-related ancestry related to the modern KBA (Barbieri et al. 2013b).

It has been suggested that the sporadic occurrence in the KBA of such mtDNA haplogroups as L4b2, L5, and L3d indicate a pastoralist migration from eastern Africa but this requires further exploration (Knight et al. 2003; Tishkoff et al. 2007b; Barbieri et al. 2014a, 2014b; Uren et al. 2016).

2.3.3 Y chromosome

Similar to mtDNA, some of the Y chromosome haplogroups found in high frequency in Khoisan groups are among the deepest splitting lineages of the global phylogeny, namely A-M51 (A1b1b2a), A-M14 (A1b1a1), and B-M192 (B2b1).[9] Except for a few specific sub-

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[8] The mtDNA haplogroup names follow the nomenclature implemented in PhyloTree$_{mt}$ (van Oven 2009) Build 17 (18 Feb 2016).

[9] We give two Y chromosome haplogroup names for the sake of clarity, the first following mutational and the second hierarchical nomenclature (see ISOGG V15.73).

lineages found elsewhere in Africa these haplogroups are considered to be autochthonous KBA lineages (de Filippo et al. 2011, Barbieri et al. 2016, Naidoo et al. 2020).

The Y-chromosome profile in the KBA was particularly influenced by immigration and admixture. Based on the geographic distribution and the microsatellite diversity haplogroup E-M293 (E1b1b1b2b2a1) has been associated with a migration from eastern to southern Africa ~2000 BP which was independent of the Bantu expansion (Henn et al. 2008, Bajić et al. 2018) (see §3.2.2). The impact by the Bantu expansion is especially strong: haplogroups linked to this spread are E-M2 (E1b1a1) and B-M150 (B2a) (de Filippo et al. 2011, Barbieri et al. 2016, Naidoo et al. 2020).

2.3.4 Lactase persistence

Lactase is a small-intestinal enzyme that breaks down non-absorbable lactose from milk into absorbable glucose and galactose. If lactose passes intact into the colon it causes intolerance symptoms (Ingram et al. 2009). Lactase persistence is the ability to produce enzyme lactase in adulthood. Both the lactase persistence phenotype and the alleles causing it are associated with pastoral practices (Tishkoff et al. 2007a; Ingram et al. 2009; Itan et al. 2010; Gerbault et al. 2011). The specific 14010C allele is associated with the lactase persistence phenotype in eastern Africa and shows recent positive selection (Tishkoff et al. 2007a). Figure 5 shows that it occurs in relatively high frequencies in eastern Africa (Tishkoff et al. 2007a) and the KBA (Macholdt et al. 2014) but is rare or absent elsewhere.

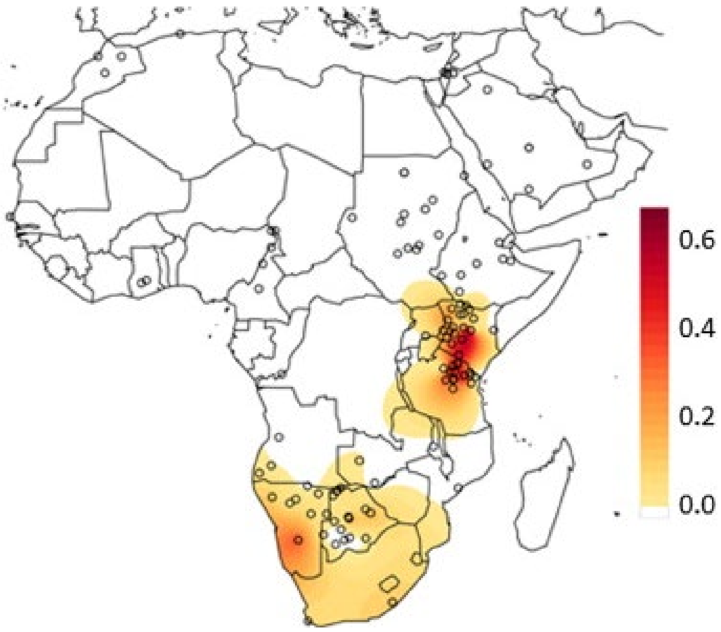


Figure 5: Frequency of lactase persistence allele 14010C. Circles indicate sample locations. (Figure 2A in Macholdt et al. 2014)

In the KBA, the allele is particularly frequent in pastoralist and/or Khoe-Kwadi-speaking groups, notably the Nama (>20%) (Schlebusch et al. 2012; Breton et al. 2014; Macholdt et al. 2014, 2015). A signal of ongoing selection for this allele is confirmed in the KBA, notably in all tested pastoralist groups but also in some Khoe-speaking San groups (Breton et al. 2014, Macholdt et al. 2014). Possible explanations for the unexpected selection among foragers include reversion to foraging by former pastoralists and/or regular milk consumption by San who work for pastoralists on peripheral cattle posts (Casimir 1990).

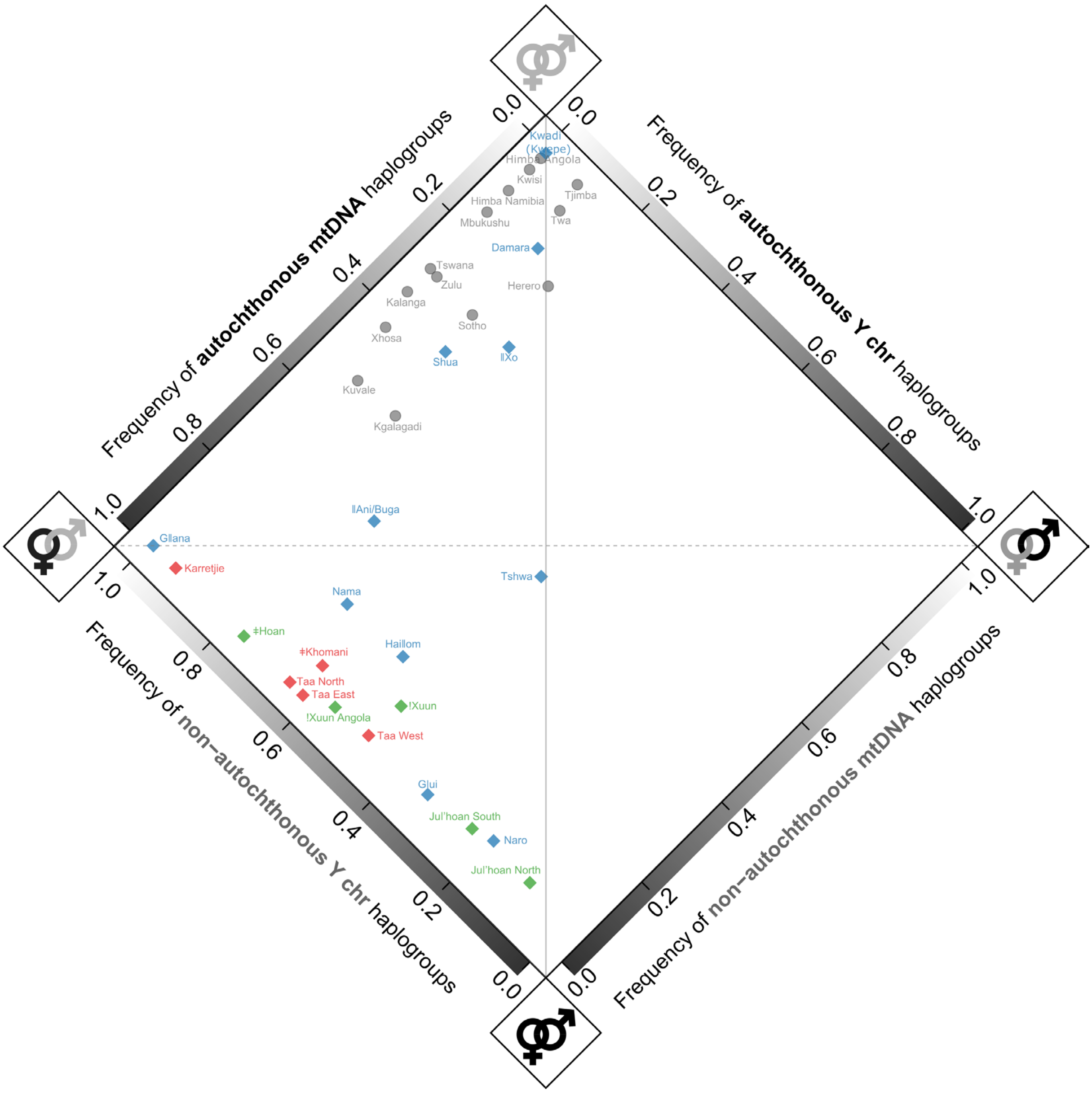
2.3.5 Admixture

Admixture of various kinds is rampant in the KBA. While there are signals of admixture among KBA-language groups (Vicente et al. 2019), we focus here on the genetic influence from non-autochthonous populations in KBA groups (Pickrell et al. 2014; Skoglund et al. 2017; Schlebusch et al. 2017; Oliveira et al. 2023). The amount and source populations vary considerably. Overall, Kx'a and Tuu populations have a lower proportion of non-Khoisan-related ancestries, while Khoe-Kwadi populations show high variability (Pickrell et al. 2014; Montinaro et al. 2017; Uren et al. 2016; Oliveira et al. 2023). Importantly, there are two Bantu-related ancestries in the KBA. One is found in highest frequency in the Himba, Herero, and remarkably Khoekhoe-speaking Damara, but is also notable in Owambo, Mbukushu, and Kwangali as well as in some Kx'a- and other Khoe-Kwadi-speaking groups of north-western Namibia. The other ancestry predominates in southeastern Bantu speakers and non-Bantu groups admixed with them (Pickrell et al. 2014; Uren et al. 2016; Montinaro et al. 2017; Oliveira et al. 2023). Importantly there is also shared genetic ancestry between southern and eastern Africa not explained by Bantu admixture, particularly so in the Nama and other Khoe-Kwadi speakers (Schlebusch et al. 2012, 2017; Pickrell et al. 2012, 2014; Vicente et al. 2021).

Genetic data indicate that in the KBA sex-biased admixture is particularly relevant, as expected for frequent interactions between foragers and food-producers (Cavalli-Sforza 1986, Lee 1993, Destro-Bisol et al. 2004). Figure 6 shows frequencies of autochthonous uniparental haplogroups in diverse KBA groups, notably the mtDNA haplogroups L0d and L0k, and the Y-chromosome haplogroups A-M14 (A1b1a1), A-M51 (A1b1b2a), and B-M192 (B2b1). The horizontal dotted line separates populations with predominantly autochthonous (below) from those with predominantly non-autochthonous haplogroups (above). The vertical line represents equal proportions of non-autochthonous haplogroups and hence no sex bias. The distance from this line reflects the intensity of sex-biased gene flow.

The observed patterns can be explained with sex-biased admixture, whereby paternal lineages of colonizing food-producing groups, notably Bantu, tend to enter autochthonous populations, while maternal lineages are frequently incorporated by colonizing groups (Bajić et al. 2018, Vicente et al. 2021). Extreme cases for the first type of sex-bias are the Karretjie people of the Karoo (Schlebusch et al. 2011) assumed to most directly reflect the ancestry of the |Xam San (Tuu), and the G‖ana (Khoe-Kwadi) in the central Kalahari (Bajić et al. 2018):

their Y-chromosome ancestry is almost completely non-autochthonous as opposed to their mtDNA heritage being Khoisan.

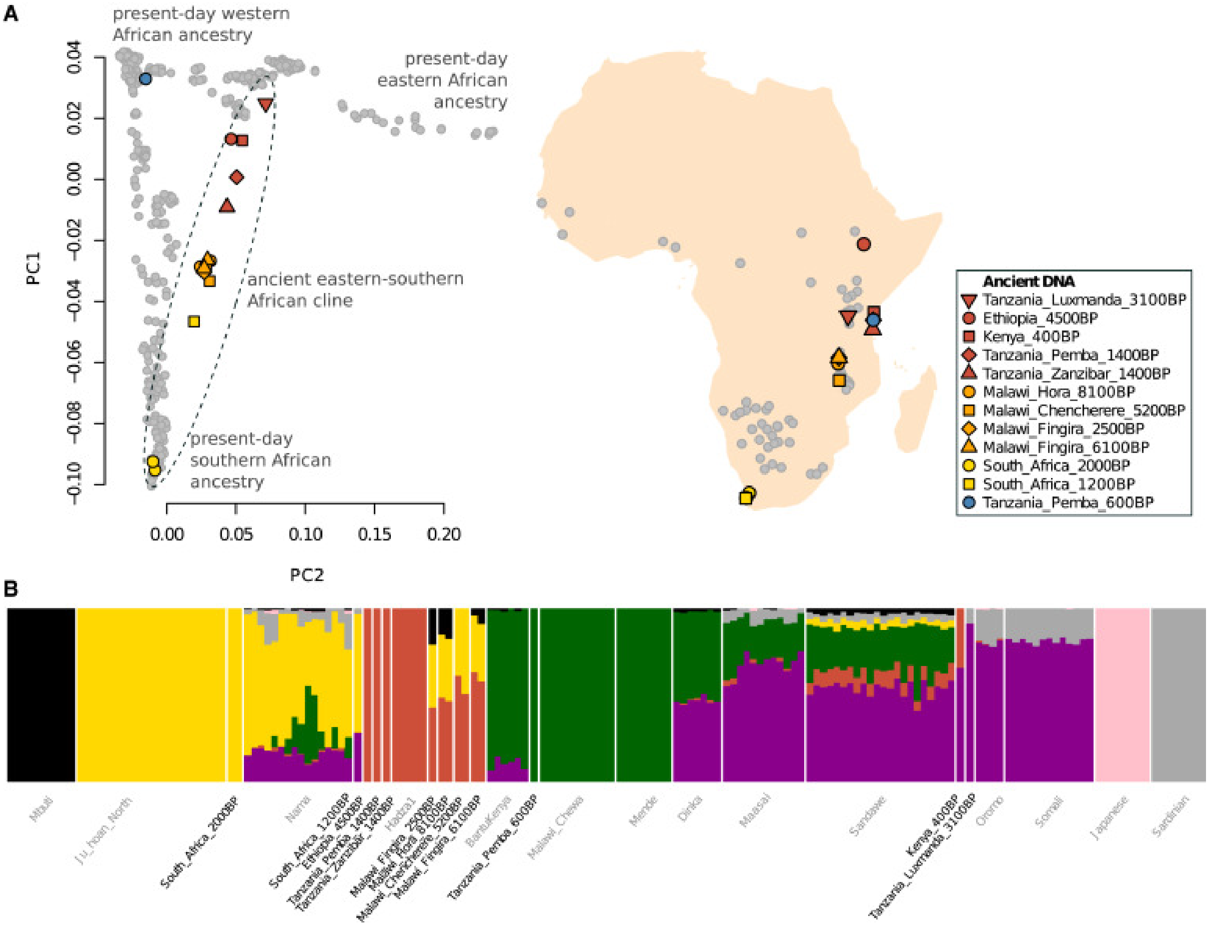


Notes: Circles = non-KBA-speaking groups; Diamonds = (formerly) KBA-speaking groups; Colors: blue = Khoe-Kwadi, green = Kx'a, grey = Bantu~non-KBA, red = Tuu

Figure 6: Dominant uniparental ancestry components in KBA groups based on mtDNA and Y-chromosome haplogroup frequencies. (after Figure 4 in Bajić et al. 2018)

2.3.6 Archeogenetics

New ancient DNA (aDNA) studies contribute greatly to our understanding of population history. Although still scarce, African aDNA samples provide us with evidence for a cline of widespread and overlapping deeply divergent forager-associated ancestries in eastern, central, and southern Africa (cf. Figure 7), which were replaced or influenced in many areas by expanding food-producing populations (Schlebusch et al. 2017, Skoglund et al. 2017, Wang et al. 2020, Lipson et al. 2022).



Notes: A) PCA of ancient (colored symbols) and present-day (grey circles) individuals, and sampling locations; B) ADMIXTURE clustering assuming 7 ancestral components

Figure 7: African population structure and aDNA samples (Figure 1 in Skoglund et al. 2017)

Ancient samples predating the migration from eastern Africa make it clear that all modern Khoisan groups harbour between 10-30% of eastern African ancestry (Schlebusch et al. 2017, Skoglund et al. 2017). Ancient samples from Botswana suggest that the pastoralist-forager admixture predates the arrival of Bantu-related ancestry (Wang et al. 2020). Some aDNA samples show similarity to present-day Nama pastoralists. For example, a ~1200 BP-old female found in a pastoralist context in the western Cape combines ancestries related to Khoisan, eastern Africa, and western Eurasia, supporting the idea that Khoe-related groups had brought northern ancestries to the Cape at least by the second half of the 1st millennium (Skoglund et al. 2017). The authors could model the individual's genetic profile as a mixture of ~60% ancestry related to foragers living ~2000 BP in the Cape and ~40% ancestry related to a ~3100-year-old individual from the pastoralist context of Luxmanda (Tanzania).

2.4 Archeology

Archeology in the KBA not only provides aDNA but first of all data from the past on cultural anthropology. We discuss some paleoclimatic events crucial for population history (§2.4.1), basic economic-cultural sequences and their geography, separating the period of exclusive foraging (§2.4.2) from that after the advent of food production (§2.4.3), and finally the locally diagnostic rock art (§2.4.4). Figure 8 maps the archeological sites mentioned below.

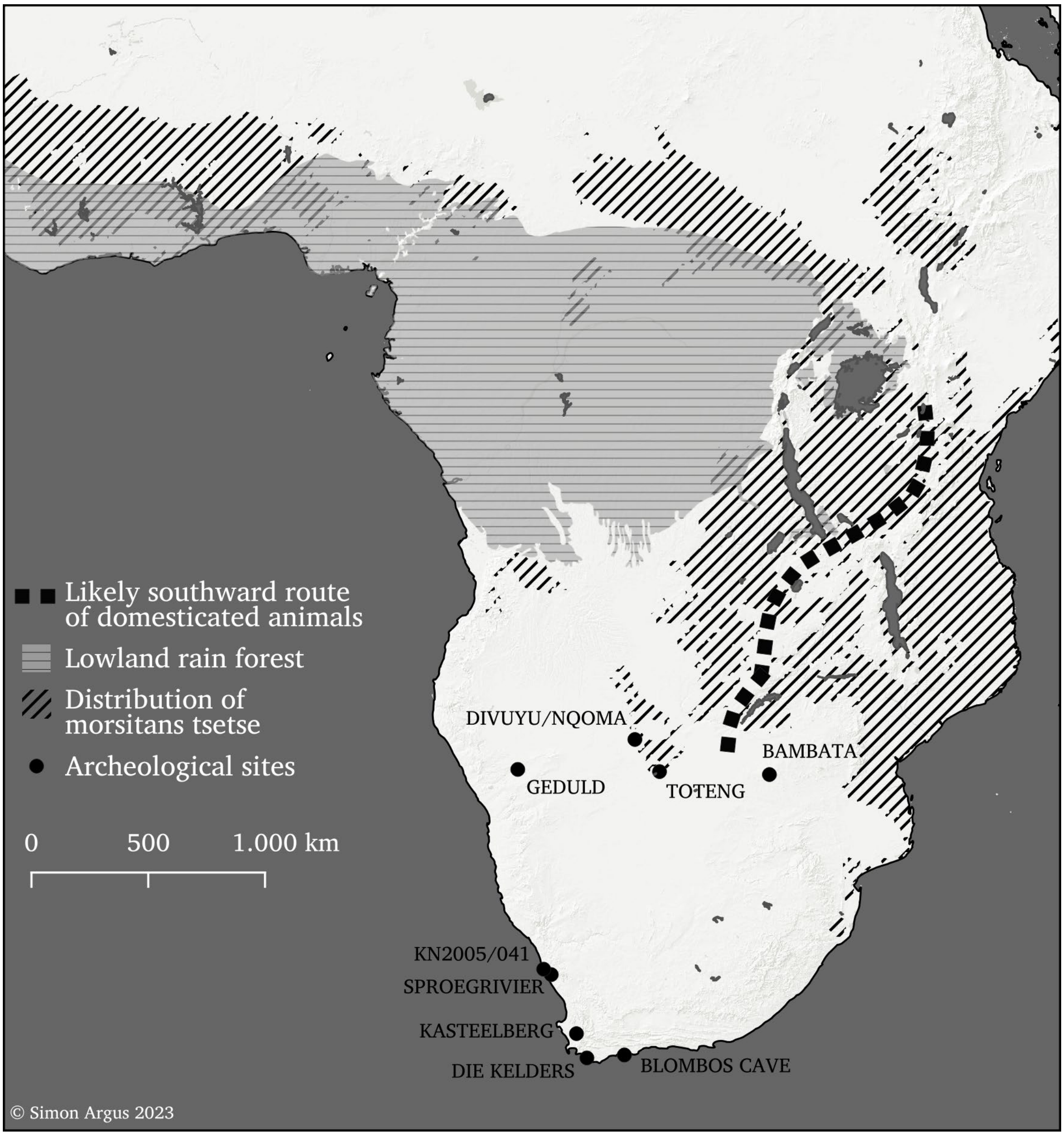


Figure 8: Southern Africa with mentioned archeological sites and major barriers for the expansion of savannah pastoralism (after Smith 2016: 416)

2.4.1 Paleoclimatic dynamics

KBA climate fluctuated considerably during the Holocene (cf. Deacon and Thackeray 1984), of which we report events we think to be informative for modelling population dynamics. During the Last Glacial Maximum, 18000 BP, the sea level was 130m lower than today exposing a huge plain attractive for large-game hunting. It also appears that there were few sites occupied in today's interior (Mitchell 2002) suggesting that the southern coast was more amenable at that time. With the rise of the sea to its present level c. 12000 BP and the earlier coastal sites coming under water one can envision a northward inland movement by foragers (Van Andel 1989).[10]

In the KBA interior, the climate also varied considerably. For example, there is mid-Holocene evidence in the northern Kalahari for fishing and hunting of water adapted species indicating wetter conditions (Robbins et al. 1994). Another wet period is observed for the Kalahari around 2000 BP followed soon by desiccation that created modern conditions (Denbow 1986, Thomas and Shaw 1991, Shaw et al. 2003, Nash et al. 2006).

2.4.2 Exclusive foraging up to 2000 BP

The late pre- and early Holocene period is characterized in the KBA by the macrolithic Oakhurst complex (Deacon and Deacon 1999; Mitchell 2002, 2016a, b), which differs from microlithic industries north of the Zambezi, notably the Nachikufan (Miller 2001). The central forager tradition of the KBA during most of the Holocene is the Wilton complex fading later into the Final LSA. Wilton appears to have a northern origin around the Zambezi and later spread southwards across the whole sub-continent (Wadley 2001). This flaked stone industry of microlithic tools is also characterized by such features as bone tools, small-sized ostrich eggshell beads for decoration, the use of hunting blinds and pits for larger prey, smaller game hunting with snares, the exploitation of geophytes using adzes, and possibly an increase in rock art. Since all these traits were encountered with modern San, there is little doubt that they largely continue the latest LSA tradition.

There is also considerable variation across space and time within Wilton and the Final LSA, notably in resource use. Thus, already before the advent of food production, several areas attest for an intensified food procurement possibly associated with smaller and fixed group territories (Deacon and Deacon 1999: 125-7, Mitchell 2002: 187-91, Sealy 2016). However, both earlier work and recent surveys (e.g., Coulson et al. (2022) on the Kalahari) cannot yet give a full and fine-grained stratification framework across the KBA, so that forager archeology is still hard to correlate with the early linguistic dynamics (see §2.2.1/3).

2.4.3 Food production

Starting with the last centuries BC, the archeological record shows various signs of groups no longer relying exclusively on foraging. The traits relevant most are pottery, domestic animals, grain crops, and metallurgy. Since these cannot be attributed in the KBA to a single

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[10] Changes in temperature and associated sea-levels also played a role for population dynamics and cultural change in the mid-Holocene (Miller et al. 1993, Jerardino 1998, Deacon and Deacon 1999, Parkington 1999).

cultural package/population (Lander and Russell 2018), we mostly treat them separately and focus in particular on the first two.

Pottery appears in the KBA in the last few centuries BC and is a good marker for the appearance of changing lifeways, notably for a new way of processing and storing food, supplementing previously existing organic implements (cf. Lander and Russell 2020). There is a basic distinction of ceramics with thin (<10mm) vs. thick (>10mm) walls, having different spatio-temporal dynamics (Sadr and Sampson 2006, Sadr 2008a).

The earliest ceramics in the KBA are thin-walled as in eastern Africa but it is difficult to connect the southern decorative types with those far north. The KBA gives evidence for a number of different thin wares. The earliest, dated back to 2150 BP, is known as Bambata after the cave of that name in Zimbabwe (Walker 1983). From around the same time, a different thin ware called "ripple-rim" is found in northern Namibia (Kinahan 1991, Smith and Jacobson 1995). Thin-walled pottery also spread southwards, notably to Kwa-Zulu Natal (Mazel 1992) and the Western Cape (Sadr and Smith 1991). Some locations also attest for considerable change over time, of which the 1000-BP shift in the western Cape from spouted to lugged wares is particularly relevant here (Smith 2006, Sadr et al. 2017). The considerable variation is such that archeologists do not agree on specific relations between different thin-ware types within the KBA or identify concrete source(s) outside it.

There is also disagreement on the authorship. According to Sadr (2008a: 106), thin-walled pottery generally "is found in small and large, open and sheltered sites, always associated with LSA stone tools, some combination of a hunter-gatherer-forager-fisher-herder subsistence pattern". Foragers clearly used thin wares early on; Sadr and Sampson (2006) even suggest that they could have made the earliest pottery, as some is grass-tempered. However, the quality of most ceramics suggest that they are the result of a well-established tradition, potentially copied partly by local foragers. Huffman (2005, 2021), in turn, assumes that Bambata pottery belongs to EIA Bantu farmers (who normally possessed thick wares, see below) and was especially scraped to trade with foragers who preferred light-weight containers because of their mobile lifestyle.

The historical interpretation of thick-wall pottery in the KBA is far less controversial. It generally entered the area later than thin ware, spreading especially throughout the east of the subcontinent and is thus assigned to EIA Bantu farmers. As opposed to thin ware, Huffman (e.g., 2007) and others propose detailed historical relations between different types and subsume them under the Chifumbaze complex originating in the northeast.

Since domestic animals do not have wild progenitors in Africa, they must have been brought in from the north. This was steered by animal diseases, notably but not exclusively trypanosomiasis, which restrict the areas of propagation outside the KBA but apply there to a lesser extent (Smith 1992; Gifford-Gonzalez 2017a, b; Mitchell 2017; see Figure 8). As mentioned in §2.2.4, the domestic animals crucial in this context are sheep and cattle, as their origin is controversial in various respects but informs major population processes. A general problem is a correct species identification, which more and more receives due attention (Horsburgh and Gosling 2020, Le Meillour et al. 2020, Coutu et al. 2021).[11]

In the northern KBA, the first sheep and cattle occur together and in conjunction with thin-walled pottery, namely 2000 BP at Toteng in Botswana (Robbins et al. 2008), coinciding with wetter conditions in the Kalahari (§2.4.1). Sheep alone are attested around the same time far to the south implying a remarkably fast spread, notably at Spoegrivier on the Namaqualand coast (Sealy and Yates 1994) and Blombos Cave in the southernmost Cape (Henshilwood 1996). Horsburgh, Beckett and Gosling's (2022) study of modern and ancient sheep observes that a "low level of genetic diversity in southern African sheep is consistent with models of serial founder effects as sheep populations moved across these diverse ecosystems", which suggests a considerable amount of leapfrogging movement rather than a cross-KBA spread on a broad front. In the Cape, too, thin-walled pottery arrived around the same time, notably at Die Kelders (Schweitzer 1979), and a few hundred years later at Kasteelberg (Sadr and Smith 1991). Many archeological sites with sheep (and pottery) otherwise display a local pre-herding profile (cf., e.g., Smith and Jacobson 1995), an important point we return to in §3.2.2. The southward spread of cattle had different trajectories. The earliest secure date deeper in the KBA is again in the west at the site KN2005/041 in northern Namaqualand but four centuries later (Orton et al. 2013). Livestock in Bantu farmer contexts are found around the same time but outside the KBA both north and east of it (Lander and Russell 2018). Only after 1000 BP are cattle frequent in the southern KBA accompanied by evidence for milk consumption (Sealy 2010). This timing appears to coincide with the increase of cattle in LIA Bantu settlements in the east and the expansion of enclosures to accommodate the livestock (Mitchell 2002: 348-55).

It is mostly assumed that metallurgy as well as the core set of traditional domestic plants, namely savannah grain crops adapted to summer-rainfall areas[12] like pearl millet, finger millet, and sorghum, reached the KBA with colonizations associated with Bantu speakers, mostly coming from East Africa (Mitchell 2002, Lander and Russell 2018). One of the first location in the KBA with these traits are sites from the 6th/7th century AD in the

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[11] The introduction of goats and dogs is less relevant in this context. It is agreed that goats arrived with Bantu-speaking farmers (Badenhorst 2018, see also §2.2.4), although the exact time remains unresolved due to the difficult distincion from other bovids. Similar problems apply to dogs due to inter-species similarity with wild canids like jackals. Dogs have been used for a long time by all KBA groups, including foragers (Ikeya 1994, Mitchell 2008), but it is uncertain who introduced dogs and when. While Bantu groups are implicated conventionally, Hall (2000) and Mitchell (2014) rightfully caution that dogs may have accompanied pre-Bantu herders, which is possible given comparative vocabulary on dogs in Khoe-Kwadi (Güldemann, Fehn and Naumann 2015).

[12] This climatic dependence is also thought to be a major reason why the Bantu expansion stopped at the eastern border of the winter-rainfall area of the Cape, in turn favoring the persistence of Khoe-speaking herding societies.

Tsodilo Hills of the Kalahari like Divuyu and Nqoma (Denbow 2011, Wilmsen 2011). Grain crops widened considerably the subsistence base for Bantu speakers, and iron implements would have given them the edge when expanding their fields and clearing the bush reducing tsetse infestation hazardous to cattle, which is suggested as a reason for their numerical increase in the LIA (Hall 1986). Metal use is also found in LSA herder contexts that apparently precede/are independent of the advent of Bantu. Thus, iron made it to Geduld in Namibia ca. 1800 BP before the currently assumed Bantu arrival (Smith and Jacobson 1995), and copper was known from the beginning of the Dutch Cape settlement to be traded by Namaqualand Khoekhoe. This is evidence for partly long-distance trade in and knowledge exchange about metal, even though finds in LSA sites remain limited (cf. Miller et al. 1998).

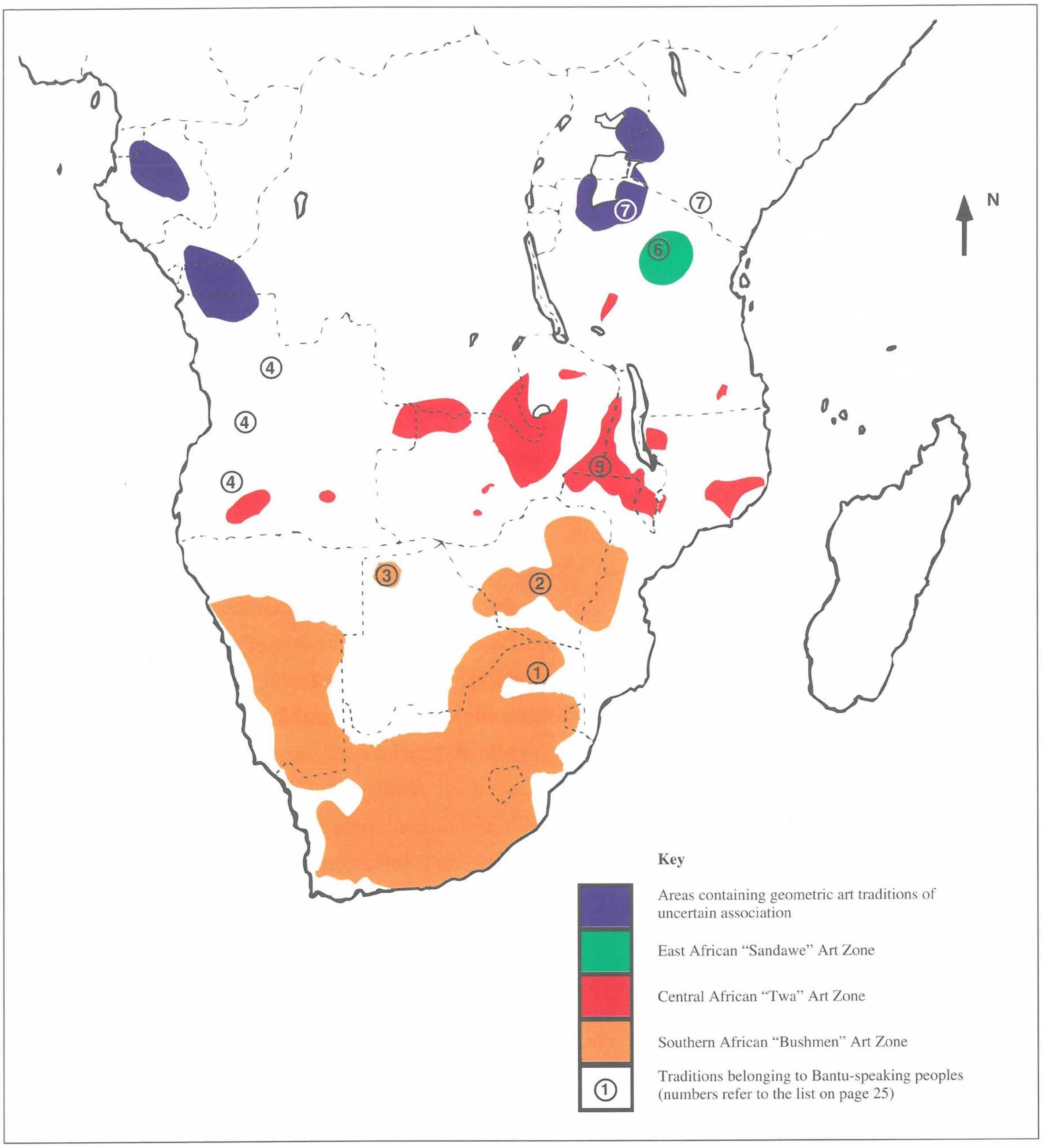

Figure 9: Major distinction between KBA and northern rock art (Smith 1997: 23)

2.4.4 Rock art

Rock art in and close to the KBA is an important indicator of different populations. The baseline shown in Figure 9 is the spatial separation between traditions that go back to early foraging times, namely a geometric type labelled "Twa" in southern Angola, Zambia, and northern Mozambique opposed to the type south of that area labelled "fine-line" and which largely coincides with the KBA. Although we reject the misleading label "Bushmen", the art is agreed to be tied closely to the belief systems of modern San, notably the trance dance as their central curing ritual (cf. Vinnicombe 1976, Lewis-Williams 1981, Parkington 2003).

The spatial pattern in Figure 9 becomes blurred later by the appearance in the KBA of non-entoptic geometric rock art. One trajectory of expansion is from the Central Limpopo Basin in a southwestern direction reaching eventually the Western Cape and appears to often follow water courses. Most authors associate this new tradition with the first spread of herding more than 2000 BP (Smith and Ouzman 2004, Orton 2013), although it should not be called "Khoekhoe" rock art after a group of later vintage. Eastwood, Blundell and Smith (2010) argue that the northeastern KBA fringe, notably the Tsodilo and the Limpopo-Shashe confluence areas, gives evidence for foragers taking up elements of the new rock art and attribute the new distinct forager style specifically to (Kalahari) Khoe-speakers. Other rock art types can be attributed to groups colonizing the KBA later, notably Bantu and Europeans, or to mixed communities emerging at the multiple cultural frontiers (cf., e.g., Jolly 2007).

3 Synopsis

3.1 Previous accounts

Several linguistically steered accounts of KBA prehistory incorporate non-linguistic data, notably Westphal (1980, superseding 1963), Güldemann (2008a, 2020), and Fehn, Amorim and Rocha (2022). We summarize their central hypotheses vis-à-vis the initial simplistic "Khoisan"-Bantu dichotomy and its associated two-stage model whereby Bantu people brought food production to an exclusively foraging world.

Westphal (1963, 1980) is the first to propose that the Khoe family was a newcomer to southern Africa and introduced herding. He offers other new ideas for a comprehensive KBA history, albeit without much empirical substantiation. He not only proposes the widespread replacement of Khoe by Bantu languages but also that some Khoe languages "were superimposed on an older "Bush" language system [= substrate] viz. (1) Tshu-Khwe [= Kalahari Khoe], (2) Hai-n‖um [= Hai‖om] (perhaps related to Ju), (3) Dama (perhaps related to Kwadi and perhaps not)" (1980: 75). He also assumes "that small groups of Bantu-speaking hunter-collector people with some sort of horticultural-vegecultural knowledge preceded the potters and metal-workers of the various stages of the Iron Age in the coastal lowlands" (1980: 72). Speculative and unwarranted claims aside, three components of his scenario are questioned by current findings, namely the overly splitting classification of San languages, the treatment of Kwadi as a San language unrelated to Khoe, and the dating of the Khoe expansion to ca. 3000 BP or yet earlier.

Güldemann (2008a, 2020) combines a new, empirically based language classification with modern non-linguistic data and also ties the spread of Khoe-Kwadi, that is, **including** Kwadi, to the introduction of sheep herding. The work characterizes the profile of the proto-community on entering the area and outlines changes mediating between it and the profiles of modern Khoe-Kwadi groups in more detail. We take up this "migration-cum-immersion" model in §3.2.2. At this point, suffice it to say that the diversity among Khoe-Kwadi groups is explained by a multiplicity of temporally and geographically specific changes in different sub-groups, notably language contact and shift, cultural change, and extensive and multiple genetic admixture. Thus, the spread of the family as a whole is characterized as a complex process involving extensive interaction with indigenous populations rather than a simple demic colonization that spread among other things (a) new language(s).

Fehn, Amorim and Rocha (2022) take over the three-layer approach for the KBA and Güldemann's Khoe-Kwadi model. They flesh it out by remedying the previous dearth of genetic data about the Kwadi, Damara, and northern Kalahari Khoe, all Khoe-Kwadi-speaking groups in southern Angola and northern Namibia with strong non-Khoisan ancestry. They identify their non-Khoisan component as related to ancestry of neighboring Bantu speakers and mediated by contact occurring **after** the Khoe-Kwadi expansion (see §3.2.3).

3.2 Refining the population history of the KBA

In the following, we elaborate on the previous proposals in view of findings not yet fully appreciated for the modelling of KBA prehistory. Overall, the data assembled here also seem to support the linguistic three-stage scenario. Table 4 shows some basic correlations across the four disciplines that appear to converge on a tripartite layering of linguistic populations. This admittedly simplistic picture serves as a backdrop for our following discussion, which proceeds from the earliest to the latest population horizon.

Linguistics			**Typical subsistence**	**Typical archeology**	**Diagnostic genetics**
Family	**Type**	**Area**			
Bantu	Bantu	Bantu spread zone	Agropastoralism	Iron Age	mtDNA: various Y: E-M2, B-M150
Khoe-Kwadi	Khoe-Kwadi	Kalahari Basin	Herding∼foraging	LSA Herder	e.g., Lactase persistence
Kx’a	Non-Khoe		Foraging	Wilton	mtDNA: L0d, L0k Y: A-M51, A-M14, B-M192
Tuu					

Table 4: Interdisciplinary links in KBA populations within the four-field approach

3.2.1 Tuu and Kx'a and foraging prehistory

Human history in the KBA up to the end of the last millennium BC belonged to foragers and it is beyond doubt that Tuu and Kx'a languages go back to this time and thus represent the earliest extant linguistic KBA layer. Their special linguistic-typological character correlates with a distinct profile in terms of subsistence and associated cultural traits, compatible archeological records, and unique genetic makeup. Only the genetic profile (not captured fully in the highlighted bottom-right cell of Table 4), which percolated in various degrees all later population layers of the KBA, identifies a meaningful "Khoisan" concept.

Many other issues regarding the two language families remain anything but clear. Thus, are their multiple structural similarities due to long-lasting convergence or remnants of an ancient genealogical relation? Pronoun paradigms (Güldemann 2018b: 104) and reconstructed lexicon (Güldemann and Loughnane 2012: 243-5), rather than superficial comparisons of vocabulary from few geographically close dialects (Starostin 2008) or of short grammatical forms (Collins and Honken 2016, Collins 2017), indicate that future research needs to investigate the possibility that Non-Khoe is an ancient family. This can only be resolved by dedicated historical-comparative work.

Also, how far back should the two families be projected as lineages of the KBA? Pace common assumptions (cf. Mitchell 2010; 2016a, b), there are no linguistic grounds to be certain that Tuu and/or Kx'a have been in their modern area before the Holocene, raising the question when their speakers colonized the area, and from where? Do they have any relation to the population dynamics connected to sea-level change and coast-inland forager fluctuation in the south (§3.1)? Or is their history tied to changes revolving around the Wilton complex expanding from the north (§2.4.2), and in this connection, what was the nature and history of relations of KBA foragers to those in the north characterized by Nachikufan industries and geometric rock art (see Muianga 2013)?

Finally, must we reckon in the KBA during the Holocene with the existence of other forager lineages? Although linguistic data are unlikely to recover this, it can be expected on account of non-linguistic evidence at least in KBA peripheries. One case is the northwest along and north of the Angola-Namibia border known to have hosted foragers distinct from San further south (Estermann 1956, 1962).[13] The linguistic and genetic profile of groups known by such exonyms as Kwisi and Twa has been recently analyzed by Oliveira et al. (2018, 2023). This research confirms that they speak Bantu languages close to neighboring Kuvale and Herero-Himba, explained best by language shift. More significant is that their mtDNA profile turns out to be an outlier not only against Khoisan but even non-Khoisan

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[13] This is in line with the general assumption of different forager populations in the north based on findings from archeology (see §2.4.2 on LSA industries and §2.4.4 on rock art) and physical anthropology (Morris and Ribot 2006).

groups, who speak Bantu or Khoe-Kwadi languages.[14] The biological and cultural evidence is thus compatible with the hypothesis that these peripatetics derive from foragers who spoke languages unrelated to anything we know in the KBA today.[15]

The extant Tuu and Kx'a families were certainly subject to considerable dynamics in the later Holocene, quite apart from the impact of contact and competition with colonizing groups (cf. Denbow and Wilmsen (1986) for the Kalahari). Most modern languages are large dialect clusters whose coherence and geographical extension suggest expansions that are not many millennia old (§2.2.1). One question is whether these spreads were in terms of Güldemann, McConvell and Rhodes (2020: 14-5) of the "skirting" type into empty territories or of the "encroaching" type into areas of preexisting populations. Identifying the first type requires more fine-grained information about paleoclimatic dynamics that may have created depopulated areas. The second type concerns the character of neighboring populations and mutual group relationships. Such issues may still be plumbable in the Central Kalahari where encroaching expansions are observable. The overall picture there points to a layering of the three lineages whereby Kx'a seems to have been the earliest. Its presumably original compact distribution became interrupted by the newly colonizing Khoe and Tuu families (§2.2.1), which also explains the genetic affinities between Ju and ǂ'Amkoe (aka ǂHoan) speakers (see Vicente et al. 2019: 9). Unexpectedly, the area attracting these encroachments is ecologically quite unfavorable, which relates to another crucial question, namely the cause(s) of forager expansions. While one may be tempted to merely think of population pressure by incoming food producers, one must not underestimate forager-internal dynamics (cf. Güldemann, McConvell and Rhodes 2020: 14-6). The most recent history of Kx'a- and Tuu-speaking groups has been impacted strongly by contact with colonizing food-producers, which has been partly mentioned above and is taken up again in the following discussion.

3.2.2 Khoe-Kwadi and the advent of herding

The spread of pastoralism is currently by far the most controversial topic of KBA prehistory, especially among archeologists (Sadr 1998, 2003, 2008b, 2014, 2015; Smith 1990, 2008, 2014, 2016; Orton 2015). A lot of the discussion hinges on the conceptual distinction between foragers and herders (cf. Russell and Lander 2015), whereby the specific Khoekhoe pastoralism tends to inadequately steer the cultural modelling. Being aware of the multi-dimensional and partly clinal nature of cultural distinctions and thus problematic discrete categorization, we apply here the more general concept of food production in which control

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[14] The authors also investigated a peripatetic group called "Tjimba" - a term Himba-Herero herders use primarily for "paupers" without cattle. This Angolan group patterns linguistically and genetically with neighboring pastoralists. However, other "Tjimba" may well be closer to the Kwisi and Twa, for example, those studied by MacCalman and Grobbelaar (1965) in the Baynes Mountains of Namibia.

[15] Another possible locus of now extinct linguistic forager lineages is the South African coast related to the sea level dynamics mentioned in §2.4.1.

over the reproductive cycle of one’s caloric resources is a qualitative difference to its absence (cf. Güldemann, McConvell and Rhodes 2020). Hence, original foragers pursuing animal husbandry in this sense can no longer be viewed simply as foragers even if retaining many aspects of their earlier culture. Concretely, we see Sadr's (2003) "hunters with [reproducing herds of] sheep" on the food-producing side of the divide, which archeologists may or may not want to call "Neolithic". The central question in this context is the linguistic affiliation of the population(s) engaged in herding - this regarding two stages, namely a) during the transfer from eastern to southern Africa and b) subsequently within the KBA, whereby it is partly necessary to treat sheep and cattle separately. We proceed here from the more recent to the earliest events, starting with the important Cape region.

That is, much of the discussion about herding history revolves around the Khoekhoe. Sometimes the complex picture in the larger KBA merely seems to serve as a backdrop to elucidate the history of the narrow southwestern Cape (Khoekhoe pastoralists in modern Namibia are agreed to reflect a later northward expansion). Since the Khoekhoe were full pastoralists with sheep AND cattle (Fauvelle-Aymar 2008), a gradual transition from the archeologically attested sheep-oriented herding (see §2.4.3) to Khoekhoe pastoralism is unlikely. Indeed, the Cape is assumed to display two culturally distinct pastoral layers (Sadr 1998). Signs of economic and cultural change in the Cape a millennium after the first herder arrival are, for example, the transition from spouted to lugged pottery (Smith 2006) and a stark increase of cattle associated by a different human diet (Sealy 2010). This timing conforms with the linguistic diversity across Khoekhoe dialect clusters like Cape, !Ora, Eini, and Nama, which suggests a breakup of Proto-Khoekhoe considerably later than 2000 BP.

If the formation of Khoekhoe culture and language is indeed tied to the new focus on cattle, areas to the northeast of the Cape are implicated, which by then were predominantly Bantu-speaking (see §2.4.3). There is indeed various evidence that groups with a linguistic Khoe affiliation were present there and interacted particularly with Bantu groups, which could have resulted among other things in the adoption of sheep by Bantu and of intensive cattle-keeping by (pre)-Khoekhoe groups. The linguistic case has been made, albeit without sufficient methodological rigor (e.g., Westphal 1963, Ehret 2008). Recent work, notably Gunnink (2022), puts this idea on a sound footing (pace Heine and König 2008: 241): linguistic Khoe influence not only affected modern Nguni but should be assumed already for Proto-Nguni. This pushes the contact with pre-Khoekhoe varieties not only further back in time but also to a northeastern region far beyond the historical Khoekhoe range. A likely eastern origin also explains intriguing Khoekhoe lexemes apparently coming ultimately from Arabic like *mari-* 'money' (< Arabic *ma:l* 'wealth') and *daaxa-* 'cannabis plant, dagga' (< Arabic *daχ:ana* 'to smoke') as mediated by direct or indirect links to the Swahili coast and the Indian Ocean exchange network.[16] The implied route of cattle-oriented Khoe into the Cape is also compatible with Smith and Ouzman's (2004) expansion trajectory of non-forager geometric rock art from the Limpopo-Shashe area southwestwards along the Vaal and Orange.

In conclusion, Khoekhoe identity (and the term) should not be projected back to the earliest herders in both the KBA and the Cape. Yet more importantly, the incorporation of local foragers aside (Güldemann 2006), the above scenario implies that the Cape Khoekhoe harbour two distinct pastoralist traditions, whereby the affiliation of the submerged language(s) of the first layer becomes less certain. That it also belonged to Khoe is not unlikely (see below) but a more conclusive linguistic argument now requires detailed historical-comparative work within this family.

The above scenario for the Khoekhoe, notably their emergence in the southeastern KBA, may well relate to Sadr's (2015) claim of two events in the propagation of livestock in southern Africa. In any case, it is his early western spread along the Atlantic seaboard reaching the Cape 2000 BP that remains most controversial among archeologists, particularly regarding the problematic opposition between "demic" and "cultural" diffusion. The central challenge is the scarcity of unequivocal herder sites as opposed to abundant sites combining sheep remains and apparent forager-related records, provoking a hot debate about how to interpret such key archeological traits as ostrich eggshell beads, lithics, pottery, and different faunal remains, and whether these allow one to posit the presence of distinct forager and herder identities. We refer the reader to the large amount of literature revolving around this debate, notably on the (in)visibility of herders (cf. Robertshaw 1978, Fauvelle-Aymar et al. 2006, Sadr 2008b). We only mention here two things. First, according to Loftus and Pfeiffer (2023) forager sites in the southwestern Cape around the relevant time seem to show a response to new, presumably pastoralist, groups in the area rather than the plain adoption of livestock from other foragers. Second, Sadr's (1998, 2003) concept and term "hunters-with-sheep" remains as questionable as when invoked first. There are no convincing modern examples that can be conceived as realistic analogs for a prehistorical "forager world" in which livestock was transferred with enormous speed over large distances crossing multiple natural and social boundaries. Ikeya's (1993) oft-cited goat-herding G‖ana in the Central Kalahari are unlikely candidates as they are in fact encapsulated foragers in the periphery of a food-producing system sustained by Bantu immigrants, whose strong impact is betrayed among other things by the mixed genetic ancestry of precisely this San group (see §2.3.5). The presence of and contact with food-producing groups also characterize

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[16] Middle Eastern traders, presumably largely Arabic-speaking, ventured down the East African coast and partly into the African interior (cf. the ethnographic and genetic data about the Lemba, Soodyall 2013). This and possibly yet other groups are largely ignored as a potential source of Eurasian genetic ancestry in southern Africa, which is independent of the late admixture with European colonists.

archeologically attested cases of foragers who incorporated to some extent livestock into their subsistence (cf., e.g., Fewlass et al. (2020) on Lesotho).

The problems with archeological and cultural details aside, a major shortcoming of the controversy is an inadequate or even lacking appreciation of linguistic research. For one thing, the detailed linguistically oriented Khoe-Kwadi history proposed by Güldemann (2006, 2008a, 2020) does not model the spread of the family, and by implication of herding, as a large-scale demic migration. On the contrary, the overall scenario implies in large degree what Sadr (2015) later called "infiltration" by rather small groups entering into intensive interaction with preexisting foragers - a fact largely ignored by some pertinent contributions (e.g., Guillemard 2020). Linguistic findings nevertheless imply some amount of demic spread as languages in prehistory did not expand without any moving people who speak and generationally transmit them. Overall, linguistic, and now genetic, findings which involve **both** migration and contact render the counterposing of "demic" and "cultural" diffusion in the KBA an outdated approach.[17]

Yet more pertinent to the idea by Sadr and others of sheep being "handed over" between forager groups from the northern to the southwesternmost KBA is what such a scenario predicts for the resulting linguistic-cultural landscape. Down-playing Khoe-Kwadi-related spreads but considering the language distribution of Figure 1 (and not including the traceless extinction of unknow groups), one must expect Kx'a- and Tuu-speaking foragers to substantiate at least to some extent the hunters-with-sheep paradigm. However, there is no historical or modern evidence that they were the agents of such a cultural diffusion - more deeply entrenched herding is restricted to Khoe-Kwadi groups and this family did spread.

Regarding the question of bringing domestic animals down to the KBA, there are two major linguistic hypotheses. The traditional idea is "the acquisition of various aspects of culture, including livestock and material culture, by southern African [Khoe-Kwadi] Bushmen [around the northern KBA], from a people of northern origin" (Barnard 1992a: 30; see, e.g., Ehret 1982, Denbow and Campbell 1986). This idea leaves open why these "northerners" would themselves have stopped at the KBA margin after passing through the most curtailing tsetse-free corridor (cf. Figure 8). Several proposals exist on their linguistic affiliation, namely Central Sudanic (Ehret 1968, 1982), East Sudanic (Ehret 1998, 2001), Cushitic (Blench 2009), and - as the hitherto default source of food production - Bantu (e.g., Elphick 1977, Phillipson 1989). Bantu aside, there is no concrete linguistic evidence for any of the other language groups being close to the area at the relevant time (see Haacke (2008) for a general critique of Ehret's linguistic argument).

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[17] See also Jerardino et al.'s (2014) questionable exercise of abstractly modeling the "Neolithic transition" in southern Africa. They conclude that the "**cultural** effect on the [KBA] Neolithic wave of advance was **57 ± 6%**" taking as analog the fully agricultural European Neolithic but having a meager database of just 17 archeological KBA records (whereby the two earliest of 15 sheep dates by Pleurdeau et al. (2012) have even turned out to be invalid).

The other proposal entertained since Westphal (1963, 1980) and supported here is that herders, now identified linguistically as Pre-Khoe-Kwadi, came with at least sheep from eastern Africa themselves. This is based on various affinities of this family with languages in the northeast (see §2.2). It is also compatible with genetic data regarding autosomes, lactase persistence, and possibly Y-chromosomes in various modern Khoe-Kwadi groups (see §2.3). Only robust support from archeology is still missing due to insufficient data.

In this scenario, Khoe-Kwadi would be a linguistic population overlaying that of the foraging Tuu and Kx'a speakers. Multiple successive interactions between local and colonizing groups are behind the participation of Khoe-Kwadi in the linguistic KBA convergence zone as well as the partly strong overlap, sometimes virtual identity, of some modern family members with Tuu and Kx'a groups in terms of culture and/or biology. This explains why Khoe-Kwadi-speaking groups were originally subsumed under the outdated "Khoisan" concept associated with the KBA. Although appearing like an entrenched indigenous KBA lineage, Khoe-Kwadi is more likely to be immigrant to the area, in line with its wide and fragmented distribution and its affinity to eastern Africa, and to have become "sedimented" in the southern periphery of its earlier spread zone (cf. Nichols 1992: 18-20), because it was widely supplanted by the subsequent southward Bantu expansion.

	Language group	Language	Subsistence	**Genetic profile**
0	proto-group	Khoe-Kwadi	Pastoralism	non-Khoisan
1	Kwadi	**Shift to Pre-Kwadi from ?Bantu**	**?**	Maintenance of non-Khoisan
2	Northeastern Kalahari Khoe	Maintenance with Non-Khoe substrate	Shift to foraging	Maintenance of non-Khoisan
3	Southwestern Kalahari Khoe	Shift to Khoe from Non-Khoe	Maintenance of foraging	Maintenance of Khoisan
4	Pastoral Khoekhoe	Maintenance with Non-Khoe substrate	Maintenance of pastoralism	“Relative” shift to Khoisan
5	Hai‖om, ǂAakhoe	Shift to Khoekhoe **from Ju and ?Khoe-Kwadi**	Maintenance of foraging	**Maintenance of Khoisan**
6	Damara	Shift to Khoekhoe **from ?Bantu or Khoe-Kwadi**	**?**	Maintenance of non-Khoisan

Table 5: Simplified population history of major Khoe-Kwadi-speaking groups (adapted from Güldemann 2008a: 125, 2020: 139)

Table 5 gives the schematic outline of Khoe-Kwadi history according to its major subgroups. This is necessarily crude and in particular cannot capture specific genetic admixture. The assessments by Güldemann (2008a, 2020) largely hold and are supported now by molecular rather than physical anthropology. In particular, southwestern Kalahari Khoe groups like

Naro and G|ui, when assessed as populations, are best viewed as Non-Khoe foragers having shifted to a Khoe language. G‖ana and Tshwa are similar but show stronger genetic admixture from Bantu. Northern Kalahari Khoe groups like Khwe and Shua are more complex: they could be modeled as Khoe herders having incorporated a pronounced linguistic and genetic forager substrate (see Cashdan (1986) for supporting ethnographic evidence) in a first phase and having lost the herding component and been subject to additional strong Bantu influence in a second phase (but see also §3.2.3). The pastoral Khoekhoe similarly appear as Khoe herders with an even stronger San substrate, whereby it must be considered, too, that the surviving groups both in the Cape and in Namibia have a later, yet more complex contact history. San language shift also holds for Hai‖om and ǂAakhoe in relation to Namibian Khoekhoe, additionally allowing for extensive genetic admixture from yet other neighbors. Güldemann (2008a: 121-4) contains additional details on all subgroups within the "migration-cum-immersion" model. Changes compared to this study, bolded in Table 5, concern Khoe-Kwadi-speaking groups in northern Namibia and southern Angola and are treated subsequently in connection with the Bantu expansion.

3.2.3 Bantu - rethinking its expansion in the KBA

The modern picture and archeological findings imply that the impact of the Bantu expansion in the KBA cannot be underestimated. This major population process in conjunction with European colonization is why the KBA as a linguistic area is a reconstruction rather than a modern reality because its languages have been submerged in large parts of the area. While Wilmsen's (1989) idea of early forager encapsulation cannot be generalized across the board, Bantu groups indeed entered deep into the Kalahari (Denbow and Wilmsen 1986, Denbow et al. 2008) so that even core KBA groups display non-Khoisan genetic admixture (§2.3.5).

Bantu influence on KBA-language populations and the converse phenomenon that Bantu groups incorporate genetic Khoisan ancestry accompanied by linguistic substrate interference also applies in the northwestern KBA (Gunnink et al. 2015, Pakendorf et al. 2017, Oliveira et al. 2023). However, genetics are qualitatively distinct there: not only do San populations have considerable portions of Western-Bantu admixture but such Khoe-Kwadi-speaking groups as the Damara and Kwadi predominantly cluster with this ancestry type (cf. Figure 2). Is such a situation adequately explained in the three-stage model as the late result of Bantu admixture as per Fehn, Amorim and Rocha (2022)?

We question this hypothesis in the light of various recent findings about the Bantu expansion (see Bostoen 2018) that are also crucial for modeling its history in the KBA. First, the current evidence contradicts the original assumption that Bantu groups left the Nigeria-Cameroon homeland by skirting the rainforest and moving into eastern Africa but supports overwhelmingly the "Late-split" or "East-out-of-West" model. That is, Bantu only penetrated and traversed the rainforest (Pakendorf, Bostoen and de Filippo 2011; de Filippo et al. 2012) so that the linguistic west-east split emerged later by Western Bantu giving rise to Eastern

Bantu, which only subsequently spread widely with the savannah-adapted agropastoral subsistence, including into the KBA. Hence, the modern Bantu spectrum north of and within the KBA has two major distinct layers in linguistic (cf. Bostoen 2007a, b), genetic, and cultural terms. Last but not least, the earliest Bantu groups after leaving the rainforest cannot be assumed to have had a full-fledged agricultural subsistence but rather depended on arboriculture and low-scale farming (Bostoen 2014, Bostoen and Muluwa 2017).

The above points and the fact that eastern and southern Africa are equally distant from the Bantu staging point south of the rainforest make a version of Westphal's (1963: 261, 1980: 72) heretofore unorthodox scenario likely. Early Bantu communities, when still low-level food-producers, could have advanced directly from the forest margin southwards, reaching the northern KBA at the same time as or even partly earlier than Khoe-Kwadi-speaking herders. A link between the Congo and the KBA is in fact a long-held hypothesis by Denbow (1990, 2014: 62, 84-105). He identifies a "Ceramic LSA" on the Loango coast south of the rainforest from 3000 BP on, which is characterized by pottery, oil palm exploitation, and, around 300 BC, iron but lacks other crops of the later Bantu-typical subsistence. He also explicitly entertains a connection with the first Bantu speakers in the northern KBA.[18]

An early presence of Western Bantu groups having pottery and relying on foraging and early-stage-farming would throw a different light on the formation of modern Khoe-Kwadi-speaking groups in the Angola-Namibia border zone. Regarding genetics, apart from the most recent Bantu admixture, they would be expected to combine in different ways four other ancestries of: a) early Western Bantu as proposed here, b) genuine Khoe-Kwadi herders, c) local Ju foragers, and d) least notable but graspable in the Kwisi and Twa, local non-Khoisan foragers (cf. §3.2.1). Contact could have produced subsistence profiles ranging from foraging to early forms of food production, notably smallstock husbandry but also simple farming brought by early Bantu. The last component may explain such practices and accompanying vocabulary in Khwe, hitherto completely unexplained (Köhler 1966, 1986).

The new hypothesis is also compatible with the linguistic information on the relevant groups. Khwe is special in Kalahari Khoe in showing not only Ju elements but also Bantu influence untypical for the late-contact profile across the KBA, notably prenasalized consonant clusters and, reminiscent of Bantu verb extensions, the most complex system of verb suffixes within Khoe. Kwadi is an archaic Khoe-Kwadi language with a considerable Bantu component, which may well have entered the language as substrate interference.

The Damara appear to be the most enigmatic case. They speak Khoekhoe implying a language shift after the advent of Nama herders. Vedder's (1923: 153-169) information about linguistic features deviating from mainstream Nama does not allow any inference

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[18] An early arrival of Western Bantu groups in the northwestern KBA would also throw a new light on the early presence of iron, the fast diversification of thin ware, and the partly asynchronic spread of these ceramics in relation to sheep.

about their original language. Hence, it could also have been Bantu, which, however, would have differed from such modern languages as Herero etc. as these also integrate the later Eastern Bantu impact.[19] Equally unknown is the original Damara subsistence due to a long interaction with and subordination under Khoekhoe and Herero. Barnard (1992a: 199-213) reported practices ranging from foraging to low-level food production, which is compatible with the profile hypothesized here. Overall, a much earlier arrival of Bantu particularly in the northwestern KBA before the advent of their relatives with a northeastern savannah subsistence is possible, which changes the historical population models tremendously.

3.3 Outlook

The above discussion should have made clear that in spite of considerable progress, many questions revolving around KBA population history still remain open. We outline a few areas which merit more attention in future research in order to tackle them.

The major task for linguists is to deepen or, on some groups, even start historical-comparative research based on the considerably increased amount of empirical data on most languages. This concerns both reconstruction work in order to understand family-internal dynamics and research on past language contact as a reflex of interacting speech communities. For inferring prehistoric culture and ecology that can be combined with genetic and archeological observations, archeolinguistics is to focus in particular on lexical reconstruction within the 'words-and-things' approach.

Genetics should intensify more fine-grained population research by shifting the focus to recent small-scale dynamics, besides ancient population processes that are interesting for early human evolution but do not inform the history of even the oldest linguistic lineages like Tuu and Kx'a. Important progress can also be expected from increasing aDNA samples with denser time transects in the Holocene, allowing us to better understand the spatio-temporal distribution of ancestries related to modern Khoisan populations, to pinpoint the exact time of their replacement in territories where they are no longer present, and to gain insight into the complexity of admixture with incoming groups.

Last but not least, we need far denser archeological sampling across the entire KBA beyond the relatively well surveyed South Africa. A more representative picture would allow a) tracing the dynamics of individual markers of subsistence and culture such as artifacts, domesticates, settlement patterns etc. more precisely through space and time, and b) establishing a robust classification of site types that can be related conclusively to social and/or economic identities. This does not only concern the simple distinction of forager vs. herder vs. farmer groups but also a fine-grained differentiation within these basic types. This

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[19] The gentic proximity between Damara and Herero suggests that the latter are descendents from a similar source population further north that shifted language during this later Bantu expansion phase.

is particularly relevant for forager traditions, as this is crucial for illuminating population dynamics before the advent of food production.

In geographical terms, future research needs to integrate systematically the KBA periphery, which harbors groups crucial for a better understanding of the entire area as they may define its geographical limits or reflect a wider distribution of its population traits in the past. The northwestern KBA boundary has been in the focus of our present discussion but areas further east are just as important, as shown for Zambia by genetics (Barbieri et al. 2013b) and for Zimbabwe in research on music (Kubik 1998) and fine-line rock art.

From a general methodological perspective, the past research has been hampered recurrently by confounding concepts and terms across different disciplines and/or applying incommensurate time scales. In particular, proto-languages or modern ethno-linguistic groups must not be transferred rashly to population entities in archeology, recent language families are incompatible with time depths beyond the Holocene, etc. Accordingly, the mutual understanding between the different disciplines involved must become more substantial in order to achieve a true communication between them.

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Abbreviations

aDNA ancient DNA, BP before present, EIA Early Iron Age, KBA Kalahari Basin area, LIA Later Iron Age, LSA Later Stone Age, mtDNA mitochondrial DNA, PCA principle-components analysis, SNP single nucleotide polymorphism

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