

The numeral system of Proto-Niger-Congo

A step-by-step reconstruction

Konstantin Pozdniakov

Niger-Congo Comparative Studies 2



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Konstantin Pozdniakov. 2018. *The numeral system of Proto-Niger-Congo: A step-by-step reconstruction* (Niger-Congo Comparative Studies 2). Berlin: Language Science Press.

This title can be downloaded at:

<http://langsci-press.org/catalog/book/191>

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ISBN: **no digital ISBN**

no print ISBNs!

no DOI

Source code available from www.github.com/langsci/191

Collaborative reading: paperhive.org/documents/remote?type=langsci&id=191

Cover and concept of design: Ulrike Harbort

Fonts: Linux Libertine, Arimo, DejaVu Sans Mono

Typesetting software: Xe_{La}TeX

Language Science Press

Unter den Linden 6

10099 Berlin, Germany

langsci-press.org

Storage and cataloguing done by FU Berlin

no logo

Ирине Поздняковой

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2 Noun classes in the Niger-Congo numeral systems

In most NC languages, the numeral stems are combined with noun class markers. More often we are dealing with the dependent markers of noun classes (in particular, in the numeral '1', as well as in the numerals '2'-'5') in those languages where there is an agreement between numerals and nouns. But class markers appear in many languages, even without any agreement. For example, when counting, numerals are often used in a nominal function and include obligatory markers of noun classes. In this case, numerals as nouns and, on the other hand, numerals as proper numerals can have different class markers (and different roots). Thus, in Likile (Bantu C) *li-yɔɔ* 'ten' (CL5), *mo-túkú* / *mi-* 'dozen' (CL3 / CL4) (Carrington 1977).

In many languages, nominal classes in numerals are easily recognized. In other languages, as a result of phonetic processes at the junction of CM and numeral stem and/or as a result of changes by analogy in the paradigm of numerals, it might be difficult to determine which noun class is included in the numeral, although we can distinguish a lexical root. Thus, in Lulamoji (Bantu J) in some derived numerals (*mm-kágá* '60' < *mu-kágá* '6' and *mm-sáánvu* '70' < *mu-sáánvu* '7'), an obscure CM **mm-** is observed (Larry Hyman, p.c.). It is not homorganic, so we can not treat it as CL10. Meanwhile, in the majority of other languages within this group, it is clearly CL10 which is observed in these forms: cf. for example, in Gwere *ṅka: ga* '60', *ṅsanvú* '70', cf. *lù-kúmì* '1000' / *ṅkúmì*, *βiβiri* '2000' (clearly CL11 / CL10)¹. Such cases are not sufficiently dramatic for reconstruction.

However, in a number of languages in synchrony we do not have sufficient criteria to decide whether we are dealing with the root of a numeral or with combinations of a root with an archaic noun class marker. In other words, we cannot isolate the root, and therefore we cannot compare it with the roots of other languages. E.g. we possess no formal proof that the Kobiana (Atlantic) term

¹The irregular allomorph of CL10 may have arisen as a result of a change by analogy with the basic numeral '6' and '7': N homorganic (CL10) in these derived forms > **mm-** by analogy with **mu-** (CL3).

2 Noun classes in the Niger-Congo numeral systems

sana ‘four’ is composed of *sa-* being a class prefix adduced to the lexical base (*-na*). This base is only distinguishable by means of external comparison, although this method alone is admittedly insufficient, since the Kobia term may as well be interpreted as an innovation (*sana* ‘4’).

In more complicated cases, it should be assumed that a noun class affix replaced one of the segments of the stem, thus becoming an integral part. The Wolof (Atlantic) numerals provide a good example of this phenomenon. The following numerical terms are attested in Wolof at the synchronic level: *ñaar* ‘2’, *ñett* ‘3’, *ñeent* ‘4’. Normally the noun class affixes are not included in the lexical base in Wolof, so synchronically we do not have to interpret the first consonant of Wolof numerals as a prefix. However, there are a number of important arguments in favor of the presence of the frozen prefix **Ñ-* in the Wolof numerals. First, these are the only numerals that agree in the *Ñ* class, being one of the two plural noun classes preserved in Wolof (cf. *fukk* ‘ten’ which agrees in the singular noun class B). Secondly, the forms *yaar* ‘2’ and *yett* ‘3’ (with the initial consonant being identical to the other plural noun class - Y) which agree in the Y class have been preserved in some Wolof dialects. Finally, as we hope to demonstrate below, the unification of numerals by class in Niger-Congo languages is characteristic of terms covering the sequence from ‘two’ to ‘four’. Thus, in the diachronic perspective, the consonants in question should be viewed as characteristic of class markers rather than stem segments. However, if this assumption is correct, we are forced to conclude that these markers have been integrated into the stem, having replaced the original initial consonants of the terms in question, the more so that VC-roots are uncommon in Wolof (numerical roots most probably had CVC structure, see Pozdniakov 2015: 615-616). This means that the Wolof terms are of little significance for the reconstruction of the terms for ‘2-4’ in Proto-Atlantic.

Most of the issues (theoretical ones included) that have complicated our reconstruction while studying noun classes in the families and branches of Niger-Congo pertain to the relationship of noun classes and numerals at the synchronic level. These problems are often left aside in the grammatical descriptions and do not attract sufficient attention from linguists. I am not aware of any work which discusses them systematically. Meanwhile, I am sure this question is worthy of attentive study because it reveals additional characteristics of noun class systems.

The first five numerals in Niger-Congo usually agree with nouns, for example in Sereer: *o-koor o-leng* ‘one man’, *a-koy a-leng* ‘one monkey’, *Ø-naak Ø-leng* ‘one cow’. In some languages and branches of the macro-family, the inventory of numerals that show agreement is reduced.

As noted, the noun class marker may appear in numerals in some contexts which are not related to the agreement.

1. For instance, for counting, the majority of languages include a class marker (CM); moreover, different numerals may have different affixes. For example, in Biafada for the numerals '1', '6-7' the class N is used, for '2-4' the class **bi-**, **gə** – for '5', **Ø** – for '8-9', **ba** – for '10'.

A lot of languages use CM in numerals starting from '6' and higher, that is in the numerals that do not show agreement in class, and not only in counting. For example, in Manjak *ngə-bvs ngə-təb* 'two dogs' (agreement), *ngə-bvs ɔ-ntaja* 'ten dogs' (lack of agreement, numeral '10' with CL **ɔ-** is used in an independent form).

The choice of the noun class for numerals in the two aforementioned contexts (in counting forms, and in numerals with no agreement) represent a very interesting case which I will outline hereinafter.

2. The interaction between noun classes and numerals cannot be limited to the aforementioned contexts. Noun classes emerge as well in derived numerals. The three main cases will be highlighted as follows.

Firstly, in the majority of Niger-Congo languages (and, apparently, even in Proto-Niger-Congo) the numeral '8' was formed from '4' by the reduplication of the first syllable of the original root **CL-na(h)i* '4' > **CL-na-na(h)i* '8'. Often the noun class marker of '4' and '8' coincides, but sometimes they do not. A question therefore arises: which factors define the choice of a noun class in a derived numeral?

Secondly, the Niger-Congo languages use compound numerals extensively, as do the majority of languages in the world. For example, the numeral '40' is formed following the model '40' = '4*10' (in many Bantu languages, for instance) or '40' = '20*2' (in the majority of Atlantic languages). The latter model is based on finger-counting, when two hands and two feet give a sum of 20. The numeral '20' goes back to the lexeme 'chief' or 'man'. In these languages the numeral '15' is often formed following the model 'two hands and one foot'. This model is well known and is discussed in the literature. However, the question of the choice of noun class in the first and second formative of these compound numerals was often left aside. Meanwhile, this question needs more clarification. The following questions will be discussed in the present study.

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In a compound numeral, for example, '20' = '10*2', the class marker is often absent in the second formative. For example, in Bomwali (Bantu, A80) we have: Ø-kamɔ '10' (CL9)², be-ba '2' (CL2), mɔ-kamɔ Ø-ba '20'. In this type of language, we have additional causes to discuss derivative words rather than syntagms.

In a compound numeral, both formatives include class markers, for example, '20' = 'CL-10*CL-2'. The CM can be different or the same in the two formatives: Pinji (B30) n-dzimà dí-bàlè '20' (10*2), Nsong (B80) ma-kwīm m-ɔ:l '20' (10*2). In the latter case, a particular type of *agreement* can be observed, that is, the second formative agrees in class with the first formative.

If in a compound numeral both formatives include class markers, as in '20' = 'CL-10*CL-2' then theoretically we can expect that the noun class of the first formative will coincide with the class of the independent numeral '10'. This strategy is very rare. One of the unique examples comes from Moghamo (Grassfields) i-yùm-bē '20' (i-yùm '10', i-bē '2'). In the majority of cases the noun classes of the two formatives do not coincide. For instance, in the same branch of Benue-Congo (Grassfields): Laimbue mī-yīm-bò '20' (i-yīm '10', bò '2'), the number '10' changes its class, being part of the first formative of the numeral '20'. The interpretation of this strategy in Niger-Congo languages will be given later. The same problem arises with the second formative. Very rarely does its class coincide with the noun class of the initial numeral (in the present case we deal with the numeral '2'). In the majority of cases it differs. The cause is, as it was already mentioned above, that the second formative agrees with the first one. For example, in the same group of languages (Grassfields): Mundani è-yem ye-be '20' (è-yem '10', be-be '2'). In some languages, noun classes of simple and compound forms differ even if agreement is absent.

3. Finally, the strategy of forming numerals only by the change of the noun class and with no changes in the lexical root represents a real parade of paradigmatic values of noun classes in numerals. This strategy was system-

²For a reader who is not aware of the tradition of Bantu linguistics, it is necessary to explain that in Bantu languages there is a stable inventory of noun classes, each having a fixed number. The ongoing numeration of Bantu was found useful for the study of noun classes in Niger-Congo in general, where the numeration of classes of non-Bantu languages represents a concrete etymological hypothesis. If a scholar assigns the number '6' to the class -**ɗam** of Fula (Atlantic language), it means that etymologically it should be related to the class ***ma** (CL 6N) of Proto-Bantu.

atically developed in one zone of Bantu languages, that is zone J (although it can be encountered sporadically in some other Niger-Congo languages). For example, in Chiga (Bantu J): *i-βirí* ‘2’ > *à-βirí* ‘20’ ; *mù-kâ:gà* ‘6’ > *ŋ-kâ:gà* ‘60’, *mù-nâ:nà* ‘8’ > *ki-nâ:nà* ‘80’.

It is interesting that the same language combines all three strategies. Thus, in Chiga:

1. The numeral ‘8’ is formed by reduplication of ‘4’: *i-nà* ‘4’ > *mù-nâ:nâ* ‘8’ (and we can observe the variation of noun classes 5 (*i-*) and 3 (*mù-*);
2. The numeral ‘200’ is formed by a word-combination, but not by the combination of ‘100’ and ‘2’ as we would expect. Instead, it is formed by the combination of ‘10’ and ‘2’: *βi-kùmì βi-βirí* ‘200’ (*i-kùmì* ‘10’, *i-βirí* ‘2’). Thus, ‘200’ (CL.PL) is a plural form of ‘10’ and ‘2’ (CL.SG). Furthermore, the second formative agrees in noun class with the first.
3. The numeral ‘20’ is formed from ‘10’ by changing the noun class exclusively: *à-βirí* ‘20’ (*i-βirí* ‘2’), and by the use of a different noun class, different from the one we find in ‘200’, that is CL.PL *à-*.

2.1 Noun classes in the counting forms of numerals

In some Niger-Congo languages, numerals do not have noun class markers in the counting form, but the number of these languages is very low. In the Atlantic family the only language with this feature is Balant. In the majority of Niger-Congo languages while naming a numeral (for example, in counting) noun class markers are used. These markers may be the same for all numerals, but this is a rare case. More often, for the numerals 1-10 there are three to four different markers (furthermore, special class markers may be used for the numerals ‘20’, ‘100’, ‘200’ and others).

A fragment of the Tetela (C80) numeral system is presented below (Table 2.1):

We see here a variety of classes as well as plenty of mini-clusters (note the noun class switch that occurs when a number becomes a part of a compound term; this phenomenon is characteristic of the Niger-Congo languages). The terms for ‘one’ (*ô-* class), ‘hundred’ (*lo-*) and ‘thousand’ (*ki-*) appear to be isolated on account of their noun class. At the same time, the following groups of terms are distinguishable: ‘2-3’ (*ha-*), ‘4-6/20’ (*a-*, «/» refers to the grouping of non-adjacent numerals), ‘7-8’ (*e-*), and ‘9-10’ (*di-*). It should be noted, however, that

Table 2.1: Tetela numerals

1	ó-tɔy	9	di-vwá
2	ha-énde	10	dí-kumi
3	ha-sátu	20	á-kumi á-ende
4	a-néy	90	á-kumi di-vwá
5	a-tánu	100	lo-kámá
6	a-samále	200	n-kámá y-éndé
7	e-sambéélé	1000	ki-nùnu (yínja)
8	e-náánéyi	2000	ø-nunu p-énde

even in such systems some numerals can be used without noun class markers ('2000').

Three issues need to be mentioned here.

The noun class markers are easily distinguishable in Tetela. However, for the majority of the NC languages (especially the non-Bantu ones) this is not the case. The criteria that would allow for distinguishing between the markers and the segments of stems are often lacking, which means that we have no idea which stem in a language under study is to be used for comparative purposes. The situation is even more grave in those numerous cases where an additional class marker is added to a numeral which contains an archaic class marker integrated in a stem.

The mechanism underlying the grouping of numerals into the mini-clusters (by including them in a common noun class) remains virtually unexplored, although it is certainly worthy of investigation and thorough consideration from the theoretical point of view. What was the motivation behind the use of the class marker **ha-** with the Tetela terms for 'two' and 'three', while in case of 'nine' and 'ten' the class marker **di-** was preferred in this language? The answer to this question is probably not to be sought within the semantics of a given noun class. On closer examination, the choice of a noun class in such distributions is often unmotivated by anything other than the need to formally distinguish a group of numerals (as opposed to other groups). In this respect, this mechanism is very similar to the alignment by analogy as applied to numerals in many languages. This strategy (implying an irregular alteration of a part of a lexical stem) can be compared to a radical surgery, which is never an easy option. Languages with noun classes have less traumatic means to achieve the same result, e.g. by using different noun class markers to distinguish between the groups of numerals. This elaborate marking technique is widely attested in the Niger-Congo lan-

guages. The grouping of numerals is typologically interesting as well: some of the groups are fairly common whereas some are quite rare. Moreover, it is probable that these groups were formed independently in different languages: a situation where a pair of closely related languages exhibit radically different grouping and vice versa is not uncommon.

Some numerals are not normally subject to grouping and tend to be marked with a specific noun class, thus standing in opposition to the rest of the numerical terms. The use of this specific class is especially frequent with the terms for ‘one’, ‘hundred’ and ‘thousand’, cf. e.g. specific noun classes observable in the Tetela terms for ‘one’ (ó-) and ‘hundred’ (lo-).

Let’s look at the distribution of numerals in noun classes for the languages where this information is available. This observation will be made on a selection of 254 Benue-Congo languages (among these, 166 are Bantu languages, evenly distributed by zones). Our sampling comprises languages that are known to employ noun classes on the numerical terms used in counting.

2.1.1 The specific marking of numerals

As mentioned above, specific noun classes are used with the terms for ‘one’ and ‘ten’ especially often: 174 languages out of 254 mark the numeral ‘1’ in a distinguished way, and 151 languages mark the numeral ‘10’ separately.

Examples of systems with the term for ‘one’ being in opposition to the rest of the numerals (marked with a different noun class)³ are provided below (Table 2.2).

Examples of one other strategy (the term for ‘ten’ being a noun remains in opposition to the rest of the numerals by means of a noun class) are given in Table 2.3.

Another strategy with the terms covering the sequence from ‘two’ to ‘nine’ being opposed to the terms for ‘one’ and ‘ten’ is characteristic of the languages represented in Table 2.4.

However, the terms for ‘one’ and ‘ten’ can form a group opposed (by means of a noun class) to the rest of the numerals (Table 2.5).

With the exception of the terms for ‘one’ and ‘ten’, a specific marking of numerals by means of a noun class is rarely attested. A specific noun class (different from noun classes in other numerals) was found in only 6 languages for the numeral ‘3’, and in only 7 for the numeral ‘4’. It should be noted, however, that a

³Considering the fact that numerals ‘2-9’ belong to the same noun class, the numerals ‘6-9’ are not included in Tables 1.2-1.5.

2 Noun classes in the Niger-Congo numeral systems

Table 2.2: Specific noun classes in ‘1’

Branch	Language	‘1’	‘2’	‘3’	‘4’	‘5’	‘10’
J30	Nyole	ndala	ebiri	edatu	ené	etaanu	ehúmi njereere
Defoid	Ede Ica	ɔkɔ	eji	eta	ēē	ɛwu	ɛya
Defoid	Ede (dial.)	ɔkē	médzì	méta	méhē	méhú	méwá
Defoid	Ifè	ènɛ / ɔkɔ	méédzì	méeta	méerē	méerú	maá
Mbe	Mbe	ómè	bép ^w ál	bésá	béñí	bétjān	béfwōr
Mbam	Nomaande	ɔmɔtɛ	béfendi	batátɔ	bényise	batáánɔ	bɔɔháta
Mbam	Tuotomb	ómò	péfá ⁿ d	pédààt	pínis	pétàn	p ^w ówàt
Mbam	Tuki	umwé:sií	mówá	mótátó	mwé:né	motá:nó	mwábótɔ
Mbam	Yambeta	ímù?	móɓààn	módáád	múni?	mótáàn	mówád
Mbam	Nubaca	pòmóhò	m ^w ántfì	mùtát	mùpìhi	mùtā:n	m ^w ap ^w at
Mbam	Yangben	pùmòm	mándè	matát	méni	mátàn	mát
Mbam	Numaala	bùm^wòm	mā:ndè	mádádɔ	méni	mát ^h án	mát ^h
Mamfe	Denya	gémā	ópéá	ólé	óni	ótà	ófiā

Table 2.3: Specific noun classes in ‘10’

Branch	Language	‘1’	‘2’	‘3’	‘4’	‘5’	10
S30	Kgalagadi	(bɔ):ɲwɪ	(bɔ)birí	(bɔ)rá:rɔ	(bɔ):nɛ	(bɔ)t ^h á:nɔ	lɪfó:mɪ
S10	Kalanga	(kɔ)ɲómpɛlá	(kù)bílí	(kù)tátú	(kù)nnà	(kù)jānù	gùmí
Cross-River	Bete-Bendi	ikèn	ifè	ikíé	inè	idíɔŋ	lèh ^w ó
Mbam	Nugunu	gímmue	gáande	gádado	génni	gátáano	séɔdo
Idomoid	Eloyi	ńgwònzé	ńgwòpó	ńgwòlá	ńgwòndó	ńgwóló	úwó
Jukunoid	Akum	ájì	afà	ata	apì	acóŋ	ìkùr(ù)
Platoid	Tyap (Kataf)	anyun	afean	atat	anaai	afwuon	swak

specific marker is often employed for the terms within the sequence from ‘six’ to ‘nine’, e.g. the term for ‘nine’ bears a specific noun class marker in the 151 languages under study.

2.1.2 The grouping of numerals by noun class

Adjacent numerals are more often grouped by their noun classes. Among different numeral grouping types, several are diffused across all main branches of Benue-Congo. I will list 15 of the more frequent groupings of numerals and illustrate each of them with an example. These groupings are reported in Table 2.6.

Even limiting Table 2.6 to 15 groupings demonstrates the fact that some numerals (for example, ‘2’) are grouped by noun class more often than other numerals (for example, ‘8’). By analyzing the whole table of groupings (reported in Ap-

2.1 Noun classes in the counting forms of numerals

Table 2.4: Common noun classes for ‘2’-‘9’

Branch	Language	‘1’	‘2’	‘3’	‘4’	‘5’	‘10’
Cross-River	Ebughu	sɪŋ	ibà	itɛ	inìàŋ	itɪŋ	lùgò
Cross-River	Oro	ki	ibà	ítɛ	íníàŋ	ítɪŋ	lughu
Cross-River	Usakade	tʃɛn	m̀bà	ntá	nnìòŋ	ntʃón	nùòp
Cross-River	Leggbo	ẁɔ̀ni	áfɔŋ	àttan	ànnan	àzen	dzo
Platoid	Ayu	ɪdɪ	afah	ataar	anaɲaf	atugen	ifog
Grassfields	Mundani	yea-mɔʔ	bebe	betat	bekpi	betáǎ	èyem
Igboid	Ekpeye	ɲinɛ	ʃibó	ʃító	ʃínó	ʃísɛ	ɖi
Tivoid	Ipulo	émò	viál	vétàt	vɛ̀ni	vétàn	épó:t
Isimbi	Isimbi	kēnə	m̩ə̀rək̩p̩ə	mākōl̩ə	mōpi	mātōnə	būyù
A40	Bankon	(i)yǎ	(bi)ʃá	(bi)iyâ	(bi)nân	(bi)tán	ifóm
A80	Bekwil	wát / ɲgót	e-ʃá	e-lél	e-nâ	e-tên	kám
A80	Koonzime	gwár	bibá	bilél	binâ	bitên	kám
B20	Kélé	nwúntù	bábá	bálál(è)	bánáyì	bátán	dyúm(ù)
B20	Ntumbede	iwótó	bábà	báràrè	bónáyè	bátánè	dzómè
J20	Jita	kam ^w i	βiβiri	βisatu	βina	βitanu	ekumi
K20	Mbunda	cimo	vivali	vitatu	viwana	vitanu	likumi
M20	Ndali	kamukene	fi-wiri	fi-tatɔ	fi-na	fi-hano	kalo ^o go
N30	Nyanja	cimódzi	(zi)βiri	(zi)tátu	(zi)nái	(zi)sanu	k ^h úmi
N20	Tumbuka	ka-môza	tu-wiri	tu-tátu	tu-nâyi	tu-nk ^h onde	k ^h úmi
P20	Makonde	iimo	mbiili	nnaátu	nʃe:ʃe	mwaánu	likuúmi / kuúmi

Table 2.5: Common noun classes for ‘1’ and ‘10’

Branch	Language	‘1’	‘2’	‘3’	‘4’	‘5’	‘10’
Platoid	Ayu	ɪ-dɪ	a-fah	a-taar	a-naɲaf	a-tugen	i-fog
Tivoid	Ipulo	é-mò	v-íàl	vé-tàt	vé-ɲì	vé-tàn	é-pó:t
Bantu-A40	Bankon	(i)yǎ	(bi)ʃá	(bi)iyâ	(bi)nân	(bi)tán	i-ʃóm
Bantu-M20	Ndali	ka-mukene	fi-wiri	fi-tatɔ	fi-na	fi-hano	ka-lo ^o go

pendix A-B), the following observations can be made regarding each numeral.

Numeral ‘1’. Groupings of the numeral ‘1’ are relatively rare: the majority of languages, obviously, prefer to oppose ‘1’ to all other numerals. In case it is grouped with other numerals, the most frequent grouping is within the first five (‘1-5’) or six (‘1-6’) numerals. In the analyzed database there are four languages which differentiate the first two numerals ‘1-2’. For instance, Ngoreme (Bantu-E10): *e-m^we* ‘1’, *e-bere* ‘2’, but *i-satɔ* ‘3’, in Gitonga (S60) *mwéyò* ‘1’, *mbili* ‘2’, but *dzi-ná* ‘4’.

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Numeral ‘2’. The numeral ‘2’ reveals the maximum predisposition to groupings. The most frequent are: ‘2-5’ and ‘2-6’. The grouping ‘2-4’ is significantly less frequent but remains present in the majority of Bantu zones and in other groups of Benue-Congo languages.

Numeral ‘3’. ‘3’ is often found in groupings but is very rarely opposed by noun class to ‘2’. However, some very interesting examples exist. For example, Mbuun (Bantu-B80): *umwés* ‘1’, *byël* ‘2’, *í-tár* ‘3’, *í-na* ‘4’, *í-tân* ‘5’. It is worth mentioning that grouping of ‘3-8’ and ‘3-10’ were not encountered in any of the languages examined.

Numerals ‘4’ and ‘5’. The only frequent grouping involving ‘4’ is ‘2-4’ (except groupings that include four numerals or more) and for ‘5’ it is ‘2-5’ or ‘2-5/10’. The grouping ‘5-9’ was encountered only in five languages and the grouping ‘5-10’ and ‘5-8’ (in combination ‘5-8/10’ – only in one language. The lack of a frequent grouping of ‘5-9’ can seem even more strange because in many languages numerals ‘6-9’ are based on 5 (moreover, this type of derivational model can be reconstructed for Proto-Bantu and, perhaps, for Proto-Benue-Congo, with the sole exception of the numeral ‘8’ which was apparently formed from ‘4’). Another unexpected case is the lack of grouping for ‘5/10’, that is the lack of a specific class for ‘5’ and ‘10’, considering the fact that in many languages ‘10’ is formed from ‘5’. This model was encountered only in one dialect of Eggon: *ò-tnó* ‘5’, and *ó-kpo* ‘10’, while in other numerals the noun class is not marked (I am not aware whether the different tone on the prefix indicates a different noun class).

Numeral ‘6’. A high number of groupings of ‘6-9’ is natural. In many languages it becomes ‘6-8’ because of the specific derivation of the number ‘9’. In contrast, groupings ‘6-10’ are very rare.

Numeral ‘7’. It is worth mentioning the frequent grouping of ‘7-8’ (21 languages). We are dealing not with one concrete class in Benue-Congo but rather a similar way of marking the numerals ‘7’ and ‘8’. In the three examples reported in Table 2.3 the presumably common CL7 (Cilungu *tʃí*-, Sakata *ke*-, Xhosa *si*-) was found, in other languages a number of different classes can be encountered (Table 2.7).

Numerals ‘8’, ‘9’, ‘10’. The same characteristic is typical for the frequent groupings of ‘8-9’ and ‘9-10’, shown in Tables 1.8-9.

2.1 Noun classes in the counting forms of numerals

Table 2.6: The most frequent groupings of numerals based on noun classes in Benue-Congo languages

Grouping	#	Entire grouping	BC branch	Language	'1'	'2'	'3'	'4'	'5'	'6'	'7'	'8'	'9'	'10'
2-5	58	1, 2-5, 6, 7-8, 9, 10	Bantu-F10	Cilungu	tjòǒǵá	ví-íli	ví-táti	ví-ni	ví-sáánò	mù-tàándá	tjfi-niimbáli	tjfi-nááni	fúúndimbali	i-kúmi
2-6	42	1, 2-6, 7-8, 9, 10	Bantu-C40	Sakata	némo	i-pé	i-sar	i-ni	i-tsir	i-soj	ke-fo	ké-né	leva	jō
2-4	24	1, 2-4, 5, 6, 7, 8, 9, 10	Bantu-C50	Pagibete	moti	e-bale	e-salo	e-kwanjane	bumoti	motofa	sambo	mwambe	libwa	zomi
2-9	22	1, 2, 9, 10	Grassfields	Mundani	yea-mo?	be-be	be-tat	be-kpi	be-tāā	be-ntua	be-sāambe	be-flāā	be-bʒʔa	è-yem
7-8	21	1, 2-6, 7-8, 9-10	Bantu-S40	Xhosa	jè	m-biní	n-táti	*n-né ?	n-t'ānù	n-t'āndat'ù	sí-ll'etjilè	sí-bʒzʒ	li-t'ʒ6á	li-fúmi
6-9	20	1-5, 6-9, 10	Ekoid	Nde-Ndele	n-dʒi	m-ba	n-sa	n-ne	n-don	a-sighasa	a-simma	a-neghane	a-sima-wobo	wobo
9-10	16	1, 2-5, 6, 7, 8, 9-10	Platoid	Lijili	lō	à-bé	à-tjé	a-nàró	à-só	mì-nzi	mù-tá	rúnó	zà-tjé	zà-bé
1-6	15	1-6, 7-8, 9, 10	Bantu-E10	Simbiti	ka-m'we	ka-βere	ka-tato	ka-nne	ka-taano	ka-sa'saḟa	mu-hu'ḡate	mo-naane	ke'da	i-kmi
6-8	15	1-5, 6-8, 9-10	Bantu-F30	Nilamba	ka-mwe	ka-beli	ka-tatu	ka-nee	ka-láno	mu-tandatu	mup-ungate	mu-naana	kyenda	kyumi
2-10	14	1, 2-10	Mbe	Mbe	ómè	bé-p'āl	bé-sá	bé-ni	bé-tján	bé-sésár	bé-tānelep'āl	bé-nibéni	bé-tānebéni	bé-fwór
1-5	14	1-5, 6, 7, 8, 9, 10	Grassfields	Ghomala	yá-mu?	yá-pwá	yá-tá	yá-pfuá	yá-tá	ntóká	sambwáé	hóm	vùṛá	yām
8-9	12	1/7, 2-6, 8-9, 10	Bantu-H30	Ngongo	m-wisi	b-wol	bé-tat	be-wan	bé-tan	be-saman	ns-ambwadi	ke-nan	ke-bva	é-kwom
1-10	9	1-10	Defoid	Ayere	ì-kā	ì-dʒi	ì-tā	ì-jě	ì-tú	ì-fā	ì-dʒ'ɪ	ì-rō	ì-dā	ì-g'á
7-9	9	1, 2-5, 6/10, 7-9	Idomoid	Alago	ó-je	è-pà	è-ta	è-nè	è-ho	ì-hiri	à-hapà	à-hatà	à-hánè	ì-g'wó
2-3	9	1, 2-3, 4-6/9, 7-8/10	Cross-River	Elemé	n-ne	ǝ-bre	ǝ-taa	è-táale	è-wò	à-ṛarabà	à-ṛarabà	à-sira'ò	à-ṛò	à-ṛò

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1. The first column contains a stable grouping of numerals illustrated by an example. The second column indicates the number of languages which have this grouping (out of 254 languages under consideration). The rows in the table are organized in decreasing order. The third column lists all the groupings based on the noun class for a concrete language. Groupings of the adjacent numerals are indicated by a hyphen. Groupings of non adjacent numerals are indicated by a slash. Thus, the formula in the third column of the last row can be interpreted as follows: in Eleme there are three groupings of numerals – ‘2-3’ (class ð-), ‘4-6’ and ‘9’ (class è-), and also ‘7-8’ and ‘10’ (class à-).

Table 2.7: Groupings of ‘7’-‘8’ by noun classes

Branch	Language	‘6’	‘7’	‘8’	‘9’
Bantu-B70	Teke-Tyee	bísémene	n-tsaama	m-pwómɔ	Owá
Bantu-C80	Tetela	asamále	e-sambéélé	e-náánéyi	Divwá
Bantu-J30	Nyore	bisasaba	mu-safu	mu-nane	Sienda
Platoid	Yeskwa	èncí	tò-nvà	tó-ndát	tyúôrá
Cross-River	Eleme	èʔòrò	à-ʔàràbà	à-ʔaataa	èsiraʔò

Table 2.8: Groupings of ‘8’-‘9’ by noun classes

Branch	Language	‘7’	‘8’	‘9’	‘10’
Bantu-B10	Myene	ò-rwáyénô	è-nánáyì	è-nóyòmì	ì-yómí
Bantu-B20	Sake	bì-tánènèbibá	rì-mwâmbì	rì-bvùwó	dzúmù
Bantu-B80	Mpiin	n-sámwê:n	bí-nán	bí-vwa	kub
Bantu-H10	Kikongo	sàmbúwàlì	í-nàná	í-vùwà	kúmì
Bantu-B80	Songo	n-sambwar	ki-nan	ki-va	kwim
Bantu-J40	Nande	erì-rínda	omú-nani	omw-énda	erí-kúmi
Bantu-J50	Tembo	βi-rínda	mú-nanɛ	mw-enda	é-kumi
Grassfields	Ngomba	sambá	yé-né-fom	ye-ne-pfúʔú	ne-gúm

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Table 2.9: Groupings of ‘9’-‘10’ by noun classes

Branch	Language	‘8’	‘9’	‘10’
Bantu-B70	Teke-Tyee	m-pwómo	o-wá	o-kwúúmu
Bantu -C40	Budza	mo-nánáye	li-bwá	ly-ómo
Bantu -C80	Tetela	e-náánéyi	di-vwá	dí-kumi
Bantu -G60	Hehe	m-nane	nyi-gonza	nyi-chumi
Bantu -J60	Rundi	umu-naáni	i-tfeénda	i-tfúmi
Platoid	Lijili	rúnó	zà-tfẹ	zà-bẹ

2.2 Noun classes in derived (reduplicated) numerals

Reduplication is widely attested as a means of constructing numerical compounds in NC. This is especially applicable to the pattern ‘8 = 4 redupl.’ which, as we hope to demonstrate below, can be reconstructed at the Proto-Niger-Congo level. Another common pattern (attested, however, with a somewhat lesser degree of frequency) is ‘6 = 3 redupl.’. Three main strategies pertaining to the use of the noun classes are employed within this derivation scenario:

1. Reduplicated terms preserve the class marker of the source-term in both segments, cf. e.g. Ndoe (Ekoid) *be-ra* ‘3’ > *be-ra-ba-ra* ‘6’, *be-ne* ‘4’ > *be-ne-be-ne* ‘8’; in Alege (Cross-River) *é-ce* ‘3’ > *é-ce-e-ce* ‘6’.
2. The original class marker is preserved in only the first segment of the reduplicated form, and omitted in the second: Okpamheri (Edoid) *e-sa* ‘3’ > *e-sa-Ø-sa* ‘6’, *e-ni* ‘4’ > *e-ni-Ø-ni* ‘8’.
3. Finally, the class marker of the first segment of the reduplicated form is different from that of its source-form: Kwa (Ekoid) *e-sa* ‘3’ > *a-sa-ka-su* ‘6’, *i-ni* ‘4’ > *a-ni-ka-ni* ‘8’.

The number of these strategies is reduced to two in cases where a derived term is non-separable (e.g. derived by partial reduplication). In such cases, the class marker of the source-term can be either employed (Kikuyu *i-tatu* ‘3’ > *i-tatatu* ‘6’), or not (Vinza *ka-ne* ‘4’ > *mu-nane* ‘8’).

We might expect that while forming ‘8’ from ‘4’, the singular class of the latter would be switched to the plural class of the former. In Bantu languages, however, this is not the case. Apparently already in Proto-Bantu we should reconstruct the derivational model **i-nàì* ‘4’ (CL.SG.5) > **mò-nànài* ‘8’ (CL.SG.3). However, from an etymological point of view, the class **mu-** represents the reflex of the class 6B.PL and not a reflex of the class 3.SG in Niger-Congo. This question raises an additional and very important topic which cannot be examined in the present study (the arguments in favor of class 6B.PL **mu** in Proto-Niger-Congo can be found in Pozdniakov2013).

Bantu languages. The following presents partial data on the numeral system in Myene (B10)⁴ (Table 2.10).

First of all, it is interesting to highlight a variety of noun classes in the left column of the table and their uniformity in the right one. In the numerals from

⁴Thanks to Odette Ambouroué for some clarifications and for a profitable discussion on noun classes in Myene.

2.2 Noun classes in derived (reduplicated) numerals

Table 2.10: Myene numerals

1. *N-mòrì (> mòrì)	
2. *N-bàni (> mbàni)	20. à-yóm á-mbàni (10*2)
3. *N-rárò (> tǎrò)	30. à-yóm á-rárò
4. *N-náyì (> náyì)	40. à-yóm á-náyì
5. ò-tání	50. à-yóm á-tání
6. ò-rówá	60. à-yóm ó-rówá
7. ò-rwá-yé-nómò (6+1)	70. à-yóm ó-rwá-yénô
8. è-ná-náyì (2*4)	80. à-yóm é-ná-náyì
9. è-nó-yòmì (10-1)	90. à-yóm é-nó-yòmì
10. ì-yómí	100. *N-kámá.
	200. kámá mbàni

1 to 10, the system includes four different singular noun classes: N- (CL9) – ‘1-4’, ò- (CL3) – ‘5-7’ (the numeral ‘7’ is formed as ‘6+1’, where *nómò* means «the only one, the same»), è- (CL7) – ‘8-9’ (the numeral ‘8’ is a reduplicated form of ‘4’, the numeral ‘9’ is formed as ‘9 = 10 – 1’) and finally, ì- (CL5) – ‘10’. A homorganic nasal can be quite reliably reconstructed in ‘1-4’, sometimes appealing to indirect characteristics. For example, in *tǎrò* ‘3’ the nasal is absent but in Myene **tf-** is not a reflex of *t. In this language *t- > r-, as can also be seen in the second formative of ‘30’. The initial **tf-** can be traced back to *N-r-.

In numerals of dozens only CL6 à- is used, which is one of the plural classes (with a collective meaning). An interesting detail: in ‘20’ – ‘50’ the second formative agrees with the first one in noun class (á-), and in ‘60’ – ‘90’ there is no agreement (the second formative maintains noun classes which mark the units as in independent forms; its high tone is due to the high tone in the preceding root *yóm*).

Non-derived numeral ‘100’ belongs, as ‘1’, to the singular class CL9. Does the second formative of ‘200’ agree with the first one? It is impossible to say, because the noun classes of both formatives coincide when used singularly.

Finally, it is possible to formulate the principle of derivation with reference to the noun classes: the numeral ‘10’, being a formative of numerals ‘20’ – ‘90’, maintains its meaning but changes the singular noun class to a plural noun class following the most standard SG ~ PL correlation in the language. For CL.SG.5 (ì- in Myene) which is expressed through *ì-yómí* ‘10’, the standard correlate is CL.PL.6 (à-). Concerning the second correlate (units), it agrees with the first one (dozens)

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in the numerals that even in independent use show agreement with nouns (in Bantu numerals ‘1-5’ show agreement with nouns). For this reason in numerals ‘20’–‘50’ units from ‘2’ to ‘5’ agree with ‘10’ in its plural form and in ‘60’–‘90’ second formatives ‘6’–‘9’ do not show agreement.

If we confront the numeric characteristics of simple and derived forms, the formation of numerals in Myene can be represented by SG > PL-PL and numerals ‘60’ – ‘90’ by SG > PL-SG.

This system is quite typical for Bantu languages, although the variation is considerable. The main variations are illustrated in the Table (1.11), including languages only from the zone J:

Table 2.11: Number patterns in derived numerals

SG > SG-PL	10 > 200	CL5 > 5-8	Hema	10	ikumi	200	ikumi bibiri
SG > SG-PL	1000 > 2000	CL11 > 11-8	Hema	1000	rukumi	2000	rukumi bibiri
SG > PL-PL	2 > 20	CL5 > 6-6	Gundu	3	isátó	30	makumi gasató
SG > PL-PL	100 > 200	CL5 > 6-6	Shi	100	igana	200	magána abiri
SG > PL-PL	10 > 200	CL5 > 8-8	Chiga	10	ikúmi	200	βikúmi βiβiri
SG > PL-PL	100 > 200	CL7 > 8-8	Ganda	100	tjikúmi	200	bikúmi bibiri
SG > PL-PL	1000 > 2000	CL7 > 8-8	Shi	1000	cihumbi	2000	bihumbi bibiri
SG > PL-PL	1000 > 2000	CL11 > 10-8	Ganda	1000	lùkúmi	2000	ṛkùmi bibiri
SG > PL-SG	8 > 80	CL3 > 6-3	Shi	8	múnaani	80	mákumi galí múnaani
SG > PL-SG	9 > 90	CL3 > 6-3	Shi	9	múénda	90	mákumi galí múénda
SG > PL-SG	1000 > 2000	CL11 > 10-5	Soga	1000	lùkúmi	2000	ṛkùmi iβiri
PL > PL-PL	2 > 20	CL8 > 6-6	Shi	2	bibiri	20	mákumi abiri
PL > PL-PL	3 > 30	CL8 > 6-6	Shi	3	bifarhu	30	mákumi afarhu
PL > PL-PL	4 > 40	CL8 > 6-6	Shi	4	bíni	40	mákumi ani
PL > PL-PL	5 > 50	CL8 > 6-6	Shi	5	birhaanu	50	mákumi arhaanu

The Hema example demonstrates that the pluralization of the class for the formation of derived numerals is not mandatory (at least, for hundreds and thousands), although it unconditionally dominates in the languages of this group (Shi, Chiga, Ganda, Soga). If the simple numeral is already marked for plural class (there are examples demonstrating this), the first formative of the derived numeral appears with a new plural class (for example, in Shi). In the combination SG > PL-PL the plural classes in a composed derived numeral can be different (Ganda, derivation ‘1000’ > ‘2000’).

While forming a word combination from one word, the number of possible combinations of singular and plural classes amounts to eight. As shown in the table, only four of these combinations are actually encountered. No languages show combinations SG > SG-SG, PL > SG-SG, PL > SG-PL, PL > PL-SG. This distri-

bution demonstrates how pluralization is used for the formation of numerals of higher rank. This strategy can be systematically found in other branches of Niger-Congo.

Atlantic languages. In order to be able to compare the principles of derivation of numerals in Bantu and in Atlantic languages systematically, we need to first formulate at least three main differences between these systems.

First of all, it is important to highlight that the system of Bantu is decimal, which is not typical for other branches of Niger-Congo, nor for other branches of Benue-Congo. The overwhelming majority of Atlantic languages are ‘20’-based and not decimal. In these languages, accordingly, ‘40 = 20*2’ (and often ‘100 = 20*5’) and very rarely ‘40 = 10*4’.

Secondly, in Atlantic languages the numerals ‘6-9’ are systematically formed following the model ‘5’ + ‘1, 2, 3, 4’. This model does not permit the change of noun classes for the numerals ‘6-7’ and/or ‘7-9’. The numerals ‘6-9’ maintain all the characteristics of ‘5’ (first formative) and ‘1-4’ (second formative).

Thirdly, contrary to Bantu, the majority of forms of ‘5’ are formed from the lexeme ‘hand’, maintaining the noun class of this lexeme. In Proto-Bantu ‘hand’ and ‘five’ are reconstructed as different roots.

The sum of the abovementioned factors explains the fact that noun classes in the numerals ‘6-9’ are of no concern to the present study. Nonetheless, as will be further demonstrated, the main principle of interaction between noun classes and numbers in the numeral system of Atlantic languages is similar to that of Bantu.

Apparently, derived numerals were already formed following the model ‘40 = 20*2’, ‘60 = 20*3’, ‘80 = 20*4’ in Proto-Atlantic. Different strategies of agreement are partially shown in the table (Table 2.12, (only the most simple cases were reported):

Table 2.12: Atlantic languages: noun classes in the derived numerals

	‘20’	CL	‘40’	CL-CL	‘2’	CL
Bijogo	o-joko (‘person’)	SG	ya-joko ya-n-som	PL-PL	n-som	PL
Banjai	‘ə-v-i (‘chief’)	SG	‘u-v-i yu:- βe	PL-PL	‘su:-βe	PL
Kasa	ə-yi: (‘chief’)	SG	ku-yi: ku-luβə	PL-PL	‘si-luβə	PL
Bayot (Sénégal)	‘ə-yi (‘chief’)	SG	‘ku-yi kɔ-ɪɪg:ə	PL-PL	‘ɪɪg:ə	PL
Bayot (Guinea Bissau)	ga-baməgol (‘person’)	SG	gɔ-məgol-gɔ-rɪg-ga	PL-PL	tɪg-ga	
Kwaatay	butuman	SG	ba-k-an ba-ka-suba	PL-PL	ku-suba	PL
Nyun Gunyamolo	buruhur	SG	ɟamaŋ ɪ-nakk	PL-PL	ha-nakk	PL
Karon	ə-wi	SG	ə-wi e-supək	SG-SG	su-supək	PL

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As demonstrated in Table 2.12, the majority of Atlantic languages within the Bak branch (Bijogo, Banjal, Kasa, Bayot) show that in the numeral ‘40’ (‘60’, ‘80’) the units ‘2’ (‘3’, ‘4’) agree in general according to a plural class and not according to the class of the numeral ‘20’. The same principle is characteristic for the languages of Benue-Congo. In all four abovementioned languages, the formation of ‘40’ is based on the agreement in number as for animated nouns CL1.SG – CL2.PL (this is very clear especially knowing the etymology of the numeral ‘20’).

Pluralization as a form of derivation is used when the form of the numeral ‘20’ is not transparent (Kwaatay *butuman* ‘20’, unclear etymology, Nyun Gunyamolo *buruhur* ‘20’ (possibly from «price + man»); in the numeral ‘40’ lexemes are used with the meaning ‘people’). In some languages (Karon) the agreement is based on the singular class of the numeral ‘20’ and not on its plural correlate.

In Atlantic languages that, like Bantu, systematically follow the decimal system, the pluralization of the class permits the formation of new numerals (more often as word combinations) (Table 2.13):

Table 2.13: Agreement in numerals derived from ‘10’

	SG ‘10’	PL ‘40’	SG, PL ‘4’
Basari	ε-pəxw	ɔ-fəxw ɔ-nəx	ḃə-nəx
Sua	Ø-tɛŋi	i-tɛŋi i-naŋ	b-nan

In such cases agreement of the formatives can be observed, that is the same noun class is used for dozens and units. In the languages where ‘20’ is formed from ‘10’ (10*2), the units more often do not show agreement:

- Mankanya *i-pêŋ* ‘10’ (literally: «hands»), *i-pêŋ ŋí-tèp* ‘20’ (*ŋí-tèp* ‘2’), *i-pêŋ ŋi-bakir* ‘40’ (*ŋi-bakir* ‘4’);
- Jaad *pa-ppo* ‘10’, *pa-ppo ma-ae* ‘20’ (*ma-ae* ‘2’), *pa-ppo ma-nne* ‘40’ (*ma-nne* ‘4’),
- Palor *dɛ:ŋkɛh* ‘10’, *dɛ:ŋkɛh kɛ-nɛk* ‘20’ (*kɛ-nɛk* ‘2’), *dɛ:ŋkɛh ni:ki:s* ‘40’ (*ni:ki:s* ‘4’).

Even in the following case the use of a plural class for units is possible: Baga Fore *ε-tɛɛ* ‘10’, *ε-tɛɛ mɛn-di* ‘20’ (*fi-di* ‘2’), *ε-tɛɛ mɛ-nɛŋ* ‘40’ (*fi-nɛŋ* ‘4’).

Finally, in order to complete the description, hybrid composed forms will be reported, that is when ‘40’ can be traced the root ‘20’ and not ‘10’ but in units where ‘4’ is used and not ‘2’. This means that in ‘20’ – ‘90’ the root ‘10’ is used, which is different from the main root:

- Nalu *tɛ br-lɛ* ‘10’ (literally: «two hands», *br-lɛ* ‘2’), *alafaŋ bi-lɛ* ‘20’, *alafaŋ bi-na:ŋ* ‘40’ (*bi-na:ŋ* ‘4’);
- Pepel *o-disɛpɛnɛ* ‘10’, *ŋ-taim pugus* ‘20’ (*ŋ-pugus* ‘2’), *ŋ-taim ŋ-uakr* ‘40’ (*ŋ-uakr* ‘4’);
- Limba *kɔɔ-hi* ‘10’, *kɔ-nt^hɔ ka-aye* ‘20’ (*ka-aye* ‘2’), *kɔ-nt^hɔ ka-nan* ‘40’ (*ka-nan* ‘4’).

In spite of plurality of strategies, the modern systems of agreement of units in the dozens reflect a significant distinction that is characteristic of the two main branches of Atlantic languages – Northern and Bak. Apparently, the proto-languages of the Bak group maintained the principle of agreement which was typical for Proto-Niger-Congo, that is, the agreement of units following the plural correlate of ‘10’ or ‘20’. This principle was lost in the system of the Northern branch, where it can be encountered in only one of the Tenda languages, Basari. It is also present in Nyun Gunyamolo, but in this language, as it is highlighted by different scholars, the numeral ‘20’ (and probably the whole agreement model) is borrowed from Joola (Bak).

The model of agreement in ‘200’/ ‘2000’ works in a similar way, as shown in Table (1.14):

Table 2.14: Agreement in ‘200’ and ‘2000’

Language	‘100’	‘200’	‘1000’	‘2000’	‘2’
1 Balant	game	g-geme g-sibi	wili mbooda (‘1’)	g-wili g-sibi	-sibi
2 Bayot	ɛ-temel	r-temel i-rig’ga	ɛ-ɔli	r-ɔli-rig’ga	tig’ga
3 Banjal	ɛ’-keme	si’-keme ‘su:-βɛ	‘e-uli	‘s-u:li ‘su:-βɛ	‘su:-βɛ
4 Kwaatay	temer	si-temer sú-suba	ẽ-ñjune	sú-ñjune sú-suba	kú-suba
5 Baga Fore	bɔ ben (‘1’)	fu-bɔ fi-di	tengben ben (‘1’)	fi-tengben fi-di	fi-di
6 Nalu	m-laak	a-laak bi-lɛ	m-jaak	a-jaak bi-lɛ	bi-lɛ
7 Basari	keme	ɔ-keme ɔ-ki	wəli	ɔ-wəli ɔ-ki	ɓə-ki
8 Konyagi	keme	wɛ-keme wɛ-ki	wəli	wɛ-wəli wɛ-hi	wɛ-hi

As observed for dozens, the agreement in ‘200’ and ‘2000’ can be systematically observed only in the languages of the Bak group (languages 1-5 in Table 2.14). In the Northern group this agreement is found only in Basari (7). Even

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in Konyagi, the fact of agreement is not clear because in this language the CM of ‘2’ in ‘200’ and ‘2000’ coincides with the CM of *cl2* in independent use (for the same reason it is not clear whether we encounter agreement in Baga Foré (5). Moreover, there is no agreement in Nalu (6), a language of the same branch.

In the majority of languages, the noun classes of ‘200’ and ‘2000’ systematically differ from the noun classes of units and dozens. This is typical for Niger-Congo, perhaps because in ‘100’/‘200’ and ‘1000’/‘2000’ we are often dealing with borrowings.

Mel languages. The present analysis will be limited to the data from one Mel language, that is Temne (Kərata dialect) collected by David Odden (Table 2.15):

Table 2.15: Noun classes in Temne numerals

1	p-ín				
2	pì-ráj	20	ki-gbá		
3	pì-sas	30	ki-gbá ‘tɔ́-fót (20+10)		
4	pa-nlɛ	40	tì-gbá tí-ríj (20*2)		
5	tamát 5 (*ta-tam-at)	50	= 20*2+10		
6	du-k-ín (X+1)	60	tì-gbá tí-sas (20*3)		
7	dɛ-ríj (X+2)	70	= 20*3+10		
8	dɛ-sas (X+3)	80	tì-gbá tâ-nlɛ (20*4)		
9	dɛ-ɲanlɛ (X+4)	90	= 20*4+10		
10	tɔ́-fót (< *ta-fu-at)	100	k-ɛmɛ k-ín	200	t-ɛmɛ tí-ríj
		1000	Λ-wúl ‘ɲ-ín	2000	ɛ-wúl jɛ-ríj

The numerals ‘1-4’ in counting forms belong to *CL.SG pV-*. The numeral ‘5’ can be traced back to the form with positive meaning of definiteness (**ta-tam-at*) – as well as 10 (< **ta-fu-at*), initially having the structure CV-CVC-VC, where CV- and -VC are allomorphs of the noun class in a definite form and CVC is the root (Pozdniakov1993)⁵. For us, it is important that the numerals in ‘5’ and ‘10’ can be reconstructed with *CL.SG ta-*. The non-derived numeral ‘20’ can be traced to *CL.SG*, and in particular *kə-*. The numerals ‘40’ – ‘90’ are formed with the change of the noun class in the first formative to *CL.PL tə-*. Furthermore, the second formative agrees with the first one in noun class and consequently is also included in the class *tə-*. That is to say, this is the same derivational model as in

⁵It is clear that ‘5’ and ‘hand’ have assonance in the languages of the group. Due to space limitations, it is impossible to explain the complicated emergence of this assonance. Let’s also leave aside details on the first formative in the numerals ‘6-9’.

2.2 Noun classes in derived (reduplicated) numerals

Bantu and in Atlantic languages. This model emerges as well in the formation of ‘100’ and ‘200’. In the borrowed form *keme* ‘100’ the initial root consonant can be interpreted as a singular CM (the same noun class as in ‘20’). That means that ‘200’ is used as its plural correlate and the original root consonant gives us *t*-. Finally, the correlation of ‘1000’ ~ ‘2000’ can be interpreted as correlation in number but with a new pair of classes: CL.SG *Λ*- ~ CL.PL *ε*-.

Gur languages. An example of an interesting system from the Ditammari language (Oti-Volta) follows (Table 2.16):

Table 2.16: Ditammari: agreement in the derived numerals

SG	PL-PL	SG
tɛ-pii-tɛ ‘10’	si-pi-si-dɛ ‘20’	dɛɛ-ni ‘2’
	si-pi-si-tâadi ‘30’	tâadi ‘3’
	si-pi-si-wɛi ‘90’	n-wɛi ‘9’
di-tu-si-di ‘100’	yɛ-tu-si-ɛ yɛ-dɛɛ ‘200’	dɛɛ-ni ‘2’
di-yɔɔ-di ‘1000’	yɛ-yɔɔ-d-ɛ yɛ-dɛ ‘2000’	

In this example we can see the correlation of number classes in derivatives and «agreement» between the parts of syntagm in ‘200’ and ‘2000’ using different structures of class markers (prefixes, suffixes, confixes, or the lack of marker).

Similar formation strategies of derived forms can be found in another language from the Gurma group (Oti-Volta), Miyobe (Table 2.17):

Table 2.17: Miyobe: noun classes in derived numerals

SG	PL, SG-PL, PL-PL	SG
kɛ-fi ‘10’	ɑ-fɛɛ-rɛ ‘20’	-tɛ ‘2’
	ɑ-fɛɛ-na ‘40’	n-na ‘4’
pí-lɛ ‘100’	pí-lɛ-pí-lɛ mɛ-tɛ ‘200’	
kú-kotokú ‘1000’	á-kotokú ɑ-tɛ ‘2000’	

In ‘20’ (10*2) and in ‘2000’ (1000*2) a plural correlate CL.SG *kV*- (CL.PL *á*-) is used. In ‘2000’ the numeral ‘2’ agrees in noun class with ‘1000’ (the root is formed from the word with the meaning ‘sack’). In ‘200’ the reduplication of ‘100’ and a special class marker (CL.PL *mɛ*) for the formative ‘2’ are used.

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Another language from Gurma group Ntcham follows the same standard model (Table 2.18):

Table 2.18: Ntcham: noun classes in derived numerals

SG		PL-PL		SG	
20	m-mùṛkú	40	ì-mùṛkú ì-lí	2	ṇ-lí
100	di-làátàà-l	200	kú-làáfaa-u		
1000	Ø-kùtùkú	2000	Ø-kùtùkú-bì bì-lí	2	ṇ-lí

The numeral ‘200’ is formed from ‘100’ by changing from the singular class to the plural one.

The existence of similar strategies for use of plural class markers for the formation of numerals of higher rank in different areas of Niger-Congo (Benue-Congo, Atlantic languages, Mel languages and Gur languages) permits us to presume that similar principles of interaction between noun classes and numbers were typical for the system of Niger-Congo as well. There are no traces of derivative pluralization in Kru and Ijo languages, but they can surely be found in Kwa languages. I did not manage to find similar strategies in the Adamawa and Ubangi languages, nonetheless traces can be found in Kordofanian languages.

Here is an example from Koalib, a Kordofanian language (Table 2.19):

Table 2.19: Koalib example

SG		PL-PL		SG	
20.	t-úṛì	40.	r-úṛì r-ìṛèn	2.	-ìṛèn
		2000.	á-lep (< arab) w-ìṛèn	200.	mìe kw-ìṛèn

A prefix for the plural class is used for the formation of the numeral 40. The formative ‘2’ in ‘40’ agrees with the formative ‘20’ in the noun class. In ‘200’ the prefix of singular class CL1 is used, which includes animated nouns and borrowings. In ‘2000’, in the formative ‘2’ is used for the prefix w-, a standard agreement marker for vocalic noun classes.

Traces of pluralization of noun classes as a means of derivation in numerals can be found in Moro and Acheron (both are Kordofanian languages).

This distribution gives us sufficient grounds to assume that derivation for the formation of dozens in Niger-Congo was similarly established in Proto-Niger-Congo.

2.3 Noun class as a tool for the formation of numerals

Finally, there is one (perhaps the most interesting) strategy for formation for derived numerals. It consists exclusively of changing the noun class for the formation of a derived form. The system from Efik is partially reported below (Table 2.20):

Table 2.20: Efik example

2	í-bá	40	à-bà
3	í-tá	60	à-tá
4	í-nánj	80	à-nànj

In Efik, as in the majority of Niger-Congo languages, a stable correlation in number CL5.SG ~ CL6.PL can be found: in Efik reflexes of these classes are accordingly í- ~ à-. A simple change of singular class to plural (with no compound forms and no reduplication) is enough to form ‘40’ from ‘2’, ‘60’ from ‘3’ and ‘80’ from ‘4’. Apparently, this system uses ‘20’ as its primary base.

The formation of new numerals by a change in noun class can be encountered in some languages of Benue-Congo, including Bantu (Table 2.21):

Table 2.21: Benue-Congo examples

Bantu-B80	Tiene (Tende)	4	i-nîi	40	mu-nîi
Bantu-C40	Sengele	4	í-nei	40	mo-nei
Bantu-C90	Ndengese	4	i-nej	40	bo-neji
Grassfields	Limbun	4	Ø-kjè:	40	m̩-kjè:
Edoid	Degema	2	i-βá	40	ʊ-βá

This technique is mostly used in Bantu languages within the zone J. The data reported in Table 2.18 does not necessarily signify that the conceptual base for derivation is the pluralization of original forms. In Tiene, Sengele, and Ndengese, derived numerals, as well as base numerals, belong to singular noun classes.

For example, for the languages J10 SG > SG is characteristic for four derivations which can be illustrated by Gundu language (Table 2.22).

Other derivations SG > SG can be found occasionally. Apparently, the forms *n-datu* ‘6’ > *tʃi-ratu* ‘60’ (CL9 > CL7) and *mú-nanɛ* ‘8’ > *lú-nanɛ* ‘80’ (CL3 > CL11) were encountered only in Tembo (J50). We can see that the choice of nominal classes

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Table 2.22: Gundu number patterns in the derivations of numerals

8 > 80		9 > 90		10 > 100		10 > 1000	
CL3 > CL7		CL3 > CL7		CL5 > CL7		CL5 > CL11	
8	mò-ná:nèí	9	m ^w è:- ⁿ dá	10	í-kùmí	10	í-kùmí
80	ki-na:nei	90	k ^j e:- ⁿ da	100	ki-kumi	1000	ru-kumi

differs in different languages, that is, it is not the symbolic semantics of nominal classes that is most important, but rather their paradigmatic modification.

In Bantu J10-J20 we find a triple derivation model CL5-*kumi* (or CL9-) ‘10’ ~ CL7-*kumi* ‘100’ ~ CL11-*kumi* ‘1000’. Thus in Hema, *i-kumi* ‘10’ ~ *ki-kumi* ‘100’ ~ *ru-kumi* ‘1000’.

This model can be found in Gur languages as well. In Nothern Nuni (Grusi group) dozens are formed exclusively by a change in noun class marker. The derivation from ‘20’ to ‘50’ is realized by the change of one singular class to another: *bi-là* ‘2’ > *fï-là* ‘20’, *bi-twàà* ‘3’ > *fï-twàà* ‘30’, *bi-nu* ‘5’ > *fï-nu* ‘50’. Formation of dozens by a change of class is encountered in some Senufo languages as well.

However, the derivational model SG > PL is much more active. In the Bantu zone J, six derivations are typical, illustrated by the following examples from Gwere (J10) (Table 2.23):

Table 2.23: Gwere number patterns in the derivations of numerals

2 > 20		3 > 30		4 > 40		5 > 50		6 > 60		7 > 70	
CL5 > CL6		CL5 > CL6		CL5 > CL6		CL5 > CL6		CL3 > CL10		CL3 > CL10	
2	ì-βírí	3	ì-sátú	4	ì-ná	5	ì-tá:nú	6	mù-kâ:gá	7	mù-sá ⁿ vú
20	à:-βírì	30	à:-sátù	40	à:-nâ	50	à:-tâ:nù	60	ṇ-kâ:gà	70	ṇ-sá ⁿ vú

For the numerals ‘20’–‘50’ CL6.PL is used, and for ‘60’–‘70’ CL10.PL is used. These classes demonstrate the correlation in number with the classes CL5.SG and CL3.SG respectively. In at least four languages in zone J, the model CL3.SG > CL10.PL was encountered for ‘9’ > ‘90’. In Gwere and Tembo, the model CL5 > CL6 is used in derivation ‘2’ > ‘20’: Gwere *ì-βírí* ‘2’ > *à:-βírì* ‘20’.

Only one language, and that is Tembo, systematically presents model PL > PL in the derivation CL8.PL > CL6.PL (Table 2.24):

This model is clearly secondary and was implemented as a result of re-interpretation,

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Table 2.24: Tembo example

3	βi-hátu	4	βí-ne	5	βi-táno	7	βi-rínda
30	má-hátu	40	má-ne	50	ma-táno	70	ma-línda

atypical of zone J, of classes in numerals ‘2-5’, ‘7’ as plural classes opposed to ‘1’.

The fourth theoretically possible model, that is PL > SG, has never been encountered in any derivation which can be considered indirect evidence for the idea that the pluralization of numerals of higher rank is one of the key strategies for the formation of derived numerals, as was demonstrated. Nonetheless, this strategy does not explain everything.

In order to present this elegant mechanism of systematic use of noun classes in the derivation of numerals in greater detail, an example from derivation in Soga using the roots ‘10’ and ‘2’ will be schematically presented. The root meaning ‘10’ matches in Soga with six different class markers, and the root meaning ‘2’ matches with three of them, as shown in Figure 1.1.

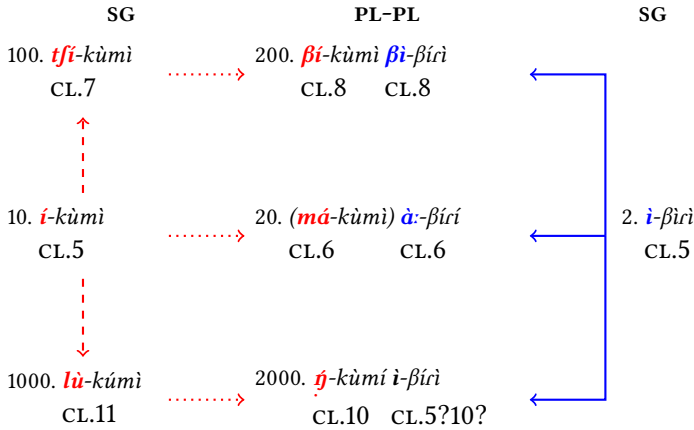


Figure 2.1: Soga numerals: derivations by noun classes

In the Soga language the root *kumi* takes part in three forms with singular class and three forms with plural class (one is facultative). In the derivations including forms of different numerals it is visible that the most stable correlations in number are: CL5-CL6, CL7-CL8 and CL11-CL10. However, the choice of CL7 and CL11 for the derivations (as shown in Figure 1.1) seems to be arbitrary. According to Larry Hyman (p.c.) in the dialect Lulamoji, the archaic form of the numeral

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'1000' belongs to the the CL11 and not to the CL14 (Hyman: «*óBu-kumí* '1000', older usage»).

The root *βiri* does not take part in singular derivates but was found in three derivates where *kumi* is marked by plural class markers. The main derivate from *i-βiri* '2' can function separately outside of the word combination (*à-βiri* '20'). In this case, the main correlation in number for the class 5 is used (CL5-CL6). The difference in the class markers CL6 *ma-* and *a-* (in some dialects *ga-*) is related to the characteristics of the paradigms of agreement markers. A question about the nature of *i-βiri* in '2000' emerges. Does it belong to CL5 or is this an homonymous form of the agreement marker in CL10? These questions are very hard to answer because we are dealing with derivational forms of class markers (often homonymous) and we cannot check on the context of agreement in order to test it.

In fact, the number of classes in numerals (both singular and plural) can be even bigger. In Soga, a singular form of '8' *mù-ná-nà* (CL3) is always formed from the numeral '4' *i-nà* (CL5). In Mpumpong (Bantu, A80), the system of numerals includes four different plural noun classes, that is CL8 for units - *tên nè i-nâ* '9' (5+4), CL6 - for dozens - *mè-kàm mè-mbá* '20' (10*2), CL4 for hundreds - *mì-tsèt mì-mbá* '200' (100*2), and CL2 for thousands - *ò-tósìn ò-bá* '2000' (1000*2).

The model of formation that was masterly developed by Soga has major relevance not only for the history of numerals in Niger-Congo, but for the theoretical analysis of the semantics of noun classes as well. The signifier of morphemes in noun class paradigms has a multilayer structure. This structure presumes that the semantics of each class can be defined through the paradigm at the intersection of four parameters: classificational, paradigmatic, syntagmatic and modal (for a more detailed discussion see Pozdniakov2003). It is useless to discuss the classificational aspect of noun class semantics in Soga numerals as we do when classes for humans, trees or animals are taken in consideration. The paradigmatic aspect of the signifier of the signs is the most relevant because the primary role is given to the correlation of classes in number, while some other paradigmatic correlations remain important as well.

In conclusion, it should be noted that the noun class switch as a derivation mechanism is not limited to Benue-Congo and can be reconstructed at the Proto-Niger-Congo level in at least one case (see chapter 4).

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The numeral system of Proto-Niger-Congo

This book proposes the reconstruction of the Proto-Niger-Congo numeral system. The emphasis is placed on providing an exhaustive account of the distribution of forms by families, groups, and branches. The big data bases used for this purpose open prospects for both working with the distribution of words that do exist and with the distribution of gaps in postulated cognates. The distribution of filled cells and gaps is a useful tool for reconstruction.

The first chapter of this book is devoted to the study of various uses of noun class markers in numeral terms. The second chapter deals with the alignment by analogy in numeral systems. Chapter 3 offers a step-by-step reconstruction of number systems of the proto-languages underlying each of the twelve major NC families, on the basis of the step-by-step-reconstruction of numerals within each family. Chapter 4 deals with the reconstruction of the Proto-Niger-Congo numeral system on the basis of the step-by-step-reconstructions offered in Chapter 3. Chapter 5 traces the history of the numerals of Proto-Niger-Congo, reconstructed in Chapter 4, in each individual family of languages.

