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## Saharan numerals

In: Blažek, Václav. *Numerals : comparative-etymological analyses of numeral systems and their implications : (Saharan, Nubian, Egyptian, Berber, Kartvelian, Uralic, Altaic and Indo-European languages)*. Vyd. 1. V Brně: Masarykova univerzita, 1999, pp. 1-14

ISBN 8021020709

Stable URL (handle): <https://hdl.handle.net/11222.digilib/122988>

Access Date: 27. 11. 2024

Version: 20220831

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# SAHARAN NUMERALS

## Dedicated to the memory of Karel Petrůček

§1. The relationship of West Saharan languages (Kanuri & Tubu ) was postulated by H. Barth (1854; in his letter to Lepsius). G. Nachtigal recognized the relationship of all Saharan languages (1879). He also concluded that the Western branch is more coherent than its relationship to Berti-Zaghawa. The internal classification of Saharan languages it is as follows (Cyffer 1981: 161; Petrůček 1988: 129):

- A. Western = TU-KAN (= Bodelean according to Ehret 1993: 105)
  - a) KAN: Kanuri, Kanemu
  - b) TU: Tubu, Tuda = Teda-Daza
- B. Eastern = BER (= Ennedian according to Ehret 1993: 105)
  - a) BERI: Zaghawa, Bideyat
  - b) SAGA: Sagato-a = Berti

It is almost generally accepted that the Saharan language family belongs to the vast Nilo-Saharan macro-phylum.

Greenberg (1963: 130) offered the following high-level classification of Nilo-Saharan languages:

A. Songhai, B. Saharan, C. Maban, D. Fur, E. Koman & Gumuz, F. Chari-Nile (consisting of Berta, Kunama, Central Sudanic, Eastern Sudanic).

Bender (1992: 15–39) places the Saharan family among “isolated outliers” together with Songhai, Kunama and Kuliak, against the “peripheral satellites” (Maban, Fur and Central Sudanic) and the “core group” (Berta; Nubian, Nara, Nyima, Tama; Surma, Jebel, Temein, Daju, Nilotic; Koman, Gumuz; Krongo-Kadugli).

Ehret (1993: 104–106) divides Nilo-Saharan into Koman (incl. Gumuz) and Sudanic, consisting of Central and Northern Sudanic. The latter super-branch is divided into Kunama and Saharo-Sahelian. The term Sahelian is used for Songhai, Fur, Maban and Eastern Sudanic.

On the other hand, Petrůček (1988: 133) admits only areal connections among Songhai, Maban and Saharan languages and rejects the Nilo-Saharan hypothesis in the genetic plan.

§2. Unfortunately, a complete comparative historical phonology of Saharan languages has not been written so far, although some partial phonetic rules

were formulated (Cyffer 1981a; 1983; Petráček 1988). The asterisked forms used here represent only hypothetical projections allowing to explain the creation of the descendant forms.

§3. The first internal analysis of Saharan (Kanuri) numerals was presented already by F. Müller (1877: 210). Kluge (1937) collected the basic data about Saharan numerals and compared them with Nilo-Saharan counterparts. The most detailed internal analysis of the numerals of all Saharan languages was presented by K. Petráček (1971: 246–252).

§4. The most important forms are collected in the following tables:

#### Numerals of KAN-group

	Kanuri Lukas	Kanuri Cyffer	Kanuri Bowdich	Maïha Barth	Kanuri Clarke #125	Kanuri Clarke #126	Kanuri Clarke #128	Kanuri Clarke #273	Kanembu Lukas
1	<i>tiló</i> <i>lǎska</i> <i>fál</i>	<i>tiló</i> <i>lǎská</i> <i>fál</i>	<i>leskar</i>	<i>lagen</i>	<i>tilo</i>	<i>ielo !</i>	<i>lakka</i>	<i>lazka</i>	<i>tullǒ</i>
2	<i>indí</i>	<i>indí</i>	<i>ahndee</i>	<i>indē</i>	<i>andi</i>	<i>inde</i>	<i>endi</i>	<i>indi</i>	<i>yindí</i>
3	<i>yaskǎ</i>	<i>yakkǎ, skǎ</i>	<i>yaskar</i>	<i>eǎska</i>	<i>iaska</i>	<i>yasko</i>	<i>niesku</i>	<i>zesku</i>	<i>yaaku</i>
4	<i>dégǎ</i>	<i>dégǎ</i>	<i>deegah</i>	<i>daǎger</i>	<i>dega</i>	<i>dago</i>	<i>diku</i>	<i>degu</i>	<i>d'eu</i>
5	<i>úgù</i>	<i>úwu</i>	<i>ooǎgoo</i>	<i>ohoo</i>	<i>ugu</i>	<i>ooogoo</i>	<i>oku</i>	<i>ugu</i>	<i>(y)úú</i>
6	<i>arǎskǎ</i>	<i>arakkǎ</i>	<i>araskoo</i>	<i>araska</i>	<i>araska</i>	<i>araska</i>	<i>araska</i>	<i>araska</i>	<i>arakú</i>
7	<i>túlúr</i>	<i>túlur</i>	<i>toolor</i>	<i>toolor</i>	<i>tulu</i>	<i>toulur</i>	<i>tullori</i>	<i>tullu</i>	<i>túlur</i>
8	<i>wuskú</i>	<i>wuskú</i>	<i>woskoo</i>	<i>weska</i>	<i>uosku</i>	<i>waskoo</i>	<i>hasku</i>	<i>wuskee</i>	<i>yusuku</i>
9	<i>lǎgǎr</i>	<i>lǎgǎr</i>	<i>likkar</i>	<i>lekar</i>	<i>lagiri</i>	<i>lakao</i>	<i>likkar</i>	<i>lakar</i>	<i>laar</i>
10	<i>megú</i>	<i>mewú</i>	<i>meeǎgou</i>	<i>magoon</i>	<i>miagu</i>	<i>meagou</i>	<i>miiko</i>	<i>megu</i>	<i>m'eú</i>
20	<i>fíndí</i>	<i>fíndí</i>							<i>fíndí</i>
30	<i>fýǎskǎ</i>	<i>fýǎkkǎ</i>							<i>fíaku</i>
100	<i>(megǎ)</i>	<i>(meǎ)</i>							<i>yǎru / (mia)</i>
200	<i>yǎr indí</i>	<i>yǎr indí</i>							

#### Numerals of TU-group

	Kaširda Lukas	Borku Nachtigal	Daza Jourdan	Kreda Lukas	Tuda Nachtigal	Teda Müller	Tabu Carbou	Tabu Decorse	Goran Decorse
1	<i>turǎn, trǎn, trǎn</i>	<i>tron</i>	<i>trono, tra</i>	<i>tǎrnǎo, trǎn</i>	<i>toroo, tron</i>	<i>toroo</i>	<i>tron</i>	<i>torǎna</i>	<i>torǎdna</i>
2	<i>cuu</i>	<i>cu</i>	<i>cu</i>	<i>cuu</i>	<i>kyuu, ryuu</i>	<i>tšuu</i>	<i>ču</i>	<i>fu</i>	<i>fyu, ču</i>
3	<i>akkuzúu, aguzǎ</i>	<i>ǎgozoo</i>	<i>agozo</i>	<i>aguzúu</i>	<i>ǎguzuu</i>	<i>agozoo</i>	<i>agozu</i>	<i>agozu</i>	<i>akuzo, ařuzun</i>
4	<i>tuzzǎo, tǎǎ</i>	<i>tǎzoo</i>	<i>tozo</i>	<i>tozǎo</i>	<i>tǎzoo</i>	<i>tozoo</i>	<i>tuzǎ</i>	<i>tuzo</i>	<i>tuzo</i>
5	<i>foou, fǎou</i>	<i>foo</i>	<i>fo</i>	<i>foú</i>	<i>foo</i>	<i>foo</i>	<i>fǎu</i>	<i>fohu</i>	<i>fǎ, fu</i>
6	<i>dessí</i>	<i>disee</i>	<i>dissi</i>	<i>díst</i>	<i>dísee</i>	<i>disii, disee</i>	<i>dessé</i>	<i>desi</i>	<i>desi</i>

	Kaširda Lukas	Borku Nachtigal	Daza Jourdan	Kreda Lukas	Tuda Nachtigal	Teda Müller	Tabu Carbou	Tabu Decorse	Goran Decorse
7	<i>táduusu</i>	<i>tádesuu</i>	<i>tuúuzu</i>	<i>tárusu</i>	<i>tádesuu</i>	<i>turressioo</i>	<i>tudussu</i>	<i>tudusu</i>	<i>tudusu,</i> <i>turesu</i>
8	<i>wássuu</i>	<i>ósoo</i>	<i>osso</i>	<i>ássu</i>	<i>yássuu</i>	<i>osoo,</i> <i>yússuu</i>	<i>osso</i>	<i>usú</i>	<i>usú, usu</i>
9	<i>yisíí</i>	<i>isii</i>	<i>issi</i>	<i>yisíí</i>	<i>išii</i>	<i>isii, yesee</i>	<i>issi</i>	<i>isi</i>	<i>isi</i>
10	<i>múrdqm,</i> <i>múra</i>	<i>múrdom,</i> <i>múroo</i>	<i>mordom</i>	<i>márdqm,</i> <i>márdám</i>	<i>múro</i>	<i>murdoo</i>	<i>merdóm,</i> <i>mordóm</i>	<i>mordom</i>	<i>mordum</i>
20	<i>dígídám</i>		<i>digídám</i>	<i>dígírám</i>	<i>dútyuu</i>	<i>dukkiiu</i>	<i>digídóm</i>	<i>digídem</i>	<i>digídem,</i> <i>degerem</i>
30	<i>mártá</i> <i>aguzúu</i>	<i>morta</i> <i>ógozoo</i>	<i>morta</i> <i>agozo</i>	<i>mártá</i> <i>aguzó</i>	<i>murtá</i> <i>óguzuu</i>	<i>mortaguzuu</i>			
40	<i>mártá</i> <i>tuzzóo</i>	<i>morta</i> <i>tozo</i>	<i>mártá</i> <i>tozóo</i>	<i>murtá</i> <i>tozo</i>					
100	<i>kídri</i>	<i>kédree</i>	<i>kídri</i>	<i>kíndári</i>	<i>katree</i>				

### Numerals of BER-group

	Bideyat	Zaghawa	Zaghawa	Berti = Sagato-a			
	Chalmel	Tourneux	MacMichael	Spence	Arkell	MacMichael	Holý
1	<i>néko</i>	<i>nookó</i>	<i>lakoi</i>	<i>sang</i>	<i>saang</i>	<i>sa(ng)</i>	<i>sang</i>
2	<i>sui</i>	<i>súf</i>	<i>sue / šue</i>	<i>su</i>	<i>su</i>	<i>su</i>	<i>su</i>
3	<i>ue</i>	<i>uwé</i>	<i>wé</i>	<i>soti</i>	<i>soti</i>	<i>soti</i>	<i>soti</i>
4	<i>éšte</i>		<i>ište</i>	<i>sitti</i>	<i>sitti</i>	<i>sitti</i>	<i>sitti</i>
5	<i>hué</i>		<i>huué</i>	<i>pii</i>	<i>pi</i>	<i>pi</i>	<i>bi</i>
6	<i>déštè</i>		<i>deštè</i>	<i>dowiti</i>	<i>duti</i>	<i>duuti</i>	<i>duti</i>
7	<i>dešté</i>		<i>díšté / distii</i>	<i>taiti</i>	<i>teiti</i>	<i>taiti</i>	<i>taiti "10"!</i>
8	<i>uèttè</i>		<i>(w)ottè</i>	<i>kuze</i>	<i>kuzi</i>	<i>kuuzi</i>	<i>kuze</i>
9	<i>díšti</i>		<i>disti / díštii</i>	<i>kedoesi</i>	<i>kadussi</i>	<i>kiddasi</i>	<i>kizaiti</i>
10	<i>sagoti</i>		<i>timm(i)</i>	<i>masang</i>	<i>massung</i>	<i>musa(ng)</i>	<i>masang</i> "7"!
11			<i>gé lakoi</i> "another one"	<i>saamaarr</i>	<i>mesang ni</i> <i>saang mer</i>	<i>mussang</i> <i>sa ma</i>	
12			<i>gé swé</i> "another two"	<i>sumarr</i>	<i>messang im se</i> <i>mer</i>	<i>mussang</i> <i>su ma</i>	
13				<i>sotimarr</i>	<i>messando soti</i> <i>mer</i>	<i>mussang</i> <i>soti ma</i>	
20			<i>timm swé</i>	<i>masu</i>	<i>mesando</i>	<i>mussu</i>	
100					<i>umur</i>	<i>ommar</i>	

### §5. Comparative-etymological analysis

1.1. Kanuri *tiló* & Kanembu *tullq* "1" can reflect pKAN *\*tulCo*, maybe syncopated from *\*tuliCo* which would explain the vowel *i* in Kanuri (*C* means any consonant). The corresponding counterpart is pTU *\*turono*. Assuming a correspondence of the suffixal extensions, pKAN *\*-Co* means *\*-no*. Etymologically the root *\*tuRo/i-* (*R* = *r* or *l*) can be identified with the first member of the Saharan word for "fingernail": Tabu *turkano*, *turkome*, Teda-Daza

*turkən*, Zaghawa *targwi* “fingernail, toe, claw”. The second component also appears in Kanuri *fǝr-gǝmi* “fingernail” (Mukarovsky 1981: 203), cf. Kanembu *gandti*, Kanuri *gǝmbũskin* “to claw, scratch” — see Lukas 1931: 107). The closest external cognate is Fur *tori* “finger” (Meinhof). Greenberg (1963: 138) adds Surma: Tirma *teri* // West Nilotic: Burun *tuli* id.

The semantic shift “fingers (of a hand)” = “5”, allows to enlarge the related forms, cf. Maban: Masalit (Edgar) *tur* = (MacMichael) *tóro*, Maba *t(ú)ur*, Aiki *túur*, Kibet *tur* (all Edgar), Mabang *tura*, Runga *tor*, Kodoi *dur* (all Gaudefroy-Demombynes) “5” // Surma: Majang *tul*, Shabo *tuul*; Didinga, Murle, Longarim, Bale, Zilmamu *tur* “5” (Fleming 1983: 541) // Kuliak *\*tud* “5” (Fleming 1983a: 440) // Taman: Tama *tor*, Erenga *toř*, *túř*, Sungor *tõr*, Miisiiri *toř*, Maraariit *túur*, Abu-Shaarib *tur* “6” (Edgar 1991: 121), originally “5+[1]” or “a finger [in addition]” (?), cf. Mimi (Gaudefroy-Demombynes) *tulgu* “6” < Maban *\*tur-* “5” & Mimi *deg* “1” ? The meaning “5” can also be reconstructed for the first member of the numeral “7” in pKAN *\*tullor* and pTU *\*tudesu* or *\*turesu* = “5 + 2” (see 7.1.).

1.2. The variants of Kanuri *lǝskǝ* (Cyffer) = *lazka* (Clarke #273) = *lakka* (Clarke #128) = Nguru *laku* (Koelle), indicate the original *\*laSKa* (Cyffer 1981a: 14; 1981: 173). The closest cognates in Zaghawa (MacMichael) *lakoi*, (Tourneux) *nɔɔkɔ*, Bideyat (Chalmel) *néko* “1”, and the external parallels, indicate an older sequence *\*laKSa*, analyzable in *\*laK-* & *\*-Sa*. The first member is perhaps related to Kanuri (Lukas) *lǝga* “certain, some” = (Cyffer) *lǝá* “some”. There are also promising cognates in other Nilo-Saharan branches: Borgu (a puzzling language described by Meinhof & Klingenheben) *lɔk* “1” // Jebel: Aka *liigiidii*, Silak *liǝǝǝǝ*, Kelo *lɔɔǝǝ*, Tornasi *loodi*, Molo *leéǝǝ*, Malkan *leedi* “1” (Bender 1989: 152) // ? Daju: Liguri *nohorok*, Shatt *nuxu*, Nyala & Lagowa *nowane*, Sila *uǝun* “1” (Thelwall 1981: 182) // Berta: Wa-Kosho *ma-nak’u*, Fadasi *ma-nayɔ*, Gamila *mi-diku* etc. “1” (Cerulli 1947: 161 reconstructed *\*l*). The component *\*-Sa* is comparable with Berti *sa(ng)* “1” (cf. also Kanuri *sǝi* “only, except”) — see #1.4.

1.3. Kanuri *fǝl* “1” resembles remarkably Songhai *follo* “1” (Hacquard-Dupuis) = Djarma *afalǝǝ* (Westermann). Kaben (Maban family) *faya* “1” (Nougayrol) can be related too.

There are similar forms in Central Chadid: Mandara *pǝllé*, Mofaw *pǝl*, Kotoko (Lebeuf): Makeri & Gulfei *pal* “1” (Mukarovsky 1987: 280).

1.4. Berti *sa(ng)* “1” is perhaps related to Kanuri *sǝi* “only, except” (cf. also pKanuri *\*laSKa* < *\*laK-Sa* ? — see §1.2. ). External parallels also exist: Fur *soǝa* “all” (Meinhof) // Maban: “Wadai” *sen* “1” (cf. Kluge 1937: 217) // Kuliak: Ik *řa* “other” // Koman: Kwama *seendo*, South Koma *aseni* “1” (Bender).

2.1. The KAN variants *yindǝ / indǝ / endǝ / andǝ* “2” could indicate a proto-form *\*yandi*, formally derivable from *\*sandi* (Cyffer 1983: 63, 70; but he prefers to reconstruct here *\*ǝndǝ* with a gottal stop — ibid. 65, 75). It is tempting to connect this hypothetical construct with Berti *-sando* recorded by Arkell in

*mes(s)ando* “20” vs. *massung* “10”. The comparison with *mus(s)a(ng)* “10” = “10 x 1” & *mussu* “20” = “10 x 2”, recorded by MacMichael, indicates the meaning “2” for *-sando* (Petráček 1971: 250 proposed a different analysis: *me-san-do* “hand x one + pl.”). The segment *\*-and-* of the numeral “2” corresponds suggestively with the plural marker *\*-and-* of personal pronouns in Kanuri (Cyffer 1981: 171). The bare root *\*sV-* can be connected with the preceding root *\*sa...* “one”; hence *\*“one” + plural > “two”*? The second possible etymology could be based on the numeral *\*sui* “2” (#2.2.).

2.2. Berti *su*, Zaghawa *sui / šué / šué* and TU *\*cuu < \*ciu* can be derived from an archetype of the type *\*sui* or *\*cui* “2”. The external cognates within Nilo-Saharan support this reconstruction: Maban: Mimi (Nachtigal) *soen* “2” // Koman: Komo *sowen*, Twampa *súʔ*, Anej *dù-sùit*, Kwama *s(w)iyya*, Opo *suka* (all Bender), Gule *dessú* (Seligmann), Fungi *di-suik* (MacMichael) “2” < *\*suik* or *\*sui*?; Ehret 1983: 417 reconstructs *\*suʔi* // ? Central Sudanic *\*so* “4” (Bender 1992: 41, #64), cf. Kresh *sɔsɔ*, Woro, Dongo *sɔps* “4” (Santandrea), and Bagirmi *sab* “2” (Gaden) = Central Sudanic *\*θu(ɔ)* according to Ehret (1983: 417; he compares Saharan + Koman + Central Sudanic).

3.1. Common KAN *\*yasku* “3” admits more variants of internal reconstruction. Thus Cyffer (1983) derives KAN *\*y-* from *\*ʔ-*, *\*k-/g-*, *\*t-/d-*. The cluster varying in *-sk-/kk-/k-* can reflect *\*-SK-* or *\*-TK-* (Cyffer 1981a: 14; Id. 1981: 173). Starting from the fact that the KAN numeral *\*wusuku / \*wasuku* “8” represents the sum “5 + 3” (see #8.1.), the original pKAN numeral “3” could look *\*ʔasuku*. This form is compatible with pTU *\*akuzu* “3” via metathesis. The other combinations without any inner Saharan support are less probable: e.g. *\*yasku < \*(y)asku* resembles better pNubian *\*tɔssik* “3” (Bechhaus-Gerst) than pNilotic *\*däk* “3” (Reh; Dimmendaal).

3.2. The common TU numeral *\*akuzu* “3” can be related with pKAN *\*ʔasuku* via metathesis (#3.1.). Łukas (1953: 16) demonstrated that the change *s > z* is frequent in TU-dialects. Berti *kuuzi* “8” (MacMichael) supports the sequence of consonants attested in TU. There is a possible external cognate in Daju *\*kodos* “3” & *\*kosande* “8” = “3 + hand” (Thelwall 1981: 183). On the other hand, Songhai-Djarma *ahaku* “8” (Westermann) stands closer to pKAN *\*ʔasuku* “3”. The bare root *za* “3” in Songhai (the full stem *hinza* minus *hinna* “quantity”) is questionable. Bender (1981: 261) connects Kanuri & Songhai numerals “3” directly, adding Fur *iis* “3”, and some others.

3.3. Berti *soti* “3” has remarkable parallels in Mangbetu (Central Sudanic) *sɔta* “3” (but Fer *witə*, Bongo *müta*, Bagirmi, Sara etc. *muta*, Yulu *mü(ü)ta*, Baka *ɔtä* “3” — see Bender 1981: 258) // Berta: Dul (Evans-Pritchard) *zitigini*, Bertat (Marno) *sittigini*, Wetawit (Bender) *sittijini*, Jebel Ura (Bender) *zʃtʃgʃni* “3” // Kunama (Salt) *saddé*, (Bender) *saate*, Iilit (Bender) *satte* “3” // ? North Surma: Majang *jiit*, Shabo (Tefera & Unseth) *jiita* vs. South-East Surma: Meqen *sizzi*, Bodi *sfizzi*, Tirma *sizi* & *dizi*, Mursi *sfzzi* (all Haberland) = *θlzzi* (Turton & Bender).

3.4. Zaghawa *wé* & Bideyat *ué* “3” have no evident cognates among Nilo-Saharan numerals, perhaps with the exception of Lendu (a proper branch of Central Sudanic) (*u*)*gbɔ̄* “3” (Tucker). An alternative solution can be based on the hypothetical reconstruction *\*ue* < *\*uðe*, supported by tempting Nilo-Saharan parallels: Jebel: Aka *éedé*, Silak *eede*, Tornasi *ede*, Malkan *odo*, Molo *ɔɔɔɔ* (Bender 1989: 152–153); Tabi (Marno) *oda*, Hamej (Meinhof) *ōda*, Gaam (Bender & Ayre) *ɔ́ɔ̄* // Berta: Undu *mú-uðe*, Fadasi *mɔ̄-ðe* (Bender) = *mu-uði* (Cerulli) etc. “3”.

4.1. Common KAN *\*diga* “4” resembles suggestively Songhai (Prost) *taty* “4”, *takanta* “4th”, (Clarke) *a taki*, Djarma (Westermann) *itáaki* “4” (cf. already Müller 1877: 210). There are also similar forms in Koman (Bender), e.g. Komo *dɔgɔn-in*, Anej *duk-* “4”, but Twampa *dóŋɔn* and the *d*-prefix forming all the Anej & Fungi numerals lead to the protoform *\*d-oŋɔn*, representing the most wide-spread Nilo-Saharan form of the numeral “4”: pNilotic *\*(ɔ)ŋwan* (Dimmendaal) // Surma: Majang & Shabo *aŋan* (Tefera & Unseth) // Fur *ɔŋal* (Beaton), Mimi *ɔŋɔl* (Jungrathmayr) // Kuliak *\*nowa?* (Ehret) “4” // Central Sudanic: Moru-Madi *\*ńna* (Tucker); Mamvu *je-nɔ́* Balese-Obi *éci-ná* “4” (Vorbichler) etc. No traces of the *d*-prefix indicating numerals in Saharan mean probably that KAN *\*diga* has a different origin. Ehret (1983: 416–417) mentions formally similar Gaam (Bender) *ɔaag*, Tabi (Marno) *diag* “2” // Surma: Kwegu *d’áá* (Bender), Yidinit *ɔa* (Haberland) “2” and West Nilotic *\*dAk* “3” (Reh), and speculates about “more general numerical meaning”. The semantic compatibility of the numerals “3” with “2” and “4” is very problematic (varying denotations of fingers or spans ?) but the numeral “4” can be really derived from “2”, cf. the examples from Central Kalahari Khoisan languages: G//ana & G//wi /*am /amchira* “4”, derived from /*ám* “2” (Tanaka). The original meaning “2” of the root *\*dig-* can be identified in TU “20”, how it follows from confrontation with the numeral “10”: Kaširda *digidəm* “20” vs. *múrdəm* “10”, Daza *digidəm* vs. *mordom* etc. Accepting this semantic reconstruction, the KAN numeral “4” can be analyzed as *\*diga* > *\*dig-* “2” + plural marker *ká*, originally perhaps *a* (Cyffer 1981: 181; cf. yet TU *\*(y)a* — *ibid.* 162).

4.2. Common TU *\*tuzzo* “4” is comparable with Daju *\*tispet* “4” (Thelwall 1981: 183), esp. if the original form would be modified in *\*tiswet* in agreement with Baygo *teshwet* (MacMichael). It is tempting to see here a reflex of the numeral “2” discussed above (#2.2.) but the internal structure remains puzzling (*\*suisuit* = “2+2” ?).

4.3. Berti *sitti* “4” is probably related to Zaghawa *išté* & Bideyat *éšté*. The starting protoform could be again something similar to *\*suisuit* = “2+2”, as in the preceding case. The external comparanda remain uncertain, perhaps Tabi (Marno) *jessu*, Hamej (Seligmann) *yieeza* “4” can be quoted.

5.1. Common KAN *\*vogu* “5” has the most hopeful cognate in Common TU *\*fohu* “5”. Zaghawa-Bideyat *hu(u)é* and Berti *bi / pi(i)* are probably also related. On the proto-Saharan level one could expect an archetype of the type *\*βoyu* vel sim. Among Nilo-Saharan numerals the closest cognate appears in Songhai (Prost) *gu*, Djarma (Westermann) *igú* “5” (cf. already Müller 1887: 210). On the other hand, it is tempting to connect the numeral with the Nilo-Saharan etymon “arm, hand” attested in Berta (Halévy) *bue*, Rikabiyah (Cerulli) *buwaa* “arm” // Surma: Kwegu (Bender) *búuá* “hand”, Didinga *iba* “arm” (Fleming 1983: 541) // Central Sudanic: Bagirmi *boko*, Baka *baka* id. // ? Saharan: Berti *abi* “arm” (Greenberg 1963: 117, 133; Gregersen 1972: 80 adds also Niger-Congo parallels: Bantu *\*-bókò* // Dagomba *boyo* // Ubangian: Zande *bo*, Gbaya *baxa* etc.).

6.1. Common KAN *\*arasku* “6” resembles Daju *\*aran* id. (Thelwall) in the first part *\*ara...* But the Daju numeral can perhaps be restored as *\*aranda* in agreement with the following numerals: *\*paytindi* “7” vs. *\*pidax* “2”, *\*kosande* “8” vs. *\*kodos* “3”, *\*tabistanda* “9” vs. *\*tispet* “4” and *\*ande* “arm, hand” (Thelwall 1981: 183, 175). The meaning of the first element *\*ar-* remains puzzling (“overcoming”?). On the other hand, in the KAN *\*arasku* “6”, the KAN numeral *\*ʔas[u]ku* “3” (see #3.1.) can be recognized. Accepting it, the meaning of the first part should be “two / pair / both”, hence *\*arasku* < *\*ar-* & *\*ʔas[u]ku* “2 x 3”. The same structure appears in geographically closed languages of the Kotoko group (Central Chadic): Affade *frákuro* “6” vs. *kákuro* “3”, Gulfei *frekra* vs. *akra*, Kuseri *vrekager* vs. *kager*, Logone *venašker* vs. *kašker* etc.; cf. Gulfei *fregande* “8” vs. *ngandé* “4”, Kuseri *vregade* vs. *kade* etc. (Sölken 1967: 164–168, 175f). A similar pattern is known in some Kordofanian languages of the Heiban (= Koalib after Greenberg) family too: Kanderma (Seligmann) *rěčičén* “6” = *kěriičan* “2” x *kěriičin* “3”, in modern transcription Tira (Schadeberg) *lčtčcin* “6” = *kčcan* “2” x *kčcin* “3”. Bork (1912–13: 152) derived Kawarna (Seligmann) *nřghil* “6” from *\*ñeri-k-toli* “2 x 3”, cf. *toli* “3”, in modern transcription Utoro (Schadeberg) *ñtrel* “6” vs. *ččrel* “3”.

The hypothetical meaning “2” of the pKAN root *\*ar-* can be supported by numerous cognates within Nilo-Saharan: Nilotic (Dimmendaal) *\*aRyew* “2” // Nara (Thompson) *arriga* “2” & *jariga* “7” // Nubian *\*arui* or *\*auri* “2” & Nile Nubian *\*arri* “20” // Taman *\*warri* “2” // Nyima (Meinhof) *warba* “2” // Fur (Beaton) *awu* “2” // Central Sudanic *\*(a)riyu* “2” // Krongo-Kadugli (Schadeberg): Yegang *arŷa*, Krongo *yáaría*, Miri *ééra* “2” // ? Bertat (Marno) *ari* “7” // ? Koman: Fungi (Marno) *ar* “20”.

The KAN numeral “6” has penetrated in some Kotoko languages: Buduma (Koelle) *harasge* & *sarake*, Kuri (Decorse) *saraske* “6”, with the *s-*prefix forming also the numerals “4”, “8”, “9”, “10”.

6.2. Common TU *\*disse* or *\*dessi* with *-ss-* < *\*-st-* (Lukas 1953: 21) has hopeful cognates in Zaghawa *dešté* and probably also in Berti *dowiti* // *du(u)ti* “6”. In agreement with the analysis in #6.1. the internal structure “2

x 3” could be expected, maybe \*dig- “2” (cf. #4.1.) & \*soti “3” (#3.3.) > \*diwsoti ?

7.1. At first sight the common KAN \*tullor “7” seems to be quite isolated among Saharan numerals. But accepting the analysis of the common TU \*tudesiu or \*turesiu “7” = “[5] + 2” (#7.2.), it is natural to expect a similar structure also for the KAN counterpart. A similarity of the KAN numeral \*tullo “1” (#1.1.) may not be accidental. It is possible to imagine the compound \*tullo + \*ugu + \*ar “[1x5] + 2” > \*tullo + uwu + ar > \*tullor & \*tul(l)ur, whose last member \*ar- \*2” was discussed above (#6.1.). An analogical multiplication appears e.g. in some Kordofanian languages: Talodi č-e-kun-j-ilik “5” vs. y-ilik “1” or Eliri č-ebin-g-ela “5” vs. č-ebin “hand”, elle “1”, hence “5” = “one hand” (Meinhof, ZKS 6[1915–16]: 252).

The KAN form of the numeral “7” was borrowed into all Kotoko languages: Affade *dûllo*, Ngala *tyllur*, Makeri *tulu(r)*, Gulfei *tul(l)ur*, Shoe *tulur*, Kuseri, Logone *ka-toli*, Buduma *túlqr*, *tjloor* (Sölken 1967: 167–168, 176).

7.2. Common TU \*tudesiu or \*turesiu “7” can be analyzed \*x + 2”, cf. \*ciu “2” (#2.2.). This identification implies x = “[1x]5” or “[one] hand”. Perhaps a plausible solution can represent a compound \*tur- “1” (#1.1.) + Kaširda *ješú* “arm” (Lukas) + \*ciu “2” (#2.2.), hence “one arm plus two”.

There is an alternative solution identifying the first member \*tull- in KAN and \*tud- // \*tur- in TU directly with one of the Nilo-Saharan etymons for “5” (cf. #1.1.): Surma (Haberland): Majang *tul*, Didinga, Longarim etc. *tur* “5” vs. Didinga *tur-ke-ramma* “7”, Longarim *turu-ge-rem* “7” // pKuliak (Ehret) \**tud* “5” // Maban (Edgar): Maba *t(ú)ùr*, Masalit, Kibet *tur*, Aiki *túur* “5”; Mimi (Gaudefroy-Demombynes) *tulgu* “6” = “5” + *deg* “1” ? (cf. Taman “6”: Tama *tor*, Erenga *toř*, *tuř*, Sungor *tòr*, Maraariit *túur* etc. after Edgar 1991: 121) // Central Sudanic: Moru-Madi (Tucker): Pandikeri *túdweri*, Lulu’ba *túderi*, Lokai *túderi* “7” = *tòu* “5” + (*e*)*ri* “2”.

7.3. In Zaghawa *dišté* (& *distii*) and Bideyat *dèštè* “7”, the numeral “4” (*išté* and *éšté* resp.) can be recognized. The initial *d-* can be (i) prefix (besides “6” cf. also “9”) forming (some) numerals above “5”, (ii) a conjunction (cf. #7.4.), or (iii) modified numeral “3”. The latter solution is in a good agreement with the hypothetical reconstruction \**ue* “3” < \**uðe* (cf. #3.4.).

7.4. In the first syllable of Berti *taiti* “7” the conjunction *-ta* “and” (MacMichael) can be seen. If we accept it, could the numeral “7” represent the compound \**soti-ta-sitti* \*3 + 4” > \**tasitti* > \**taiti* ?

8.1. Common KAN \**wusuku* / \**wasuku* “8” represents very probably the sum \**ugu* “5” + \*?*asuku* “3”. The same structure can be expected in common TU \**wossuu* “8”. Could Zaghawa (*w*)*otté* & Bideyat *uèttè* “8” also represent the same pattern if the numeral is analyzed as *hu(u)é* “5” & (Berti) *soti* “3” > \**uesti* > \**ueste* > \**uette* ?

The KAN numeral “8” was borrowed into some Kotoko dialects: Buduma (Koelle) *huasge* = (Decorse) *sooske* = (Barth) *soosku*, Kuri *soske* (Gaufrey-Demombynes 1907: 276).

8.2. Berti *ku(u)zi / kuze* “8” agrees suggestively with common TU *\*akuzu* “3” (#3.2.). It is probable that originally this numeral also represented a compound *\*“5 + 3”*, and later its first member was lost.

9.1. In common KAN *\*lakkar // \*likkar // \*lakkir* “9”, the assimilated variant *lakka* of the numeral *\*laSKa* “1” (#1.1.) is recognizable. Any deeper structure remains unsolved. At least a hypothetical possibility could represent a compound *\*laK-* “1” and Kanuri (Lukas) *karádi* “palm of hand”, hence *\*“one [subtracted from] palms of hands”* ?

The KAN numeral “9” was borrowed into some Kotoko dialects: Buduma (Koelle) *heligar* = (Decorse) *(fi)liger* = (Barth) *seliyár*, Kuri (Decorse) *seligar* (Gaufrey-Demombynes 1907: 276).

9.2. In common TU *\*yissi* “9” probably appears the same root as in Zaghawa *dištii / distii*, Bideyat *dišti* “9”, namely the numeral “4” attested in Zaghawa *išté*, Bideyat *éšté* and Berti *sitti*. If we accept it, the initial TU *\*y-* could reflect the conjunction *ye* attested in Tubu (Lukas). The regular change *\*yi- < \*wi-* (Lukas 1953: 9) opens a possibility to see here a reduction of the numeral “5”. Hence “9” = “[5] plus 4” or “5 [+ ] 4”. The initial *d-* in Zaghawa & Bideyat remains enigmatic as in the case of the numeral “7” (§7.3.). The formal similarity of the Zaghawa numerals “6”, “7” and “9” is undoubtedly also a result of a secondary convergency. Not just an accidental parallel may be seen in Kadugli (= Talla) *uudumu fišta* “9” where *uudummu* = “5”. But the second member differs from *iigiiso* “4”. Probably a synonymous numeral “4” appears in *fiŋfišta* “8” = “4+4”.

9.3. The numeral “9” attested in Berti in variants *kedoesi* (Spence), cf. *makoedoesi* “90”, *kadussi* (Arkell), *kiddasi*, *kadassi* (MacMichael), *kizaiti* (Holý) has no hopeful etymology within Saharan. It can represent a borrowing from any Central Sudanic source, cf. e.g. Tane *mi kidi so* “9” = “5 + 4”, *mi kidi zio* “7” = “5 + 2” etc., Ngama *gridi so* “9”, Tele *geden so* “9” (see Decorse apud Gaufrey-Demombynes 1907: 230–231). The final vowel *-i* was perhaps modified after Berti *sitti* “4”.

10.1. The variants of the numeral “10” in Kanuri and Kanembu dialects allow a projection in common KAN *\*mi[a]ogu*. Analyzing it as a compound, in the latter member KAN *\*(v)ogu* “5” can be identified (#5.1.). It implies the meaning “2” for the first component. This identification has no support in Saharan languages. Outside Saharan perhaps only Gumuz *\*mband // Kunama bare // Maban \*mbari* “2” and Mimi (Gaufrey-Demombynes) *mèl* “2” can be quoted. It is interesting that in this language, classified as Maban by Greenberg and Bender, the numeral “10” *mik* suggestively resembles the KAN counterpart. Meinhof & Klingenheben have recorded a similar form in the

unclassified language Borgu: *maŋgu* "10". Similar forms appear in some Central Chadic languages (Kraft): Higi Nkafa *mùŋəy*, Higi Baza, Higi Ghye *mùŋə*, Higi Kamale *mùŋə*, Higi Futu *mùŋi*, Fali Gili *mùŋ* "10" (metathesis of a form of the type of Fali Kiria *gwùmù* "10" ?). Cf. also Egyptian *mqw* "10" ?

10.2. Common TU *\*murdom* "10" confronting with *\*digidom* "20" allows to isolate the root *\*-dom* "10". Tuda (Nachtigal) *dútyu* and Teda (Müller) *duk-kiuu* "20" represent probably an analogical compound in the opposite order, perhaps an innovation *\*dom-ciu* "10 x 2". Accepting the meaning "2" of *\*dig-* (#4.1.), it is natural to expect the meanings "one", "single", "finger" or "all" for the root *\*mur-*. Berti data, those of MacMichael especially, complete this reconstruction: *mus(s)a(ng)* "10" and *mussu* "20" vs. *sa(ng)* "1", and *su* "2" give a chance to isolate the root *\*muC-*. The identification  $C = r$  has a serious support in the numeral "100": *umur* (Arkell) = *ommar* (MacMichael) if it represents an original multiplication *\*mur-mur* "10 x 10". There are numerous parallels in other Nilo-Saharan languages although their relationship is not sure: Nubian *\*muri* > Hill Nubian *\*bure* "10", Gulfan *ilbúrg* "100", Nile Nubian *\*imil* and Meidob *immil* "100" < *\*ilmil* < *\*ilmuli* < *\*il-muri* "10 x 10" (Blažek: Nubian numerals, #10.2.) // Taman *\*martək* "10" = "10 x 1" // Central Sudanic: Lugbara *mudr* "10", *məriri* "20" where *iri* = "2" // Kuliak: So *mimir* "10" // ? East Nilotic: Bari *mere geleg* "10", i.e. "10 x 1". If we accept the relationship of these words, a common etymology should exist. There are e.g. these possibilities: (i) Bari *mər* "crown of head" >> "top [number]"; Spagnolo (1933: 73) sees in Bari "10" directly the word *mere* "mountain"; (ii) Nilotic *\*mər* "finger" (Dimmendaal); (iii) Jumjum (West Nilotic) *mreen* "all" (Bender).

The root *\*-dom*, the proper bearer of the meaning "10", has the closest relative in Zaghawa *timm(f)* "10" although a borrowing of the latter form from some Nubian source cannot be excluded, cf. Birgid *tummun* (Thelwall) = *tim-mun* (MacMichael), Meidob *tɪmizɪ* (Thelwall) = *timmigi* (MacMichael), Haraza *timinah* (Bell) besides Nobiin *dimee*, Kenzi *dimini* & Dongola *dɪmɪn* "10". Also other parallels represent at least in some cases cultural words: Berta: Fadasi & Undu *ma-θuuma*, Gebeto *mə-duma* (Bender), Fazoglo *ma-doma* (Tutschek); the prefix *ma-lmə-* forms also the numerals 1–6 // Nilotic *\*tɔmɔn* "10" (Dimmendaal) // Surma *\*tommon* "10" // Koman: Fungji (MacMichael) = Jebel Gule (Seligmann) *\*diman* in *diman-didin* "9" = "10 - 1", cf. *didian* "1". It is tempting to include here also the numeral "5" in Krongo-Kadugli: Mudo *tɪmmu*, Yegang *dúmmú*, Miri *iɪdúmmu* etc. (Schadeberg). Gaam (Bender) *təmən* = (Marno) *tamann* and Hamej (Seligmann) *təm* "1" open a possibility to derive this numeral from the meaning "all" attested in Nubian: Meidob (MacMichael) *tuma* // Maba *dum* // Kunama *tumma* (Greenberg 1963: 95, 117, 133) although a borrowing of the etymon "all" from Arabic is not excluded too. An alternative etymology can be based on Old Nobiin ΔOYM, Mahas *dumm* "to take, seize, catch" (Murray 1923: 40) // Nilotic: West: Dinka *dam*; East: Bari *dum-un* id. (Reinisch 1911: 163).

Similar forms for the numeral "10" are also diffused outside Nilo-Saharan macro-family, namely in Cushitic: Beja *tamin & tamun* "10" // Agaw *\*-täŋa* "-ty" // East Cushitic *\*tamman- / \*tamm-* "10" > Omotic *\*tamm-* "10" and in Mande: Soninke *tamu*, Bozo Sorogo *tyemi*, Malinke, Vai, Kono *taŋ*, Bambara *tan* etc. "10" (Mukarovsky 1971: 143). The task to determine a primary source remains open.

10.3. Bideyat *sagoti* "10" can be perhaps connected with Berti *sang* "1".

10.4. Common KAN *\*fi-* forming tens has no hopeful etymology within Saharan. Is it possible to compare it with Songhai (Prost) *wey*, (Westermann) *iwéi* "10" ? Cf. e.g. Kanuri (Lukas) *fidègə* "40" vs. Songhai *wqitaaki* "40". Similarly Fur (Beaton) *weye* = (Meinhof) *wo(i)ye*, *woje* "10" can be quoted. But there are remarkable parallels even outside Nilo-Saharan: Mande: Susu *fū*, Bandi, Loma *pu*, Loko *puu*, Mano *vū*, Tura *bū*, Yaure *fu*, Mwa *vu*, Samo Toma *fū* etc. "10" and Central Chadic: Gude *pu*, *puwà*, Nzangi *pu*, Gudu *pú*, Mwu-lyen *bù*, Bachama *bəw* "10" (Mukarovsky 1987: 362–363).

## §6. Conclusion.

The oldest common Saharan numerals are represented by East-West isoglosses: ## 1.2., 2.2., 3.1.+3.2., 5.1., 6.2., 8.1., 9.2., 10.2. Confronting the system of all numerals in Saharan languages with numeral systems of other Nilo-Saharan languages, it is evident that the Saharan numerals are innovated, esp. those of the KAN branch which are connected by remarkable isoglosses with Songhai (## 1.3., 3.1. & 3.2, 4.1., 5.1., 10.4.). Some wide-spread Nilo-Saharan numerals can be identified at least as members of Saharan compounded numerals: ##4.1. & 6.2. *\*dig-* "2"; ##6.1. & 7.1. *\*ar-* "2"; #10.1. *\*mbar-* "2"; ##7.1 & 7.2. *\*tur- / \*tud-* "5" (if it is not identical with TU *\*tur-* "1"). The etymological analysis of Saharan numerals gives a convincing evidence about an affiliation of the Saharan family within the Nilo-Saharan macro-family. Only few parallels represent evident borrowings, e.g. Berti "9" < Central Sudanic; on the other hand, KAN "7" > Kotoko and KAN "6", "8", "9" > Buduma & Kuri. There is also a possibility of contacts between East Saharan and Kadugli (cf. 9.2.).

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