Southern Africa as a phonological area

Christfried Naumann & Hans-Jörg Bibiko

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## 1. Introduction

### Phonological similarities

**Naro [nhr]** (Khoe-Kwadi; Botswana, Namibia; Visser in Vossen 2013: 60ff. and others)

#### Consonants

<table>
<thead>
<tr>
<th></th>
<th>bilab</th>
<th>alv</th>
<th>alv affr</th>
<th>pal</th>
<th>vel</th>
<th>velar/uv affr</th>
<th>glott</th>
<th>dent</th>
<th>ingr alv</th>
<th>ingr pal</th>
<th>ingr al-lat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>stop, vls.</strong></td>
<td>(p)</td>
<td>t</td>
<td>ts</td>
<td>k</td>
<td>kx</td>
<td>kg</td>
<td>?'</td>
<td>c</td>
<td>! q</td>
<td>† tc</td>
<td>‖ x</td>
</tr>
<tr>
<td><strong>stop, aspir.</strong></td>
<td>(pʰ)</td>
<td>tʰ</td>
<td>th tʰ</td>
<td>tsʰ</td>
<td>tsh</td>
<td>kʰ</td>
<td>kh</td>
<td>‖ h ch</td>
<td>!ʰ qʰ tʰ</td>
<td>tchʰ</td>
<td>h xh</td>
</tr>
<tr>
<td><strong>stop, vd.</strong></td>
<td>b</td>
<td>ʰw</td>
<td>ʰd</td>
<td>ʰr</td>
<td>dz</td>
<td>g</td>
<td>gh</td>
<td>‖ dc</td>
<td>dq tdc</td>
<td>dx</td>
<td></td>
</tr>
<tr>
<td><strong>stop, ejective</strong></td>
<td>t’</td>
<td>ts’</td>
<td>kx’</td>
<td>kg’</td>
<td>‖ ’ c’</td>
<td>’ q’</td>
<td>’ † tc’</td>
<td>‖ ’ x’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>nasal, voiced</strong></td>
<td>m</td>
<td>n</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>nc</td>
<td>nq ntc <strong>nx</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>fricative, vls.</strong></td>
<td>(f)</td>
<td>s</td>
<td>x</td>
<td>g</td>
<td>h</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>lateral approx.</strong></td>
<td>(l)</td>
<td></td>
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<td></td>
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<tr>
<td><strong>trill, voiced</strong></td>
<td>[r]</td>
<td>r</td>
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<tr>
<td><strong>approximant</strong></td>
<td>[w]</td>
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<td>j</td>
<td>y</td>
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</tbody>
</table>

- large consonantal inventory (45 c.)
- clicks
- aspirated and ejective stops
- dorsal affricate
# 1. Introduction

Phonological similarities

**Tsonga ~Changana, Thonga** [tso] (Bantu S.53, RSA, Mocambique; Baumbach 1987: 3-20 and others)

## Consonants

<table>
<thead>
<tr>
<th></th>
<th>bilab</th>
<th>lab-dent</th>
<th>alv</th>
<th>alv affr</th>
<th>alv later</th>
<th>p-alv (affr)</th>
<th>vel</th>
<th>glott</th>
<th>ingr dint</th>
<th>other (+ secondary)</th>
</tr>
</thead>
<tbody>
<tr>
<td>stop, vls.</td>
<td>p</td>
<td>pf</td>
<td>pf</td>
<td>t</td>
<td>ts</td>
<td>tl</td>
<td>tl</td>
<td>tf</td>
<td>c</td>
<td>k</td>
</tr>
<tr>
<td>stop, aspir.</td>
<td>p(_h)</td>
<td>ph</td>
<td>pf(_h)</td>
<td>th</td>
<td>th</td>
<td>ts(_h)</td>
<td>tsh</td>
<td>tl(_h)</td>
<td>thl</td>
<td>t:j</td>
</tr>
<tr>
<td>stop, vd.</td>
<td>b</td>
<td>bv</td>
<td>bv</td>
<td>d</td>
<td>dz</td>
<td>dl</td>
<td>dl</td>
<td>d(_3)</td>
<td>j</td>
<td>g</td>
</tr>
<tr>
<td>stop, breathy*</td>
<td>b(_i)</td>
<td>bh</td>
<td>bv(_h)</td>
<td>bvhd(_h)</td>
<td>dh</td>
<td>dz(_h)dzhd(_l)</td>
<td>dhl</td>
<td>d(_3)</td>
<td>jh</td>
<td>g(_h)</td>
</tr>
<tr>
<td>stop, vd. impl.</td>
<td>b(_l^*)</td>
<td>b'</td>
<td>d(_l^*)</td>
<td>d'</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>nasal, voiced</td>
<td>m</td>
<td>[m(_j)]</td>
<td>n</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>nasal, other*</td>
<td>m(_h)</td>
<td>mh</td>
<td>nh</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>fricative, vls.</td>
<td>(\phi^*)</td>
<td>ff</td>
<td>f</td>
<td>s</td>
<td></td>
<td></td>
<td>l~(\delta^?)</td>
<td>hl</td>
<td>j</td>
<td>x</td>
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<tr>
<td>fricative, vd.</td>
<td>(\beta--\nu)</td>
<td>vv</td>
<td>vh</td>
<td>z</td>
<td></td>
<td></td>
<td>h(_g--\lambda^?)</td>
<td>lh</td>
<td>5</td>
<td>xj</td>
</tr>
<tr>
<td>fricative, other*</td>
<td>y</td>
<td>vh</td>
<td></td>
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<td>lateral approx.</td>
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<tr>
<td>trill, voiced</td>
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<tr>
<td>intermittent, other*</td>
<td>r(_h)</td>
<td>rh</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>approximat</td>
<td>w</td>
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<td>j</td>
<td>y</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>approx., other*</td>
<td>w</td>
<td>wh</td>
<td></td>
<td></td>
<td></td>
<td>j</td>
<td>yh</td>
<td></td>
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</tr>
</tbody>
</table>

*Uncertain.

- large consonantal inventory (68 c.)
- (clicks)
- aspirated, breathy and implosive stops
- lateral obstruents
Example: Distribution of ejectives/glottalized consonants

Maddieson (2013)
# 1. Introduction

## Africa/South: Phonological characteristics

(Clements & Rialland 2008: 81)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>- ejective stops</td>
<td><em>very common</em></td>
</tr>
<tr>
<td>- aspirated stops</td>
<td><em>very common</em></td>
</tr>
<tr>
<td>- clicks</td>
<td><em>common</em></td>
</tr>
<tr>
<td>- two series of high vowels</td>
<td><em>infrequent</em></td>
</tr>
<tr>
<td>- nasal vowels</td>
<td><em>Khoisan: very common</em></td>
</tr>
<tr>
<td>- 3+ tone levels</td>
<td><em>Khoisan: infrequent</em></td>
</tr>
<tr>
<td>- slack voiced stops</td>
<td><em>Bantu: common</em></td>
</tr>
<tr>
<td>- implosives</td>
<td><em>Bantu: infrequent</em></td>
</tr>
</tbody>
</table>

## Linguistic features of the Kalahari Basin:

### Phonetics-phonology (Güldemann & Fehn, in prep.)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Tuu</th>
<th>Kx’a</th>
<th>Khoe-Kw.</th>
<th>Nguni</th>
<th>Tswana</th>
</tr>
</thead>
<tbody>
<tr>
<td>- ejectives</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>(X)</td>
</tr>
<tr>
<td>- aspirates</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>- clicks</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>(X)</td>
</tr>
<tr>
<td>- nasalization</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>- register tone system</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>- uvular stops</td>
<td>X/--</td>
<td>X/--</td>
<td>X/--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>- obstruent-obstruent clusters</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>- pharyngealization</td>
<td>X</td>
<td>X</td>
<td>X/--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>- specific lexical root phonotactics</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

\(X = \text{frequent}, \ -- = \text{absent}; \text{list includes non-phonological features not given here}\)
1. Introduction

Problems

A data basis of previous studies (coverage of languages and features)

A conflicting conclusions:

"A third zone, the South, is sharply delineated by the remaining features ....: ejective and aspirated stops, clicks, and slack voiced stops. To these features we could add their characteristic series of lateral affricates and fricatives. All these features are widely shared by Khoisan and Bantu languages in the region."

Clements & Rialland (2008: 82)

"... [S]ubstrate interference contributed repeatedly to creating linguistic similarities [in Nguni, Tswana, and Afrikaans] with Kalahari Basin languages (or at least maintaining existing ones) but has not been strong enough to make the newcomers "full" members of the area."

Güldemann & Fehn (in prep.: 18; cf. also Güldemann 2010: 572f.)

(Note: Clements & Rialland (2008) refer to phonological areas, Güldemann & Fehn (in prep.) are concerned more generally with linguistic areas.)
1. Introduction

This study

Å more systematic investigation of phonological features (phoneme inventories, syllable structure)
Å Southern Africa vs. Kalahari Basin ("Khoisan") vs. Southeastern Bantu
Å compared to other languages further north (subequatorial Africa)

Å Are there sufficient features to treat Southern Africa as one clearly delineated area?
Å Can we recognize neat subareas?
Å Is it possible to compare their validity on quantitative data?
Å Are there South African languages that are not part of the linguistic area? (Why?)
Å Are there links to areas outside of the region?
1. Introduction

Linguistic and phonological areas

- phonological areas: linguistic areas claimed on the basis of phonological traits
- linguistic areas (Campbell 2006: 6)
  - several (marked) linguistic features
  - shared by two or more languages (unrelated, or from different subgroups of the family)
  - in a geographically contiguous area
  - < diffusion (borrowing)

Qualifications

- I agree: "linguistic areas are after-the-fact constructs based on the residue and accumulation of borrowed traits" (Campbell 2006:14)
- I do not fully agree:
  - "... [I]t would be more productive just to investigate the facts of linguistic diffusion without the concern for defining linguistic areas." (Campbell 2006:2)
  - "the whole notion of 'areal phenomena' is built on the convenient fiction that each language has a specific location in space, that no more than one language is spoken in each place, and that language contact takes place between adjacent languages. However, language contacts typically occur in densely [multilingual] populated places ..." (Dahl 2001, cited in Campbell 2006: 14)

Cf. also Heine & Leyew (2008: 16)
1. Introduction

"(South African) Khoisan" languages: 3 distinct families

**Khoe-Kwadi** (≈"Central Khoisan")

- Kwadi†
- Khwe (Capriví Khwe, ||Ani ...; Ts'ixa ?)
- Shua (Cara, Deti†, |Xaise, Danisi ...)
- Tshwa (Kua, ...)
- Naro
- G||ana (G|ui, G||ana)
- Namibian Standard Khoekhoe
  (Nama-Damara, Hai|om, †Aakhoe)
- !Ora-Xiri (†)
- Eini†
- Cape Khoekhoe†

**Kx’a** (≈"Northern Khoisan")

- Ju (NW !Xun, Ju'|hoan, ...)
- †Amkoe (N¹aqriaxe, †Hoan, Sasi)

**Tuu** ("Southern Khoisan")

- Taa (West !Xoon, East !Xoon, ...)
- Lower Nossob† (|Haasi, †Auni)
- N||ng (= N|uu, †Khomani, ...)
- !Xam† (Strandberg, Achterveld, ...)
- †Ungkue†
- †Xegwi†

Güldemann (2014: 7), modified
1. Introduction

No accepted genealogical classification of Bantu languages

The referential system by Guthrie (1967-71) (revised by Maho 2009)

- geographic zones: A - S
- local groupings, e.g. A10, S40
- individual languages, e.g.
  - Ewondo A.72
  - Bulu A.74
  - Fang A.75(1)
  - Lingala C.30b
  - Kinyarwanda D.61
  - Kirundi D.62
  - Luganda E.15
  - Gikuyu E.51
  - Kamba E.55
  - Sukuma F.21
  - Swahili G.42-43
  - Kikongo H.14-16
  - Kimbundu H.21
  - Chokwe K.11
  - Luba-Kasai L.31
  - Chichewa N.31
  - Tonga (Zambia) M.64
  - Makhuwa P.31
  - Umbundu R.11
  - Ovambo R.21-24
  - Herero R.31
  - Shona S.11-15
  - Tswana S.31
  - N. Sotho S.32
  - S. Sotho S.33
  - Xhosa S.41
  - Zulu S.42

Möhl (1981: 81)
1. Introduction

Bantu languages of Southern Africa (local, largely non-controversial genealogical groupings)

(Zone K)
K10: Ngangela, Chokwe, Luchazi, ...  
K30: Kwangali, Manyo, Mbukushu, ...  
K40: Fwe, Ikuhane (=Subiya), Totela

(Zone R)
R20 (Wambo): Kwanyama, Ndonga, ...  
R30 (Herero): Central Herero, Mbanderu, ...  
R40 Yeyi

(Zone S)
S10 (Shona): Standard Shona, Ndau, Kalanga, ...  
S20 Venda  
S30 + K20 (Sotho-Tswana): Tswana, Kgalagadi, Northern Sotho, Pai, Southern Sotho, Lozi  
S40 (Nguni): Xhosa, Zulu, Swati, Phuthi, Transvaal Ndebele, Ndebele of Zimbabwe  
?S50 (Tswana-Rhonga): Tswana, Tsonga (=Changana), Rhonga  
?S60 (Copi): C(h)opi, Gitonga

1. Introduction

Other languages

**Indo-European**

Germanic: Afrikaans

Ignored:
- sign languages
- restructured urban varieties and contact languages
- other Indo-European languages

Notes:
- maps intended as abstraction of majority languages (plus selected minorities and extinct languages)
- Afrikaans also in Namibia (Khoekhoe/Afrikaans bilingualism)
### 2. Procedure

**Data collection - Phoneme inventories**

- Extraction of phoneme inventories and syllable types from published sources on 138 languages.
- Special arrangement of consonant charts: affricates and clicks parallel to place of articulation, following the "cluster analysis" of clicks (Nakagawa 2006); e.g. for Taa/West !Xoon below.

<table>
<thead>
<tr>
<th>bilab</th>
<th>lab-</th>
<th>dent</th>
<th>alv</th>
<th>alv</th>
<th>alv</th>
<th>alv</th>
<th>retro</th>
<th>p-alv</th>
<th>pal</th>
<th>vel</th>
<th>lab-</th>
<th>vel</th>
<th>vel/u</th>
<th>phar</th>
<th>glott</th>
<th>ingr</th>
<th>ingr</th>
<th>ingr</th>
<th>ingr</th>
<th>ingr</th>
<th>ingr</th>
<th>al-lat (+ secondary)</th>
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<tbody>
<tr>
<td>p</td>
<td>f</td>
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<td>t</td>
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<td>shh</td>
<td>shh</td>
<td>k, k^w, t^y</td>
<td></td>
</tr>
<tr>
<td>stop, vls.</td>
<td>p</td>
<td>tf</td>
<td>ts</td>
<td>ts^h</td>
<td>ts^h</td>
<td>ts^h</td>
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<tr>
<td>stop, aspir.</td>
<td>ph^h</td>
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<tr>
<td>stop, vd.</td>
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<td>stop, breathy</td>
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<td>d^h</td>
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<td>stop, ejective</td>
<td>p'</td>
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</tr>
<tr>
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<td>stop, other</td>
<td>dz'</td>
<td>g'</td>
<td>g'</td>
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14
2. Procedure

- language sample: 138 languages
  - aimed at maximal number of documented languages of Southern Africa (cf. above)
  - Sandawe & Hadza (Greenberg's "Khoisan": clicks)
  - 'Southern' Cushitic: Dahalo (clicks), Burunge, Iraqw
  - 3–6 languages of different groupings in the remaining Bantu zones (A–P)
  - exemplary languages for other subequatorial and adjacent lineages (Non-Bantu Bantoid [Niger-Kordofanian]; Gbayic, Bandic, Ngbandic, Mbaic, Baka-Mundu, Zandic [Niger-Kordofanian/"Ubangian"]; Lowland East Cushitic [Afroasiatic]; Western, Eastern and Southern Nilotic, Moru-Mangbetu, Kuliak ["Nilo-Saharan"])

- each language: coding of 81 numerical or categorical phonological features, e.g. "number of consonants" (14–88) or "whistled obstruents" (0 absent, 1 present)
- mapped value plots for each feature (Hans-Jörg Bibiko, in "R")
- visual inspection: assessment of 1) areally distributed features and 2) recurring areas (of similar distributions) > Kalahari Basin, Southeastern Bantu, and Southern Africa
- for each language, counting how many features are shared with these areas, e.g. "How many of the 15 typical Kalahari features are found in language A, B, C ...?" > listing and histograms
- summary for language groups

Genealogical groupings following Güldemann & Hammarström (p.c./in prep.)
Kalahari Basin

> 5 clicks

significant click inventories

*Presence of clicks*

- 0
- 1-5
- > 5

3. Results: Kalahari Basin
>3 click types
more than three basic click types, e.g. ʘ, ‖, ‥, ‖

*Number of basic click types: 0 - 5*
3. Results: Kalahari Basin

/ejectives/
presence of ejective obstruents contrastive with plain series,
e.g. /k’/ : /k/

Presence of ejective obstruents
- no ejectives
- non-contrastive with plain stops
- contrastive with plain stops
3. Results: Kalahari Basin

Vn
presence of nasalized vowels
e.g. /â/ (:/a/)

Presence of nasalized vowels
☐ 0
■ > 0
3. Results: Kalahari Basin

> 2 tones
presence of complex tone systems
including more than 2 tone levels,
e.g. high : mid : low

*Number of distinctive tone levels*
☐ non-tonal
☐ 2 tone levels
■ > 2 tone levels
3. Results: Kalahari Basin

Kalahari Basin ("South African Khoisan"): 15 (13) typical features

- **> 5 clicks**: significant inventory of clicks
- **> 3 click types**: more than three basic click types, e.g. ⊙, |, !, †, ||
- **/ejectives/**: presence of ejective obstruents contrastive with plain series, e.g. /k’/ : /k/
- **Vn**: presence of nasalized vowels, e.g. /ā/ (/:a/)  
- **> 2 tones**: presence of complex tone systems including more than 2 tone levels, e.g. H : M : L
- **KX**: presence of dorsal (velar or uvular) affricates, e.g. kx, qχ, kχ’
- **uvulars**: presence of uvular obstruents, e.g. q, g, χ, qχ’
- **TK onsets**: presence of coronal-dorsal syllable onsets (ignoring plain clicks), e.g tk, s+k, ts+x, ts’+χ
- **no voiced frics**: absence of voiced fricatives, e.g. /s/, /ʃ/, but */z/
- **1 sibilant**: presence of one sibilant (place of articulation) only, e.g. /s/ but */ʃ/
- **R, no L**: presence of intermittents (taps, flaps, trills) and absence of lateral approximants
- **Vqh**: presence of non-modal or pharyngealized vowels, e.g. /ă/, /ã/, /ã/
- **N coda**: exclusively nasals allowed in syllable codas (C(C)V(N) syllable structure)
- **no NC**: absence of nasal + obstruent syllable onsets, e.g. *NCV and *N̄CV
- **no C+w**: absence of obstruent + /w/ onset clusters
3. Results: Kalahari Basin

Kalahari Basin: Features by language

- ideal phonological area: clear boundaries (not fuzzy)
- all "Khoisan" languages show at least 10 out of 15 typical phonological features, no other language has more than 7

Bimodal distribution, discrete boundary

Histogram

"(South African) Khoisan" languages of the sample

Number of features out of 15 phonological features typical for South African Khoisan
3. Results: Kalahari Basin

"(South African) Khoisan" languages of the sample

Features by language
### 3. Results: Kalahari Basin

#### Features by language group

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<th>&gt;3 click types</th>
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0: wrong/no; < 0.26 infrequent, 0.26 - 0.74 common, > 0.74 very frequent; 1: true/yes

Average of area: 1.00 0.96 0.93 0.67 0.96 0.92 1.00 1.00 0.75 0.69 0.70 0.63 0.33 0.72 0.79

Average of languages outside: 0.15 0.00 0.09 0.09 0.23 0.09 0.00 0.16 0.11 0.14 0.14 0.16 0.37 0.37 0.24

Difference: 0.85 0.96 0.79 0.58 0.73 0.82 1.00 0.84 0.64 0.55 0.55 0.47 0.46 0.35 0.55
4. Results: Southeastern Bantu

Southeastern Bantu

> 2 affricated series
more than two series of affricates, e.g. \( \text{ts, tʃ, pf} \) (\( t, f \))

Number of affricated series
in paradigmatic relationship with non-affricated stop series at least once (ts/dz :t, tf/dʒ :t, pf/bv :p, kχ, qχ, tɬ )

0 – 5

e.g. Tsonga: 4 affricated series
Å /pf, pfʰ, bv, bvʰ/
Å /ts, tsʰ, dz, dzʰ/
Å /tʃ, tʃʰ, dʒ, dʒʰ/
Å /tsʰ, tsʰʰ, dzʰ, dzʰʰ/
Å (+ /pʃ, bʒ/?)
(cf. /p, pʰ, b, bʰ/)
4. Results: Southeastern Bantu

TL

presence of lateral obstruents,
 e.g. ŧ\, tl\, tɬ\, ɬɭ

*Number of obstruents with lateral airstreams (ɭ, tl, tɬ, ɬɭ), (excluding lateral clicks, lateral approximants)*

- □ 0
- ■ > 1

e.g.
Dahalo (Cushitic) /ɭ, tlɭ/
Iraqw (Cushitic) /ɭ, tlɭ/
Sandawe (isolated) /ɭ, tlɭ, tlɭ, ɬɭ/
Tswana (S31) / tlɭ, tlɭh/
N.Sotho (S32) / ɭ, tlɭh, tlɭ/
Chopi (S61) / ɭ, ɭɭh, ɭɭh, ɭɭh /
Tsonga (S53) / ɭ, ɭɭ, tlɭ, tlɭh, dlɭ, dlɭh /
\| Xegwi (Tuu) / ɭ, ɭɭ, ɭɭh, ɭɭh, ɭɭh /
Zulu (S42) / ɭ, ɭɭ (kɭɭ) /

27
4. Results: Southeastern Bantu

whistled obstruents (simple [non-velarized] labialized sibilants and affricates, e.g. \( s^v, z^v, t\tilde{s}^v \))

Shona (Zimbabwe): /z/ : /z^v/ : /ʒ/ ( :/z + w/)

<table>
<thead>
<tr>
<th>[z i]</th>
<th>[z^v i]</th>
<th>[ʒ i]</th>
</tr>
</thead>
<tbody>
<tr>
<td>/zino/</td>
<td>/z^vino/</td>
<td>/ʒiʒa/</td>
</tr>
<tr>
<td>'tooth'</td>
<td>'now'</td>
<td>'rainy season'</td>
</tr>
</tbody>
</table>

"Shona" in Ladefoged et al. (2009).
4. Results: Southeastern Bantu

whistled obstruents

presence of whistled fricatives and affricates, e.g. \( s^v, z^v, ts^v \)

*Presence of whistled fricatives/affricates*

- 0
- > 1
4. Results: Southeastern Bantu

**ph:f**
contrast between bilabial and labio-dental continuants,
e.g. /ɸ/:/f/, /m/:/m̥/, /β̞/:/ʋ/
(excluding p:pf, mp:mf, etc.)

*Presence of bilabial continuants contrastive with labio-dental counterparts*

- 0
- > 0
4. Results: Southeastern Bantu

implosives
presence of implosives, e.g. /ɓ/ or /b/ [ɓ]

Presence of implosives
☐ no observed implosives
☐ non-contrastive with voiced stops
■ contrastive with voiced stops
4. Results: Southeastern Bantu

Slack voiced stops

slack voice: slightly increased glottal aperture and flow (less than for breathy voice), F0 depression

e.g. Xhosa: voiced implosive /ɓ/ vs. slack voiced /b̤/ (Nguni: main acoustic cue is F0 depression)

```
[ɓɔŋɡa]  \ [b(¸)ɔŋɡa]
```

4. Results: Southeastern Bantu

cf. Breathy voiced stops

breathy voice: more increased glottal aperture and flow, loose form of vibration of vocal folds

e.g. Taa/West !Xoon: voiced /b/ vs. breathy voiced /bʱ/

[ ʰ b a r e ]

'bread'

[ ʰ bʱ a m (bʱam)]

'to be soft'

BH,DH
presence of slack (or breathy) voiced stops,
e.g. /b/ or /bʱ/

**Presence of breathy or slack voiced stops**

- □ absent
- ■ present

e.g.
NW !Xun (Kx'a) \( /dʒ^{h}: tʃ : tʃ^{h} : tʃ' : dʒ : dʒ' / \)
ǂ'Amkoe (Kx'a) \( /dz^{h}: ts : ts^{h} : ts' : dz : dz' / \)
Taa/W.ǃXoon (Tuu) \( /g^{h}: k : k^{h} : k' : g : g' / \)

Xhosa (S41) \( /b : p' : p^{h} : b/ \)
Swati (S43) \( /b : p' : p^{h} : b/ \)
Tsonga (S53) \( /d \sim d^{h} : t' : t^{h} : d : d'/ \)
Shona (S10) \( /b? : p : b? : b'/ \)
Kalanga (S15) \( /p^{h} : p : p^{h} : b? / \)
4. Results: Southeastern Bantu

Southeastern Bantu: 16 (12) typical features

- **>2 affricated series**: more than two series of affricates, e.g. /ts/, /tʃ/, /kx/
- **TL**: presence of lateral obstruents, e.g. ɬ, ᵀɬ, ɭ, ᵀɭ
- **whistled obstruents**: presence of whistled fricatives and affricates, e.g. sv, zv, tsv
- **ph:f**: contrast between bilabial and labio-dental continuants, e.g. /ɸ/:/f/, /m/:/ɲ/, /β̞/:/ʋ/
- **implosives**: (phonetic) presence of implosives, e.g. /ɓ/ or /b/ [ɓ]
- **BH,DH**: presence of breathy or slack voiced stops, e.g. /bɦ/ or /b̤/
- **plain stops ejected**: plain series of (voiceless) stops is ejective
- **> 2 sibilants**: presence of more than two sibilants (places of articulation), e.g. /s/ : /ʃ/ : /ɕ/
- **> 5 voiced frics**: presence of more than five voiced fricatives, e.g. /v/, /z/, /ʒ/, /zv/, /ɣ/, /ɦ/
- **PS**: presence of labial-coronal onsets, e.g. bz, ps, pʃ
- **dent:alv**: contrast between dental vs. alveolar stops, nasals or laterals, e.g. /t̪/:/t/ (more local?)
- **> 5 vowels**: presence of more than five distinctive vowel qualities, e.g. /i, e, ɛ, a, ɔ, o, u/
- **NC**: presence of nasal + obstruent syllable onsets, e.g. *NCV and *N̂CV
- **C+w**: presence of obstruent + /w/ onset clusters
- **no C coda**: absence of closed syllables
- **2 tones**: two distinctive tone levels, e.g. high vs. low
4. Results: Southeastern Bantu

Features by language (16 features, including 4 general Bantu features)
- weak phonological area: fuzzy boundaries, but slight bimodal distribution
- languages are not very homogenous (no language has all features, only three languages have more than 12: Tswana, Tsonga and Transvaal Ndebele)

Problems
- one genealogical group (clade) cannot be excluded (but unlikely)
- distortion by correlated features (e.g. whistled obstruents -> 2 sibilants -> 5 vd. fricatives)

Histogram

Southeastern Bantu languages (Bantu S except Tswana, Kgalagadi and Ndebele of Zimbabwe)
4. Results: Southeastern Bantu

Features by language (12 features, northern languages excluded)

- Similar assessment, but
  - General Bantu features (NC, C+w, no coda, 2 tones) excluded
  - Ignoring northern languages (Bantu A – E, Nilotic, "Ubangian", Nilotic, Cushitic, Sandawe & Hadza)

> Better results: most languages share no feature (0 or 1), languages in contiguous southeastern area share more than 3 features

Histogram

Southeastern Bantu languages (Bantu S except Tswana, Kgalagadi and Ndebele of Zimbabwe)
4. Results: Southeastern Bantu

Features by language (16 features, all languages)

Southeastern Bantu languages (Bantu S except Tswana, Kgalagadi and Ndebele of Zimbabwe)
### 4. Results: Southeastern Bantu

#### Features by language group

<table>
<thead>
<tr>
<th>group</th>
<th>&gt;2 affricated series</th>
<th>plain stops ejected</th>
<th>TL</th>
<th>whistled obsr.</th>
<th>phf</th>
<th>&gt;2 sibilants</th>
<th>&gt;5 v/d_fries</th>
<th>ps,bz,psh</th>
<th>implosives</th>
<th>dentalsv</th>
<th>BH,DH</th>
<th>&gt;5 vowels</th>
<th>NG</th>
<th>C+w</th>
<th>no C</th>
<th>2 tones</th>
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</tr>
</tbody>
</table>

*0: wrong/no; <0.26 infrequent; 0.26 - 0.74 common; >0.74 very frequent; 1: true/yes*

| average of area | 0.76 | 0.72 | 0.62 | 0.50 | 0.46 | 0.38 | 0.36 | 0.36 | 0.38 | 0.53 | 0.25 | 0.39 | 0.22 | 0.09 | 1.00 | 1.00 | 1.00 |
| average of languages outside | 0.05 | 0.04 | 0.21 | 0.00 | 0.12 | 0.00 | 0.00 | 0.07 | 0.37 | 0.99 | 0.50 | 0.45 | 0.55 | 0.34 | 0.51 |
| difference | 0.71 | 0.68 | 0.41 | 0.50 | 0.35 | 0.36 | 0.36 | 0.31 | 0.16 | 0.16 | 0.30 | 0.27 | 0.44 | 0.45 | 0.66 | 0.49 |
Southern Africa

large C inventory

large consonantal inventory
( > 33 phonemic consonants)

Number of distinctive consonants
14 – 88

clicks: cf. above
5. Results: Southern Africa

> 5 plain stops
more than 5 places of articulation
or configurations for plain series
of stops,
e.g. /p, t, tʃ, k, q, |/ 

Number of stops in the plain
(usually voiceless or aspirated;
sometimes ejected) series

3 - 12
5. Results: Southern Africa

aspirated stops
presence of aspirated stops contrastive with plain series, e.g. /pʰ, tʰ/ vs. /p, t/

Presence of aspirated stops
☐ no
■ yes

Ejectives: cf. above
UV or KX
presence of uvular obstruents or
dorsal affricates,
e.g. q, χ, kx, or qχ’

*Presence of uvular obstruents or
dorsal affricates*

- 0
- > 0
5. Results: Southern Africa

dorsal fricatives
presence of velar or uvular fricatives,
e.g. $\chi$, $\gamma$, $\chi$, $\kappa$

Presence of dorsal fricatives
☐ absent
■ present
double obstruent onsets
presence of double obstruent onsets disregarding simple labial-velars (\textit{kp}), clicks (\textit{ǀ}) and whistled obstruents (\textit{ts^v}),
e.g. labial-coronal, labial-dorsal, or coronal-dorsal double articulations or clusters such as \textit{ps, bg, tf} or \textit{ǀ\chi}

\textbf{Presence of double obstruent onsets}

- □ 0
- □ analyzed as clusters (C1 + C2)
- ■ analyzed as units (C\text{C})
5. Results: Southern Africa

no C+y
absence of clusters C+/\text{j}/

\textit{Presence of clusters C+/\text{j}/}
- absent
- present
5. Results: Southern Africa

Southern Africa: 10 typical features

Å large C inventory: large consonantal inventory (> 33 phonemic consonants)
Å clicks: presence of ingressive stops (clicks), e.g. /ǂ, ǃ̬ or ǁ̃
Å > 5 plain stops: presence of more than 5 places of articulation (or configurations) in the plain series of stops, e.g. /p, t, tʃ, k, q, /
Å aspirated stops: presence of aspirated stops contrastive with plain series, e.g. /pʰ, tʰ/ vs. /p, t/
Å ejectives: presence of ejective obstruents, e.g. /p'/ (vs. /p/) or simply /p/ [p’]
Å BH,DH: presence of breathy or slack voiced stops, e.g. /bɦ/ or /b̅/
Å UV or KX: presence of uvular obstruents or dorsal affricates, e.g. q, χ, kx, or qχ’
Å dorsal frics: presence of dorsal fricatives, e.g. x, χ, γ
Å double obstruent onsets: presence of double obstruent onsets disregarding simple labial-velars (kp), clicks (ǀ) and whistled obstruents (tsv), e.g. labial-coronal, labial-dorsal, or coronal-dorsal double articulations or clusters such as ps, bg, ts or ǀχ
Å no C+y: absence of obstruent + /j/ onset clusters

other potential features (more local distributions or secondary?)
Å presence of voiceless, breathy or slack voiced nasals (cf. below)
Å palatalization of dental/alveolar coronal series (t > c; cf. below); palatalization more generally?
Å presence of palatalized units (Cʲ)
5. Results: Southern Africa

Features by language

- Bimodal distribution, although no clearcut boundary
- Most languages in the sample share no or few features
- Languages of Southern Africa (including 'Southern' Cushitic, Sandawe and Hadza) share more than half of the features (5-10)
- "Best languages" are Khoisan > clear relation to Kalahari Basin > "2nd layer"?

Histogram

Languages of Southern Africa (Bantu S, Bantu R40, parts of Bantu K30, "Khoisan"), including 'South' Cushitic, Hadza and Sandawe; excluding Afrikaans, Bantu R10-30 and Gitonga

N of languages (total: 138)

N of features out of 10 phonological features typical for languages of Southern Africa
5. Results: Southern Africa

Features by language
## 5. Results: Southern Africa

### Features by language group

<table>
<thead>
<tr>
<th>Language Group</th>
<th>large C inventory</th>
<th>clicks</th>
<th>&gt; 5 plain stops</th>
<th>aspirated stops</th>
<th>ejectives</th>
<th>BH, DH</th>
<th>UV or KX</th>
<th>double obstr. onsets</th>
<th>dorsal fricis</th>
<th>no C+y</th>
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<td>&quot;Ubangian&quot; (3)</td>
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<td>N-Bantu Bantoid (1)</td>
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<td>0</td>
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<td>Bantu A-R, other (68)</td>
<td>0.07</td>
<td>0.08</td>
<td>0.13</td>
<td>0.12</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>0.07</td>
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<td>0.05</td>
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<tr>
<td>Germanic (Afrikaans afr)</td>
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<tr>
<td>South Cushitic (3)</td>
<td>0.33</td>
<td>0.33</td>
<td>1</td>
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<td>0</td>
<td>0.67</td>
<td>0</td>
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<tr>
<td>Sandawe, Hadza (2)</td>
<td>1</td>
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<td>1</td>
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<td>0</td>
<td>0</td>
<td>0.5</td>
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<tr>
<td>Bantu K50 (3)</td>
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<td>1</td>
<td>0.67</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.33</td>
<td>0</td>
<td>0.67</td>
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<tr>
<td>Bantu R40 (1)</td>
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<tr>
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<td>0.67</td>
<td>0.33</td>
<td>0</td>
</tr>
<tr>
<td>Bantu S40 (6)</td>
<td>0.29</td>
<td>0.29</td>
<td>0.86</td>
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<td>0.29</td>
<td>0.86</td>
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<tr>
<td>Bantu S90,k21 (7)</td>
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<td>0.83</td>
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<td>0.67</td>
<td>0.83</td>
<td>0.5</td>
<td>0.67</td>
</tr>
<tr>
<td>Khoekxwadi (8)</td>
<td>0.875</td>
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<td>1</td>
<td>0.875</td>
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<td>0</td>
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<tr>
<td>Kx’a (3)</td>
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<td>1</td>
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</tr>
<tr>
<td>Tuu (6)</td>
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</tr>
</tbody>
</table>

0: wrong/no; < 0.26 infrequent, 0.26 - 0.74 common, > 0.74 very frequent; 1: true/yes

Average of area: 0.86, 0.69, 0.93, 0.80, 0.81, 0.28, 0.43, 0.54, 0.66, 0.67
Average of languages outside: 0.13, 0.01, 0.18, 0.01, 0.19, 0.00, 0.06, 0.13, 0.41, 0.60
Difference: 0.72, 0.68, 0.75, 0.79, 0.62, 0.28, 0.37, 0.40, 0.24, 0.07
3 phonological areas

Å Kalahari Basin: best

Å Southern Africa: recognizable; Kalahari Basin languages with most complying features; several features related to features of Kalahari Basin (e.g. presence of clicks ~ large number of clicks)
  o if 'contiguous area' is not a criterion: Sandawe, Hadza, and South Cushitic included!

Å Southeastern Bantu: weakest; strong genealogical component (shared innovations?) cannot be excluded
6. Results: MDS

Multidimensional scaling (MDS) and k-means clustering

- based on 59 (/81) features with areal distributions in subequatorial Africa
- including features NOT relevant for Southern Africa, e.g. labial-velar consonants (kp), non-sibilant dental fricatives (θ, ḷ), or bilabial rhotics (ʋ, ɹ)
- probably biased to Southern Africa, however:
  - several features related to clicks
    - presence of double-articulated consonants (incl. clicks, kp, pk, etc.)
    - presence of ingressive consonants (clicks)
    - number of click types (ʘ, |, !, !!, †, ‡)
  - only one feature related to implosives
    - presence of implosives
6. Results: MDS

MDS plot

+ Southern Africa p.a.  
−Southern Africa p.a.

+ Kalahari Basin p.a.  
−Kalahari Basin p.a.

−Southeastern Bantu p.a.  
+ Southeastern Bantu p.a.
6. Results: MDS

k-means clustering (2)
6. Results: MDS

k-means clustering (3)
6. Results: MDS

k-means clustering (4)
6. Results: MDS

'Hand-made' analysis

Similar: MDS-based analysis
Conclusions

3 phonological areas: Kalahari Basin, Southeastern Bantu (?), Southern Africa

- 'Southern Africa' related to the 'Kalahari Basin' (> Khoisan substrate as main factor?)

Kalahari Basin ≈ pronounced linguistic area (clear boundary/definition)

- but: only second to 'Southern Africa' in MDS and k-means clustering

'Southeastern Bantu' – apparent subarea, but weakest and questionable

- largely excluding Sotho-Tswana
- multiple relations to East African languages?

Southern Africa

- Kalahari Basin + SE Bantu + Sotho-Tswana + Yeyi + Bantu K.30? (+ East Africa)
- primary phonological area within subequatorial Africa > Southern Bantu languages DO constitute one phonological area with Kalahari Basin (+ partially E.Africa)
- some Southern African languages outside the phonological area
  - Lozi (Sotho-Tswana language)
  - Herero, Wambo languages
  - Afrikaans
- various relations to East African languages < multiple relations? (Sandawe - Khoe-Kwadi?, S.Bantu - E.Bantu, especially Shona - Rundi/Kinyarwanda and Gitonga - Mijikenda?)

- > due to (?)
  - Khoisan substrate
  - increased network of relations
  - repeated historical relations to East Africa
Conclusions

Á vs. Clements & Rialland (2008):

− generally valid

− Shona group (S10) belonging to the phonological area of Southern Africa

− Wambo and Herero groups (R20, R30) and Afrikaans (and Lozi) excluded

− 'core': Kalahari basin/'South African Khoisan'

− (probable second southeastern nucleus)

− somehow related to "Rift"
Acknowledgements

Å  Linda Gerlach (sharing unpublished data)

Å  Anne-Maria Fehn (sharing unpublished data)

Å  Tom Güldemann (sharing his library, comments)

Å  (Hans-Jörg Bibiko !)
References (sources mentioned in this talk)


Güldemann, Tom & Anne-Maria Fehn (eds.). in prep. *The Kalahari Basin area as a “Sprachbund” before the Bantu expansion - an update*.


References (sources mentioned in this talk)


