The Evolution of the Nisgha Counting System: A Window on Cultural Change*

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1.0 INTRODUCTION

The Tsimshianic[1] languages all have a complex system of numeration, with different sets of numerals depending on what is being counted. In most cases the forms clearly derive from a basic set used for abstract counting, but the forms of the latter are not immediately analyzable. They do, however, show evidence of being themselves complex forms, especially in Nisgha (N), and Gitksan (G). Many words which are opaque in Coast Tsimshian (CT) have more readily analyzable Nisgha and Gitksan cognates;[2] the numerals are no exception.

The similarities that exist between some of the Nisgha numerals, and between the numerals and other forms in the language, make it possible to reconstruct probable derivations for most of them, especially the set used for abstract counting. The literal meaning of the reconstructed forms throws light on the manner in which the number system must have developed, and on the diverse influences that helped shape it.

2.0 NISGHA NUMERALS AND THEIR MEANINGS

There are four sets of Nisgha numerals; the categories are: objects or abstract counting, animals and fish, people, and canoes,[3] as given in Table I.[4] Boas (1911) gives more categories of numerals, but some of these are actually measures, which are nouns, while numerals have their own syntactic properties, most of which are shared with adjectives and intransitive verbs.[5] Nisgha measures are given in Table II, which is probably not complete.

The four sets of numbers in Table I agree[6] with those in Boas' (1911:396-7), with one major exception: he gives the numerals in column I under the headings 'round objects' and 'long objects',

and the ones in column II under the heading 'flat objects, abstract counting'. No mention is made of animals and fish, even though column II numerals appear in Boas (1902) in connection with words designating animals and fish as well as flat objects.

It is likely that the numerals in column I were used not so much for living animals as for their skins, an item of trade long before European contact, and by extension objects with similar uses and characteristics, such as mats, blankets, and clothing. The original Nisgha distinction was probably between 'animals, skins and equivalents' and 'objects in general', rather than between flat and non-flat objects. Since skins must have been at one time the most frequently counted items, there may have been confusion in some speakers' minds as to whether abstract counting or counting of skins was taking place.[7]

One case where the confusion has not been resolved concerns the proper classification of the forms yuxʷtáɬt and qantó:ɬt, both meaning 'eight'. In placing yuxʷtáɬt in column I and qantó:ɬt in column II, in agreement with Boas and with the CT cognates (Dunn p. 38), I have been guided mostly by my own interpretation of the original meanings of these words. Many Nisgha speakers would agree with this placement, while others would place qantó:ɬt in column I and yuxʷtáɬt in column II, the order given in the Gitksan Primer.

There are obviously some common elements within the numerals:

- except for 'two', all the 'human' numerals have some similarity to the column I forms; most of them end in -ó:ɬ;
- all forms for 'one' begin with kʸ-, and so does one of the 'ten' forms;
- all forms for 'three' begin with kʷiɬ-;
- the forms for 'five' and 'nine' all begin with kʷst-;
- the forms for 'seven' start like one of the 'two' forms and end like those for 'six'.

The following sections examine the numerals in more detail, though not necessarily in order.

	I Abstract counting, Objects	II Animals	III People	IV Canoes
1	kʸíl	kʸé:kʷ	kʸó:l	qaméʔet
2	kʸílpil	tipχá:t	paqatíl	qalpéltkʷs
3	kʷilál	kʷilán	kʷiló:n	kʷiláltkʷs
4	tχálpχ		tχalpχtó:l	tχálpχkʷs
5	kʷstíns		kʷstinsó:l	kʷstínskʷs
6	qó:lt		qo:ltó:l	qó:ltkʷs
7	tipχó:lt		tipχo:ltó:l	tipχó:ltkʷs
8	yuχʷtált	qantó:lt	yuxʷtaltó:l	yuxʷtáltkʷs
9	kʷstimó:s		kʷstimo:só:l	kʷstimó:skʷs
10	xpíl	kʸáp	xpó:l	kʸápkʷs

Table I: Nisgha numerals

	Fathoms		Spans	Fingerwidths	Periods of Days	Bundles of ten skins (Boas)
	Boas	Aiyansh				
1		kʸilq̓á:x	kʸilsáq̓ans	kʸí l sti:		kʷi:skʸiwá
2		kʸilp̓ilq̓á:x	kʸilp̓ilsáq̓ans	kʸílp̓ilsti:		kʸilpwá
3	kʷilalʔún	kʷilalq̓á:x	kʷilalsáq̓ans	kʷilálsti:		
4	tx̌alpx̌alún	tx̌alpx̌q̓á:x		wax̌ʔúnkʷs	tx̌alpx̌sá:ta	
5	kʷstinsilún	kʷstinsq̓á:x				
6	q̓o:l̓tilún					
7	t̓ipx̌o:l̓tilún					
8	y̓uxʷtal̓tilún					
9	kʷstimo:silún					
10	xpaʔúnti:	xpaʔún			xpisá:ta	

Table II: Nisgha measures (partial list)

2.1. One

In columns I, II and III all forms begin with ˈkʸ-:

I	ˈkʸíˈ	(object)
II	ˈkʸéːkʷ	(animal)
III	ˈkʸóːˈ	(person)

So do a number of other words all having to do with singularity, for instance

ˈkʸáːˈ	'to be one-eyed'
ˈkʸéːx̌kʷ	'to flee (sg)' (the plural is suppletive, hú:t)
ˈkʸéːq̓an	'to put one animal to flight'
ˈkʸóʔ	'backbone of a fish'
ˈkʸóːc	'yesterday (one day before today)'[9]

and the modifiers

ˈkʸaː	'most, the most (unique among others)'
ˈkʸaʔan or ˈkʸoʔon	'by oneself, separately'
ˈkʸax̌	'just this once, just for a minute'

It seems clear that the concept of singularity or oneness is expressed by the initial consonant ˈkʸ, or more probably, by a CV sequence ˈkʸə-, since CV is a common prefix shape.

The sequences after ˈkʸ occur elsewhere. The column I form ˈkʸíˈ ends in the suffix -ˈ which generally has the completive meaning of 'bringing something to its natural limit'.[10] The column III form ˈkʸóːˈ ends in -óːˈ like most of the other numerals in that column. The sequence -óːˈ does not seem to occur apart from the numerals, where it is restricted to the 'persons' category.[11]

The column II form ˈkʸéːkʷ ends in the derivative suffix -kʷ which is by far the most common in Nisgha and has a great variety of meanings.[12] Abstracting the suffix leaves ˈkʸéː-, a sequence that is always historically traceable to *ˈkʸáː-.[13] It is possible that this sequence was originally identical with the modifier ˈkʸaː 'most, the most', since there is a historical rule *á: > é: after palatals which applies only to stressed vowels, and modifiers are unstressed.

In column IV, ɬamé?et 'one (canoe)' probably has as its initial element the modifier ɬam 'simply, just', which is often used before kʸíɬ or kʸó:l (e.g. ɬam kʸíɬ 'just one'), and the final -t may be the suffix for 'passive of state', but the medial sequence -é?e is at present unidentifiable.

2.2. Ten

The words are:

Column I	xpíɬ	(objects)
Column II	ɬkʸáp	(animals)
Column III	xpó:l	(persons)
Column IV	ɬkʸápkʷs	(canoes)

The forms in columns I and III start with the sequence xp- before -íɬ and -ó:l respectively. Exchanging xp- for ɬkʸ-, these formations are exactly the same as those for 'one' (2.1.).[14]

The sequence xp- or xpə- (with vowel quality adjustment depending on the following consonant) also occurs in the measures

xpa?ún 'ten fathoms' (?ún 'hand, arm, outstreched arms')

and

xpisá:ta 'period of ten days' (sá:, alternate form of sá 'day'; -ta collective suffix[15])

It does not seem to occur in any forms not meaning 'ten'.[16]

It is interesting that the column II form ɬkʸáp begins with ɬkʸ- like most of the 'one' forms. There is no reason to think that ɬkʸ- has a meaning other than 'one' here: the column II forms are used for animals and fish, which were trade items as well as sources of food and clothing; ten skins or ten fish must have constituted a unit of trade well before the European fur trade,[17] hence the use of a base meaning 'one' is not surprising. The rest of the word is not identifiable at present.[18]

The form kʸáp, not xpíɬ, is the one used for multiples of ten:

kʸíɬpiɬ	wil	kʸáp	'twenty'
two	CONJ	ten	
kʷiláɬ	wil	kʸáp	'thirty'
three			

These phrases are probably of recent origin. Boas recorded a form for 'twenty', kʸiyítkʷ, also starting with kʸ-, and probably meaning 'one man' (that is, all the fingers and toes, as in many languages):

kʸ	-	(k)ʸít	-	kʷ
one		man		?

(-yít- < kʸít, alternate form of kʸát 'man, person').

2.3. Two

The numerals for 'two' are all different:

I	kʸiɬpiɬ	(objects)
II	ɬipx̌á:t	(animals)
III	paqatíɬ	(persons)
IV	qaɬpéɬtkʷs	(canoes)

This probably reflects both their extreme importance and the very diverse circumstances under which one might need to refer to two objects, animals or their skins or fish, persons, or canoes.

Only one of these forms can be fully analyzed. In column I, kʸíɬpiɬ ends in the completive suffix -ɬ[19] like kʸíɬ, which can be abstracted, leaving the stem kʸíɬp- also found in kʸiɬpwá 'two bundles of ten skins' (Table II). Like a number of Nisgha stems which show a lexical í/á alternation (cf. analysis of kʸiyítkʷ above 2.2.), traceable to earlier *é, kʸíɬp has an alternate form in á, namely kʸáɬp 'testicles'; the common meaning must be 'pair'. Both kʸíɬp- and kʸáɬp derive from earlier *kʸéɬp, which is in turn analyzable into a prefix kʸə- and a root ɬVp, probably *ɬep; stress usually falls on the

root in present-day Nisgha, but there is evidence that stress often fell on prefixes at an earlier stage of the language. There are two kʸə- prefixes in Nisgha, one with locative meaning, the other with undetermined meaning, which could be involved here. There is also a root lɬ́p, evidenced in lɬ́pkʷ 'to sew something', lɬ́pis 'to sew': that is, to assemble or join skins or pieces of cloth, two at a time. The form kʸɬ́lpil then can be reconstructed as

kʸə	-	lep	-	-l
?		assembled		COMPL

The meaning 'two' then probably derives from the meaning 'assembled together, paired'.

The other words for 'two', unfortunately, are not so tractable, and only tentative observations can be made. In column II, ɬipx̌á:t 'two (animals)' starts with the proclitic ɬip '(motion) straight down'; the final -t may be the 'passive of state' suffix. The remaining sequence -x̌á:- may be derived historically from qaq 'open' (with q > x̌ after p; á: regularly derives historically from a sequence á + velar or uvular), thus

ɬip	-	qáq	-	-t
straight down		open		PASS. STATE

and the whole word may mean 'opened straight down', probably referring to a way of handling two skins (or possibly two fish or even birds) together.

In the derivation of the column III word paqatɬ́l 'two (persons)', the root tɬ́l may be identified with that in qalax̌tɬ́l '(position) across from, facing', tɬ́limx̌kʷ 'to answer', and tɬ́ltkʷ 'to revenge oneself', all referring to situations involving two participants; there is also an alternate root in á, tál, found in tál 'to have a fight', tálq 'to talk to someone', and lu:táltkʷ 'to meet someone', which also describe situations with two participants. It seems likely then that paqatɬ́l originally had to do with a situation where two persons face each other, whether as partners or as adversaries. The initial sequence paqa- may be related to the proclitic paqayt 'in the middle'. A reconstruction *paqayt-tɬ́l 'facing each other in the middle' (of a circle of onlookers perhaps) would seem to make sense as the origin of the word for 'two (persons)'.

As for the column IV word, qa|pé|tkʷs 'two (canoes)', it has some recognizable parts, but the root is unidentified at present. The initial sequence qa|- is a prefix meaning either 'too (much)' or 'empty', or rather, 'capable of being filled'; at the end, -kʷs (preceded by epenthetic -t- caused by the preceding resonant), which may be decomposable into -kʷ and -s, is a common suffix with various meanings; the preceding -| is the same completive suffix also found in kʸí| and kʸí|pi|; but the root, pé-, probably originally followed by a velar, is unidentified, so that the total meaning cannot be guessed at, any more than for qamé?et 'one (canoe)'.[20] But judging from the derivation of kʸí|pi| 'fully assembled', and the tentative meanings of ti|pxá:t 'opened straight down' and paqatí| 'facing each other in the middle', it seems safe to assume that the original meaning of qa|pé|tkʷs must also have originally been descriptive.

2.4. Four

All words for 'four' contain the sequence txá|px:

Column I, II	txá|px	(objects, animals)
Column III	txá|pxtó:|	(persons)
Column IV	txá|pxkʷs	(canoes)

We recognize in column IV the suffix -kʷs already found in other forms for canoes, and in column III the 'human' suffix -ó:|; the preceding t must have been inserted by analogy with the corresponding forms for 'six', 'seven' and 'eight', all of which, as we shall see, end in the sequence -tó:| as a result of adding -ó:| to a final suffix -t.

In the basic form txá|px we recognize the sequence -|p- found in kʸí|pi|[21] and traceable to a root *|ep 'assembled, joined' (2.3.), followed by a suffix or augment -x found in a number of words but of yet undetermined meaning. The initial sequence txá-, which carries the stress, is probably identifiable as the proclitic txa: 'all, every': shortening of the long vowel would not be surprising in front of the cluster -|px.[22] Thus we reconstruct txá|px as

txá:	-	|ep	-	x
all		assembled		?

a designation which is appropriate for a square or rectangular structure such as a house or a kerfed box.

2.5. Three

All the forms for 'three':

Column I	kʷiɬáɬ	(objects)
Column II	kʷiɬán	(animals)
Column III	kʷiɬóːn	(persons)
Column IV	kʷiɬáɬtkʷs	(canoes)

have in common an initial sequence kʷiɬ- followed by what appear to be suffixes.

The column IV form kʷiɬáɬtkʷs is obviously derived from column I kʷiɬáɬ by addition of the suffix -(t)kʷs (of undetermined meaning) found in qaɬpéɬtkʷs (as well as all subsequent 'canoes' forms). The words in the remaining three columns need further analysis.

The initial sequence kʷiɬ- recalls the proclitic kʷiɬ 'fixedly, rigidly' and the word kʷáɬkʷ 'to be dry'. The primary meaning of the alternate roots kʷiɬ/kʷáɬ is probably 'stiff, rigid, unchanging', a description which applies to dried substances such as fish, wood and seaweed. This root is also recognizable in the phrase kʷàɬtim qóːt, literally 'stiffened heart',[23] meaning 'readiness, resoluteness (in front of danger, death, etc.)'.

One may wonder why a root meaning 'stiff, rigid, unchanging' would be used in the formation of words meaning 'three'. The most stable structure is a triangular one, as is well-known to the Nisghas, who construct their oolichan-drying frames with three vertical poles set in a triangular pattern, and held together by sets of three crosspieces, a fact which is not without significance in this discussion.

Turning now to the suffixes, in column III it is probable that the -óːn of kʷiɬóːn 'three (persons)' should be identified with the 'human' suffix -óːɬ found in the other column III forms. The change ɬ > n, which is fairly common though sporadic in Nisgha,[24] may have been triggered or encouraged by the presence of the earlier ɬ of kʷiɬ-.

In column I, kʷiláɬ, seems at first sight to end in the same completive suffix -ɬ, as kʸíɬ 'one' and kʸíɬpiɬ 'two', but a combination kʷíɬ + -ɬ would yield ¢kʷíɬɬ or ¢kʷíɬ,[25] not kʷiláɬ. It seems more probable that kʷiláɬ is a former compound of the object-incorporating type, with the second member probably -ʔáɬ, thus

kʷáɬ	-	ʔáɬ
to stiffen		?

hence kʷiláɬ, after loss of glottal stop and unstressed vowel reduction, both common in compounds.

The element ʔáɬ postulated as the second member of this compound does not occur by itself, but is reconstructable from such forms as

kʸáːɬ	'to be one-eyed' (kʸ- 'one')
cáɬ	'eyes, face' (c- 'in')
ʔáɬaq	'to be quick-tempered, assertive, determined, brave, as shown by the expression in one's eyes' (-q suffix of undetermined meaning)

The literal meaning of kʷiláɬ then would be 'stiffening the eye'.

I would suggest that the word ʔáɬ meant not only 'eye', but also, metaphorically, 'triangular pattern'.[26] The meaning of kʷiláɬ then is 'stabilizing the triangle', a description which applies to the crosspieces that hold a triangular frame together, and which themselves form a triangle when in place, a set of three before; a phrase such as kʷiláɬit+ qanqán, meaning originally 'the pieces of wood that stabilize the triangle' could easily have come to mean only 'the three pieces of wood'.

In the remaining form kʷilán[27] 'three (animals)', in column II, we can assume that there has been dissimilation from earlier *kʷiláɬ, just as in kʷilóːn from *kʷilóːɬ. In many words ending in glottalized consonants, glottalization seems to have been originally a separate morpheme, and there are some related unglottalized forms. The form ʔáɬ- as a variant of ʔáɬ is evidenced in the proclitic ʔaɬuː 'plainly, visibly' (-uː modifying suffix)

2.6. Five and nine

The forms are:

Five:	Column I, II	kʷstíns	(objects, animals)
	Column III	kʷstinsó:l	(persons)
	Column IV	kʷstínskʷs	(canoes)
Nine:	Column I, II	kʷstimó:s	(objects, animals)
	Column III	kʷstimo:só:l	(persons)
	Column IV	kʷstimó:skʷs	(canoes)

Again, the suffixes -ó:l for persons and -kʷs for canoes are added to the basic forms. The latter are obviously related, as they both begin with the sequence kʷst- otherwise found only in the word kʷstáqs 'to leave or abandon something'. This transitive verb is built on the root *staq 'side', evidenced in the proclitic staχ̌ or sta: 'on one side', preceded by the prefix kʷ- of undetermined meaning and followed by the (here) transitive suffix -s. The mó:s at the end of kʷstimó:s seems to be the word mó:s 'thumb'. If the upper limit of numeration is the number of fingers, it makes sense for the word for 'nine' to mean 'leaving out one thumb'. The form for 'five', then, most likely means 'leaving out one hand'. It is possible to derive the actual forms kʷstimó:s and kʷstíns by regular rules, from earlier, transparent forms.

These forms are object-incorporating compounds. Transitive suffixes such as the final -s of kʷstáqs are not used in object-incorporating compounds,[28] thus we reconstruct:

kʷstáq	-	mó:s
leave		thumb

A series of historical velar-weakening rules operating before consonant gives regularly

kʷstaχ̌mó:s
kʷstahmó:s
kʷsta:mó:s

and the long vowel a: reduces in unstressed position, thus

kʷstamó:s

and eventually the modern

kʷstimó:s

Similarly, 'leaving out one hand' is a compound:

kʷstáq	-	ʔún	-	-s[29]
leave		hand		

yielding

kʷsta:ʔúns

and later

kʷstəúns
kʷstúns

But this form has the vowel ú, not í as in kʷstíns. Comparison of Nisgha with Gitksan and CT shows that many instances of Nisgha í derive from earlier ú, by an historical rule ú > í under certain conditions,[30] thus the present kʷstíns.

2.7. Six and seven

The forms are:

Six:	Column I, II	q̓ó:l̓t
	Column III	q̓o:l̓tó:l
	Column IV	q̓ó:l̓tkʷs
Seven:	Column I, II	t̓ipx̌ó:l̓t
	Column III	t̓ipx̌o:l̓tó:l
	Column IV	t̓ipx̌ó:l̓tkʷs

The column III and IV forms have the suffixes -ó:l and -kʷs regularly added to the column I and II forms. In both cases, these end in the cluster -lt, representing the two suffixes -l, 'completive' as in kʸíl̓ 'one', kʸíl̓pil̓ 'two', qalpél̓tkʷs 'two

(canoes)', and -t 'passive of state'. These two suffixes are often associated, and the meaning of the whole is 'brought to its natural completion, fully completed'.[31]

The first part of q̓ó:l̓t 'six' is probably a derivative of q̓óq 'to pull on something that is attached at one end (e.g., roots, hair)'; other derivatives are q̓óq+ 'cedarbark rope', q̓é:q+ 'to drag something', and probably also q̓ó: 'penis' and q̓ó:m 'to be desirous'. Long vowels generally result from an earlier sequence of short vowel plus a velar or uvular, thus q̓ó:l̓t can be reconstructed as

q̓óq	-	-l̓	-	-t
pull, extend		COMPL		PASS. STATE

The word for seven, t̓ipx̌ó:l̓t, is obviously related to q̓ó:l̓t. It starts with the proclitic t̓ip '(motion) straight down', and the following x̌ is the reflex of q̓ after the consonant p (cf. t̓ipx̌á:t above, 2.2.). The meaning is 'extended straight down'.

One may wonder why words for 'six' and 'seven' would have the common meaning 'fully extended'. I suggest that this expression refers to the position of the hand that is doing the counting. After counting up to five (by whatever method),[32] the hand would then be extended,[33] probably horizontally, for 'six', and then rotated into a vertical position with thumb up, for 'seven'.

2.8. Eight

The forms are:

Column I	qantó:l̓t
Column II	y̓uxʷtál̓t
Column III	y̓uxʷtal̓tó:l
Column IV	y̓uxʷtál̓tkʷs

As usual, the column III and IV numerals are formed by suffixation to a more basic form. The column I and II forms do not resemble each other except that they both end in the sequence -l̓t, also found in 'six' and 'seven'. As we saw earlier with 'three', however, the segment l̓ is not always a suffix.

The column I form qantó:ɬt is yet another case where interpretation must remain conjectural. The initial sequence qan- might be the proclitic qan 'leaning against something' or the prefix qan- which forms abstract nouns. The remainder, tó:ɬt, is probably analyzable in the same manner as qó:ɬt 'six', that is, as a root ending in a velar or uvular, followed by the suffixes -ɬ 'completive' and -t 'passive of state'. The root may be either tóq 'to take or grab something plural' or tóx̌ '(objects) to lie, to be put, laid'. The derivative -tó:ɬt means then either 'fully taken' or 'fully laid out' (in the plural), both of which are possible semantically, thus qantó:ɬt is reconstructable as

qan	-	tóq/tóx̌	-	-ɬ	-	-t
?		take/lay		COMPL		PASS. STATE

If qantó:ɬt was originally used for animals and fish, it may have to do with some practice in connection with the handling of animal skins, or fish. There is a word lú:kʷs meaning 'bundle of forty dried fish'. It is likely that four groups of ten were prepared, then bundled together, and qantó:ɬt would be an appropriate term to use.

In column II, the word ʔyuxʷtáɬt has a somewhat unusual shape: unstressed initial syllables rarely begin with glottalized resonants. It could be interpreted as an object-incorporating compound starting with the verb ʔyúxʷ 'to fish with line', but this verb is intransitive, and the rest of the word, táɬt, does not have a recognizable meaning. Instead, it is more probable that the phonological sequence yuxʷ is the common contraction of ʔi: huxʷ 'and again'.[34] Such a phrase would be suitable for the expression of a number considered as an addition to another number. The word huxʷ 'again' is often reinforced by the addition of the particle ti: 'indeed, too'; a reduced form of this particle, tə (with vowel quality adjustment) is used to form numbers above ten, as in

xpíɬ	ti	kʸíɬpil	'twelve'
ten		two	

In ʔyuxʷtáɬt, the t which follows ʔyuxʷ could be the reflex of this particle. There remains the sequence ʔáɬ, already found in the derivation of kʷiláɬ 'three' (2.5.), with the meanings 'eye', 'triangle', and therefore here, 'three'. The contraction ʔyuxʷtáɬ represents the original phrase

ʔi:	huxʷ	ti:	ʔáɬ
and	again	too	three

The final -t (which is not in the Gitksan Primer form) was probably added by analogy with the ending in qó:ɬt 'six', tɬpx̌o:ɬt 'seven' and qantó:ɬt 'eight', once the original meaning of yuxʷtáɬ had been forgotten.

One wonders again why a word for 'eight', coming after words for 'six' and 'seven' indicating hand movements, would mean 'and again three'. Movements of the whole hand are limited, and use must be made of the fingers again at some point: if nine is still indicated by leaving out the thumb, eight will mean also leaving out the adjacent finger, or, in additive rather than subtractive terms, using 'again three' fingers: probably by curling them into the palm, while leaving the hand in the same vertically oriented position as for seven.[35] For nine and ten, the remaining finger and the thumb join the three curled fingers.[36]

3.0 DEVELOPMENT OF THE NUMBER SYSTEM

It is possible to suggest a rough chronology of the development of the Nisgha number system as well as of the evolution of the method of counting.

Of the ten numerals for abstract counting, only kʸíɬ 'one' and xpíɬ 'ten' appear to contain a morpheme with actual numerical meaning. The morpheme kʸə- 'one' has especially wide distribution, and is used in the formation of words designating larger units, kʸáp 'ten (animals)', probably 'a set of ten skins or fish', and kʸiyítkʷ 'twenty' or 'one man'. The morpheme xpə- 'ten' is also used in compounds designating measures. It is likely that kʸə- is the most ancient, xpə- a later formation, but that together they designated the beginning and the end of a counting procedure of keeping track of numbers on the fingers of both hands, without, however, naming the intermediate steps.

The abstract forms for 'two' and 'four' both contain the sequence -ɬp- from the root *ɬep meaning 'assembled, joined'. The derivatives kʸiɬpiɬ 'two' (from kʸə - ɬep - ɬ 'fully assembled') and tx̌áɬpx̌ 'four' (from tx̌a: ÷ ɬep - x̌ 'all assembled') then have their origin in the techniques of assembling objects, probably in garment-making and woodworking. The abstract form for 'three', kʷiɬáɬ (from kʷaɬ-ʔáɬ 'stabilizing the triangle') also has its origin in a technique, that of

constructing stable triangular frames. What are now numbers were then originally technical terms.

In contrast, the forms for 'five' and 'nine' refer to a manner of keeping track of numbers: if the goal is to assemble a set of tens, or two hands' worth, five and nine represent incomplete sets, readily identifiable on the hands: 'leaving out one hand', 'leaving out one thumb'. At some point, the descriptive words kʸíɬpiɬ, kʷiɬáɬ and tx̌áɬpx̌ started to be used for abstract counting, bridging the gap between one and five. It is probable that counting was done on the fingers of both hands, repeating the sequence one to five on each hand until all the fingers were used up. Nine was viewed as an incomplete ten, and for a time there was no need of other numerals between five and ten.

The remaining numerals q̓ó:ɬt 'six', t̓ipx̌ó:ɬt 'seven' and y̓uxʷtáɬt or qantó:ɬt 'eight' bridge the terminological gap between five and nine, just like the originally technical words kʸíɬpiɬ 'two', kʷiɬáɬ 'three' and tx̌áɬpx 'four'. But these older forms originally had a meaning independent of counting. By contrast, the words for 'six' and 'seven' clearly refer to the act of counting, the specific hand gestures used in a counting procedure that goes beyond five, by extending, then rotating the hand. For 'eight', the meaning of y̓uxʷtáɬt 'and again three' only makes sense if the word is part of a set of counting instructions in which numeration starts from one and proceeds by successive additions, not, as for kʷstimó:s 'nine = leaving out one thumb' by subtraction from the complete set. The other word for 'eight', qantó:ɬt, which probably also has a technical origin, 'fully laid out' or 'fully taken up', must have been used in a different context, so that it was not part of the enumerative counting procedure.

These three numerals appear to be recent words, so clearly mnemonic that they suggest that the procedure in question was at one time new and strange, perhaps running counter to established habits. The forms for five and nine show that both hands were originally used in counting; but extending the hand in different directions for six and seven only makes sense if counting is being done on the fingers of one hand rather than two, a shift in procedure requiring new gestures associated with each number if ambiguity is to be avoided: extending and pivoting the hand ensures that six and seven cannot be confused with one and two. And if eight, nine and

ten are not to be confused with three, four and five, the hand position must be different: so the fingers now curl into the palm.

All the fingers are now together, and what is seen of the hand, besides the curled fingers, is the lower half of the palm, as well as the wrist: this area has a specific name in Nisgha, kʸɬ:ɬa?, a derivative of kʸɬ 'one' (with the detransitive suffix -a?); the literal meaning is approximately 'making up "one"'. This probably refers to the fact that a unit of ten has been achieved.

There would be little point in a procedure for counting to ten on one hand only, unless the other hand also played a role: that of keeping track of tens. Once one hand has 'made up a "one"', this 'one' can be transferred to the other hand. In this way, since each number from one to ten is associated with a specific gesture, it is possible to keep track of numbers up to ninety-nine,[37] without confusion.

There are, then, at least three discernible periods in this proposed development of the Nisgha number system:

1. At first, there was only a form for 'one', the base kʸə- which was attached to suitable words. 'Ten' and 'twenty' were expressed in terms of complete sets: kʸiyɬtkʷ 'twenty' was 'one man', kʸáp 'ten' was 'one set of ten skins or fish'. After a while the complex base xpə- also came to be associated with the number ten. Intermediate numbers were recognized as incomplete sets, but not named. Counting was done on the fingers of both hands, without specific words.

2. The incomplete sets 'five' and 'nine' started to be recognized formally by phrases indicating subtraction from the upper limit ten. Technical terms indicating typical patterns of two, three and four parts filled the gap between one and five. Counting to ten was still done on the fingers of both hands, probably by repeating the one to five sequence on both hands.

3. At a later date, a method was discovered or learned for counting to ten with just one hand, leaving the other hand free to count tens. In the absence of specific names for the intermediate numbers between five and nine,

> the gestures of this procedure were described, at first simply as an aid to its correct execution. Later, the meaning of the words were forgotten, and they acquired the purely numerical meanings they have today.

The shift in counting procedure can perhaps be roughly dated. It must have arisen in response to a need to count large numbers, and to name intermediate numbers rather than completing sets of ten, which must have been the ancient practice. These new conditions must have been those of the European fur trade, which created an economic situation in which much larger amounts of goods than before were changing hands; exchange rates were fluctuating according to supply and demand, and were often set by the Indians themselves.

It is impossible to establish on linguistic evidence alone whether the counting method evidenced by the Nisgha numerals, and their cognates in the other Tsimshianic languages, was developed independently in the Tsimshianic area, learned from some other group, or whether it is a case of stimulus diffusion: the idea of such a method may have been diffused, though not the actual details. It is remarkable that the new numbers were not borrowed from some other language: perhaps this type of counting was observed being done silently.[35] Areal research would be profitable in this connection.

Whatever the origin of the new counting procedure, its adoption must have given great impetus to counting and measurement, and to the formation of new words. Phrases were coined for numbers beyond ten, so that any number up to ninety-nine could be indicated. Paradigms such as those for persons and canoes, which only had a few entries, for one, two and perhaps ten, were filled in by the creation of new forms, derived by adding suffixes, or what appeared to be suffixes, to the abstract stems, or what appeared to be stems (e.g., -ó:l ('human' suffix) added to kʷil- considered as the stem of kʷilál 'three', -tó:l added to txálpx̌ 'four' on the analogy of qo:ltó:l 'six (persons)'). The abstract numbers themselves were used as prefixes to suitable words (e.g., kʸilqá:x 'one fathom' from kʸíl 'one' + qá:x 'wing, wingspan, armspan').[38]

4.0 CONCLUDING REMARKS

The morphological clarity of the Nisgha language gives us a rare window on the past life of the people and makes forgotten

aspects of a culture come alive. The Nisgha number system embodies a record of ancient cultural patterns and of cultural change precipitated by outside factors. It touches upon all aspects of life: it makes reference to crucial techniques, to social relations, to trading practices and their evolution; it preserves the beautiful metaphor of the eye for the triangle.

From a more general point of view, the evolution of the Nisgha number system may give clues to what probably happened in other parts of the world, where it is unlikely that decimal systems sprang up full-blown, and where unanalyzable numbers probably have a long but forgotten history of non-numerical meanings.[39]

NOTES

*The Nisgha (nɪsqáʔ, [nɪsg̊áʔə̥]) language is spoken in the Nass Valley of British Columbia. It is the 'Nass dialect' of Boas' (1902) *Tsimshian Texts* and of his 1911 *Tsimshian*.

The data presented here represent the speech of New Aiyansh, present home of the Gitlakdamix (kʸitlax̌ɬáːmiks) band. They were collected during the course of my employment with the Nisgha Bilingual/Bicultural Centre of B.C. School District no. 92 (Nisgha), in 1977-80 and again in the summer of 1982, during which times I resided on the reserve at New Aiyansh.

Among the numerous Nisgha speakers who helped me learn their language over the years, I am especially indebted to Mrs. Nita Morven, Mrs. Rose Robinson, and Mrs. Verna Williams, who were my first teachers of Nisgha, and whose patience and friendliness never failed; to the Rev. Hubert McMillan, a Nisgha hereditary chief of the Wolf tribe and priest of St. Peter's Anglican Church, New Aiyansh, as well as to Mr. Harold Wright, a hereditary chief of the Eagle tribe and Cultural Researcher for the Gitlakdamix band. Mr. Bert McKay, hereditary chief of the Frog/Raven tribe and Coordinator of the Nisgha Bilingual/Bicultural Centre, arranged for me to have access to these and other resource persons.

Bruce Rigsby provided me with a copy of the Gitksan Primer as well as many Gitksan data.

Neil Gallaiford made valuable suggestions about the counting procedure from eight to ten.

The reconstructions and interpretations presented here are my own, and I alone am responsible for any errors.

[1]I am coining this term on the analogy of German: Germanic. German is one of the Germanic, not German, languages. Similarly Tsimshian (c̓im 'in' + sán 'Skeena River'), now known among linguists as Coast Tsimshian, is only one of the Tsimshianic languages, which also comprise Southern Tsimshian, and in the interior, Nisgha and Gitksan. The latter two have been referred to as Nass-Gitksan (cf. Rigsby 1975, which gives Gitksan data).

[2]For instance N and G kʸíl̓pil̓ 'two', analyzed below as kʸə-lep - l̓: CT gú?pl (Dunn 1970:38).

N cáẃaqs 'shoes', from cáxʷ - ?q - s: G cáẃaxs, CT có:xs (Dunn p. 35).

The relationship of CT to Nisgha and Gitksan can be compared to that of French to Spanish and Portuguese or Catalan: CT has a much more complex vocalism than the other languages, and there has been more extensive loss or change of consonants. Nisgha is on the whole the most conservative of the three. Little is known about Southern Tsimshian.

[3]The same categories, with almost identical forms, are given in the Gitksan Primer. CT also has a category for 'long objects', including a suffix -qan or -x̌an, probably from qán 'tree, log' (Boas 1911:396, Dunn 1970:39). The bases for 'one', 'two', and 'three' in this category do not seem to be related to other numerals, and I will not attempt to analyze them.

[4]The transcription is phonological. Nonglottalized stops are voiced prevocalically. The symbols e: and o: stand for long lower mid vowels.

[5]e.g., there is a difference between the noun-phrase

tx̌á|px̌+ sá 'four days' (-+ connective)

and the noun

tx̌a|px̌sá:ta 'a four-day period' (sá: alternate form of sá 'day'; -ta old (see note 15) collective suffix)

[6]Except in some phonological details. Boas' transcription, done before contrastive techniques were established, and based on limited data, is not always consistent, in particular in the differentiation of long and short vowels, and of glottalized and nonglottalized stops. He also fails to indicate the glottalization of resonants. For these reasons, my transcription may differ slightly from his.

[7]I was told on several occasions that Boas' informants were poor speakers of Nisgha. Boas himself thought that the tales he collected were 'only moderately well told' (1902). Boas collected his Nisgha data in 1894 in the then newly-formed Christian community of Kincolith, where his interest in 'pagan' customs was not particularly welcome, so that the only persons who would work with him were those on the fringes of society, some of whom were allegedly not native Nisgha speakers.

[8]a. Columns headed 'Boas' have not been verified. For unity of presentation and for comparability I transcribe Boas' and Dunn's forms phonologically.
b. In the first column (fathoms, from Boas), the -tí: on the last word is an intensive particle which is sometimes used after a measure.
c. Under the column 'fingerwidths', the term waẍ'únkʷs does not literally mean 'four fingerwidths', but its equivalent, 'one handwidth'. The root is ʔún 'hand or arm', also used for 'fathom'.

[9]Cf. also in Table II in the last column, kʷi:sk̓ʸiwá 'one bundle of ten skins'. The initial sequence is probably the prefix kʷi:s- used in a number of words designating garments:

e.g. kʷi:sm̓ála? 'button blanket' (m̓ála? 'to fasten', qanm̓ála? 'button')
kʷi:shaláyt 'Chilkat blanket' (haláyt 'shaman, shaman's dance')
kʷi:sháṯiks 'swimsuit' (hátiks 'to swim')

The form kʷi:sk̓ʸiwá then seems to mean 'garment made of ten skins' or perhaps 'ten skins, enough for a garment'.

[10]Like English *up* in *drink up*, *sum up*, etc.

[11]This -ó:l is different from the sequence -ó:l̓t found in the forms for 'six' and 'seven', analyzed in 2.6. below. Since -ó:l carries the stress in all cases, it is unlikely that it is a true suffix, as the overwhelming majority of true suffixes are unstressed. It is more likely to have been originally a noun, as is, for instance, q̓á:x 'wing, armspan' used as a suffix in the formation of measures for 'fathoms' (Table II). It might be a form of ʔúl 'bear', a form which in Nisgha has been replaced in most of its uses by smáx 'black bear', originally 'meat', also 'body, corpse', probably a borrowing from the Salish *səməy- (hence also CT sámi 'meat'). Identification of bears with people is common in most Northwest cultures.

[12]e.g., Passive, transitive, reflexive, 'like', 'having', etc. In many cases it seems that the only purpose of the suffix -kʷ is to differentiate the word it is added to from the original word.

[13]Justification for all rules used in these derivations is found in my unpublished paper *Nisgha plural-formation: an analysis of the morphophonemics*, which presents both synchronic and diachronic rules.

[14]The Gitksan Primer gives hixpíl, hixpó:l, which seem to involve a form of reduplication.

[15]This suffix, productive in Gitksan, is restricted in Nisgha to a few frozen forms.

[16](But there is the word xpá:ẇ 'jaws' which may ultimately provide a clue.) The sequence xp- should probably be further analyzed into a prefix x, otherwise attested but of undetermined meaning, and a base or root starting with p-, also undetermined, The original meaning of the xp- forms, then, was probably not numerical, although it must have become so fairly early, otherwise one would expect 'ten fathoms' to have been *xpil?ún, not xpa?ún (cf. kʸilqá:x from kʸil + qá:x).

[17]cf. Table II, last column, 'bundles of ten skins'.

[18]Boas (1911:398), observing the obvious relationship between the 'one' forms starting with kʸ, suggested that xpíl, kʸáp and xpó:l were similarly derived from a common root: evidently he saw in xp, which corresponds to CT kp, a reduced form of kʸáp. This is most unlikely, for the following reasons:

- initial preconsonantal x derives historically from unglottalized kʸ, not glottalized kʸ; the few instances of spirantization of glottalized velars and uvulars (as in t'ipx̌ó:lt, 2.6.) occur post-consonantally;
- the suffix -l, like most Nisgha suffixes, never changes the stress pattern of a word; a form kʸáp + l would be *kʸápil;
- even if by some exception the stress moved to the suffix, glottalization would be transferred to the final stop of kʸáp and the result would be something like *kʸipíl, or granting an unlikely spirantization of kʸ, xpíl, with glottalized p and unglottalized l, not the opposite as in xpíl.

Boas' hypothesis is therefore not tenable.

[19]Glottalization is transferred to the stem-final stop, and a vowel is inserted.

[20]Boas (1911:397) compares the sequence qalp- in qalpé'ltkʷs (older qalpé:'ltkʷs) and its CT cognate qalpé:ltk to the CT form for 'two (long objects)' q'ó:psx̌an. There are many cases where a sequence Vl, before consonant, in N and G corresponds to a long vowel in CT, e.g., N, G wí'lp 'house', CT wá:p, but if this were the case here one would expect the stressed vowel of q'ó:psx̌an to be á:, not ó:. Also, one would expect the stress pattern to be the same in N and in CT.

The initial glottalization in q'ó:psx̌an is not an unsurmountable difficulty, as there are a number of cases where CT appears to have glottalized initial consonants, e.g., N, G kʷi'lá'l, CT k'wi'lí: 'three'; N, G qantó:'lt, CT q'andó:lt 'eight'. But it is more probably that the CT forms for 'canoes' and 'long objects' are unrelated, and that the 'two' root of the 'long objects' category represents yet another aspect of the experience of twoness.

[21]The glottal element is transferred to p from the suffix -'l, (cf. above 2.3. and note 19).

[22]cf. CT tx̌á:lpx̌, Dunn p. 38. Usually Nisgha V́lC = CT V́:C (see note 20). That the l is preserved in CT shows that the long vowel must be original.

[23]cf. English 'to steel oneself'. The t in kʷaltim is the 'passive of state' suffix (-m attributive suffix).

[24]In general, these changes place n at the end of a word or closed syllable, l intervocalically, as in c'ín 'to enter', c'ilim (proclitic) 'entering' (c'ín + -m attributive).

[25]There is no attested sequence l + 'l that I know of in Nisgha: the closest parallel is

l'ínx̌	+	-'n	>	*l'inn > li'n
(trees) to fall		CAUS		to cause (trees) to fall (naturally, e.g., storm)

[26]See also discussion of y'uxʷtá'lt below 2.7.

The replacement of ?á'l 'eye' by c'á'l 'eye(s), face' may have occurred as a result of a shift of meaning from 'eye' to 'triangle' or 'three'. The two forms ?á'l and c'á'l may have coexisted for a while, cf. in present-day Nisgha ?á:q and c'imá:q, both meaning 'mouth' (c'im 'in', from c'- 'in' (old base) and -m attributive).

[27]Both Boas and the Gitksan Primer give kʷilánt; the final t is probably the passive of state suffix, which is often added to instransitive stems such as the object-incorporating compound kʷil-ʔál or ʔál.

[28]cf. kʸá+kʷ 'to pierce, stab, gaff something' but kʸá+hó:n 'to gaff (kʸá+-) fish (hó:n)'. The suffixes -kʷ and -s are allomorphs.

[29]Note that the suffix -s may have been part of the derivation of kʷstimó:s as well, where it would have been assimilated to the final s. Perhaps the meaning is reflexive or possessive (leaving out one's own hand, not someone else's). (cf. yó'oks-wé:ntkʷ 'to brush one's teeth': yóʔoks 'to wash something'; wé:n 'teeth'; -kʷ REFL)

[30]e.g., N qalís, G qalʔúst 'to let go of something'; N kʸíp, G kúp 'to eat something; N kʷstíns, G xʷstíns, CT kstü:ns 'five'.

[31]As in yánsalt '(month of) May' literally 'fully-leaved' (yans 'leaf').

[32]Although the numerals give no clue as to the original method of counting to five on the fingers, there may be other evidence: words related to counting are lícx̌ 'to count, to read something', lícx̌kʷ 'to count, to read', líc̓il 'to keep track of something, líc̓ilskʷ 'to keep track of things', líc̓ilskum-tá:la 'to keep track of money'. The root líc , may be the original plural of yác 'to hit, strike something (e.g., a drum)'. The word líckʷ designates a type of grouse that makes a loud drumming sound. It is likely that líc meant originally 'to strike or beat rhythmically'. The use of this form to refer to counting suggests that each finger was struck in turn against some support.

[33]It is not clear in what way the hand is extended. It is probably not outstretched into a span, as a morpheme meaning 'span' is part of the measures kʸilsáq̓ans 'one span', etc.; sáq̓an is a transitive verb meaning 'to lengthen, to extend something'. Perhaps q̓ó:lt refers to a position in which the hand is held out horizontally with all the fingers straight together.

[34]The Gitksan Primer gives 'giukdal', which probably represents kʸuxʷtáɬ; kʸuxʷ is a contraction of kʸi: huxʷ, where kʸi: is the more formal variant of ʔi: (as also in Nisgha). Note the lack of -t at the end.

[35]I owe this suggestion to Neil Gallaiford.

[36]If the numbers from eight to ten are counted by curling the fingers back into the palm, one wonders why six and seven are not also indicated in this way, rather than by extending the hand in two different orientations. It could be because it is almost impossible to curl in the little finger without also curling in the fourth finger, and it is also difficult to curl in those two fingers without moving the middle finger. Thus there could easily be confusion between the gestures for six and seven, and perhaps even eight. But if six and seven are indicated in a different way, there is no ambiguity in the gesture for eight.

[37]Ninety-nine: kʷstimó:s wil kʸáp ti kʷstimó:s
nine ten nine
ninety

[38]There are also words referring to 'persons in canoes or boats', e.g., Nisgha kʷitá:t 'to be fishing alone in a boat', txalpxtá:t 'to be four in a canoe or boat'. This is another case where a sequence has been taken as a suffix but has a different origin. The ending -á:t is probably the word ʔá:t 'fishnet, to fish with a net'. In the word kʷitá:t the initial sequence kʷit- is probably the same as that in the modifier kʷitu: 'alone, by oneself', and it is probably the reduced form of *kʷó:t 'lost'. Where the modifier kʸo:lu: 'alone', built on kʸó:l 'one (person)' emphasizes singleness, kʷitu: and kʷitá:t emphasize the danger of being alone in a difficult environment.

The sequence tá:t was later taken as a separate morpheme and added to numerals (CT has a complete series, Dunn p. 39).

[39]I would appreciate receiving information from readers who may know of this and similar counting procedures.

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