A preliminary look at restricted counting in Proto-Salish

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This paper examines the hypothesis that Proto-Salish had a restricted counting system ending at four, as suggested by the disparity of Salishan numerals above four, as well as the general analyzability of higher numerals. Besides these overall trends in numerals, evidence for count ending at four include a reconstructed Proto-Salish root with the meaning 'ready/completed', and a subtractive Bella Coola form for 3 incorporating the root for 4. The limitation of the system to the numeral four may have its root in preverbal cognitive processes, which seem to be limited to discrete quantities of four or less. If Proto-Salish had a restricted numeral system ending at four, the disparity and analyzability of higher numerals is expected.

1   Introduction

The Salishan family of languages presents an interesting case study in numeral divergence, in that though the languages all display numerous features of close relatedness, the numeral systems of these languages are quite disparate. Numerals in the Salishan languages vary widely across the family, primarily in numerals greater than four. Some of this disparity can be explained by borrowing (e.g., Columbian *naqs* and Nez Perce *naaqc*, '1', see Aoki 1975), but many higher numerals are analyzable in their respective languages, meaning that they most likely arose through language-internal means. Because of this, it is necessary to posit an underlying reason why Salishan languages differ so widely in counting forms. This takes a preliminary look at the hypothesis that Proto-Salish had a restricted counting system ending at four. Evidence for this is provided by four compelling facts:

(i) the general unity of numerals 1-4 and disparity of numerals 5-9,
(ii) even generally cognate forms for higher numerals are analyzable,
(iii) a Proto-Salish root for 4 meaning 'ready/completed', and

(iv) a subtractive Bella Coola form for 3, incorporating the root for 'four'.

In discussing numerals in Thompson, Thompson & Thompson (1992:187) suggest "an archaic system based on four, overlain by a later decimal system". This is primarily based on the fact that the numerals 1-4 are unanalyzable, while numerals for 5-9 all contain synchronically productive lexical roots. Because of this, we should expect the first four numerals to be significantly older than the higher numerals, which points to a restricted numeral system ending at 4. Anderson (1999) notes that reduplicated people counting forms in Proto-Salish were apparently lacking for the numerals 7-9. While these forms are not basic counting forms, this fact fits with the inherent difficulty of reconstructing Proto-Salish numerals above four.

This paper will first look in § 2 at some general tendencies and patterns in North American numeral systems, defining the terms to be applied to the Salishan systems. § 3 presents the available data on Salishan counting systems[1] and examines evidence for an earlier non-decimal system, with specific emphasis on the possibility of a restricted count ending at four. Since positing an original restricted counting system requires a source for the current decimal system, § 4 looks at the possible origins of the modern Salishan decimal system. § 5 summarizes the main claims of the paper and outlines plans for future research, including a new reconstruction of Proto-Salish numerals.

2　　Numeral systems in North America

The North American continent displays significant variety in numeral systems, with attestations of counts based on four (a cluster of Californian languages (Dixon & Kroeber 1907), including the Chumashan languages (Beeler 1986)), five (including Nez Perce (Aoki 1994), Wichita (Rood & Taylor 1996), and Munsee Delaware (O'Meara 1996)), six (see claims concerning Costonoan and Miwokan languages in Beeler (1961) and Blevins (2005)), and ten (many languages, including Salishan (Anderson 1999)). For counting multiples of ten, there is more limited variety, with some languages using ten as a base (many languages, including Salishan languages) and others using twenty (fewer languages, including Upper Kuskokwim (Collins & Collins 1966)). The numeral referred to as the counting base is that numeral upon which higher

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[1] I am currently lacking complete data for Pentlatch, Nooksack, and Lower Chehalis, as complete numeral stem lists for these languages have (to my knowledge) never been published. Plans are in motion to obtain unpublished data on these languages so that a complete picture of the Salishan numeral systems may be given in a later work. Partial lists for Nooksack and Lower Chehalis are included, but unfortunately no data has been published on Pentlatch. § 3 lists the sources for all the data used throughout this paper.

numerals are consistently based. The determination of a counting base can be done based on two observations:

> (i) the numbers up to the posited base do not consistently incorporate any lower root
>
> (ii) numbers above the posited base consistently incorporate the root corresponding to the difference between that number and the base.

Consistency is important in the determination of a counting base. Certain numerals are cross-linguistically likely to incorporate certain roots even if those roots do not form a counting base, including 6 and 6, which often incorporate the roots for 3 and 4, sometimes with a morpheme meaning 'twice' or 'both', e.g., Quinault *múːs*, '4', *cáːmus*, '8'. However, unless other numerals are also based on 4, or the difference between themselves and 4, there is no reason to posit a base four system. Terms commonly used to label counting systems of certain bases include quaternary (base four), quinary (base five), senary (base six), and decimal (base ten). For counting multiples of ten, vigesimal (base twenty) is also used. Some languages use a different root for counting multiples of ten than for counting lower numerals. For instance, in a quinary language like Nez Perce, which uses the roots for 1-3 in numerals 5-8[2], 15 is not '5 times 3' but '10 plus 5', and 20 is not '5 times 4' but '10 times 2'.

Many languages do not have completely unanalyzable numerals below the counting base, though many (such as Navajo and English) do. Because of this, it is important not to use analyzability as a criterion for determining the counting base, even though it is often suggestive. As mentioned above, one common cross-linguistic schema involves using the roots for 3 and 4 in 6 and 8. Hymes (1955) refers to this as "pairing". Though pairing is uncommon in the Salishan languages, it does occur in all four languages of the Tsamosan branch.[3] Another common practice is the use of subtractive counting, which involves subtracting a lower numeral root from the counting base to derive the number(s) just below it, akin to the Roman numeral system whereby 9 is written IX, '1 less than 10 (X)'. The subtractive forms may contain roots for both the counting base and the number subtracted, or just one or the other. Subtractive counting is rare in Salishan, but where it is used it typically involves only the root of the number subtracted, e.g., Thompson *təmɬpéyeʔ*, '9', from *péyeʔ*, '1'. Numerals may also be analyzable because of lexical roots relating to the fingers or event coinciding with the numeral, e.g., the use of the root for 'to cross over' in the

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[2] 9 being a borrowing from Chinookan (Rigsby 1965).

[3] I am using Mithun's (1999) classification of the Salishan languages, which is almost identical to Kuipers' (2002) classification, but with further subdivisions of the South Georgia and Tsamosan branches.

words for 6 in many Salishan languages, referring to the crossing from the first hand, used for the numerals one through five, to the second hand.[4]

3   Salishan counting systems

The Salishan languages display remarkable variety in numerals given the genetic relatedness of the languages involved. While modern Salishan languages are purely decimal, evidence seems to point to an earlier non-decimal system, which would explain the great diversity of higher numerals in the family. Presented below is a comparison of the numerals from three Salishan languages: Lushootseed, from the Central Salish branch of Coast Salish, Tillamook, a Coast Salish language, and Shuswap, a Northern Interior language.

(1) Comparison of Lushootseed, Tillamook, and Shuswap numerals.

	Lushootseed	Tillamook	Shuswap
1	dəč'úʔ	higi	nək'ʷú?
2	sáliʔ	sæli	səséle
3	łixʷ	čæʔnæt	kəłés
4	búus	wis	mus
5	cəlác	c'xes	cilkst
6	ƛ'əlačiʔ	yilʔháči	təq'mékst
7	c'úʔkʷs	tč'us	cúcłkeʔ
8	təqačiʔ	tqǽči	nək'ʷʔú?ps
9	xʷəl	liyú	təmłənkʷúk'ʷʔe
10	pádac	ahančs	ʔúpekst

Though partially obscured by numerous phonological changes, several similarities appear upon careful analysis. All three languages show reflexes of Proto-Salish roots in 2, 4, and 10. The Lushootseed and Shuswap forms for 1 both stem from the reconstructed Proto-Salish form (Kuipers 2002), as do Tillamook and Shuswap forms for 3. However, above 4 things become more complicated. Beginning at 5, many of the numerals contain lexical suffixes for 'hand' or 'arm', including Shuswap *cilkst*, '5', Lushootseed *ƛ'əlačiʔ*, '6', and Tillamook *tqǽči*, '8'. While the numerals 1-4 show no analyzability, many of the upper numerals not only incorporate affixes for 'hand', 'arm', or 'finger', but also consist of verb roots. Lushootseed *ƛ'əlačiʔ*, '6', comes from *ƛ'ál-*, 'reverse the side of', and *təqačiʔ*, '8', comes from *tq(a)*, 'close, block'. Similar reflexes are seen in the Tillamook forms for 6 and 8. The Shuswap form for 6

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[4] See Eels (1913) for several types of evidence that the origin of numeral systems lies in the use of fingers for counting.

derives from a reflex of Proto-Salish *t'aq'*, 'cross over' (cf. other Salishan forms for 6: Squamish *t'aq'ač*, Okanagan *t'aq'mkst*, Spokane-Kalispel-Flathead *t'aq'n*). The form for 7 appears to be a C_1 reduplicated cognate of Thompson *cúłkeʔ*, lit. 'pointing finger', and the form for 9 is a subtractive form incorporating the root for 1.

Unity of lower numeral cognates across the family and disparity of higher numerals could possibly be explained by borrowing. Since lower numerals are more frequent and are generally assumed to be more resistant to borrowing, this could explain the distribution of cognates in Salishan languages. The problem with such an explanation is that Salishan higher numerals are analyzable, which all but rules out any possibility of explaining such disparity through borrowing. Thus the uniformity of lower numerals and disparity of higher numerals, when combined with the analyzability of higher numerals, suggests, following Thompson & Thompson (1992), that the current decimal system is a newer innovation on top of an older restricted system. The fact that all modern Salishan languages are decimal suggests that Proto-Salish, at some point in its development, may have completed the transition to a decimal system, but it seems necessary to posit a restricted counting system at an earlier stage to account for the diversity of modern cognates.

To avoid parenthetical citations attached to every datum in this paper, this section lists the sources from which data for the Salishan languages was obtained. While not every language is explicitly cited in this paper, I did use data from every language available (i.e., every language except Pentlatch) in calculating percentages of languages with analyzable forms for numerals, etc. Languages used and sources consulted are: Bella Coola (Nater 1984), Comox (Sapir 1991), Sechelt (Beaumont 1985), Squamish (Kuipers 1967), Halkomelem (Galloway 1993), Nooksack (Galloway 1984), Northern Straits (Montler 1991, Galloway 1990, Efrat 1969), Klallam (Thompson & Thompson 1971), Lushootseed (Bates, Hess, & Hilbert 1994), Twana (Drachman 1969), Quinault (Modrow 1971), Lower Chehalis (Snow 1969), Upper Chehalis (Kinkade 1991), Cowlitz (Kinkade 2004), Tillamook (Edel 1939), Lillooet (van Eijk 1997), Thompson (Thompson & Thompson 1996), Shuswap (Kuipers 1983), Okanagan (Mattina 1987), Columbian (Kinkade 1981), Spokane-Kalispel-Flathead (Carlson & Flett 1989), Coeur d'Alene (Greene 2004). All Proto-Salish and Proto-Coast-Salish data is from Kuipers (2002). Chinookan data is from Michael Silverstein and Rob Moore (p.c.). Chumash data is from Beeler (1986).

The following subsections look at four pieces of evidence for a restricted count in Proto-Salish ending at four. § 3.1 presents data on the disparity of higher numerals in modern Salishan languages, in contrast to the unity of cognates across languages for numerals 1-4. § 3.2 further looks at the

analyzability of these higher numerals, ruling out an analysis of extensive
borrowing from neighboring languages to explain the diversity of forms for
higher numerals. § 3.3 looks at Kuipers' (2002:123) suggestion that the forms
for 4 in several Salishan languages (Squamish, Halkomelem, and Lillooet)
derive from a Proto-Salish root for 'ready/completed'. § 3.4 presents a small but
perhaps crucial piece of evidence for a proto-system ending at 4: a subtractive
form in Bella Coola for 3 that incorporate the root for 4.

## 3.1   Disparity of higher numerals

As mentioned above, the Salishan languages display startling variety in
their higher numerals, given the relatedness of the family as a whole. While
lower numerals tend to be cognate across most or all branches of the family,
higher numerals often differ even within smaller sub-branches. (2) gives a
summary of the similarity of Salishan numerals across the entire family (PS =
Proto-Salish, PCS = Proto-Coast-Salish).

(2) Similarity in Salishan numerals

	Most common root	Percentage of languages
1	PS *n(a)k'uʔ	50%
2	PS *ʔəsal(i/a)	68%
3	PS *kaʔłas	73%
4	PS *mus	86%
5	PS *cil(-ak-is(t))	68%
6	PS *t'əx̌	40%
7	PCS *c'uʔ	45%
8	PCS *tqačiʔ	27%
9	PCS *tə́wixʷ	45%
10	PS *(ʔu)pan	86%

(2) shows that lower numerals are much more consistent across Salishan
languages than are higher numerals. The percentage of languages sharing the
most common root peaks at 4, with 86% of modern Salishan languages having a
reflex of Proto-Salish *mus*. This percentage drops somewhat for 5, and then
more precipitously for 6, reaching a low for the numeral 8, for which the
languages show eight different roots, and the most common root, *tqačiʔ*, is only
found in six languages. (3) presents this graphically.

**(3) Percentage of cognates for most common numeral roots**
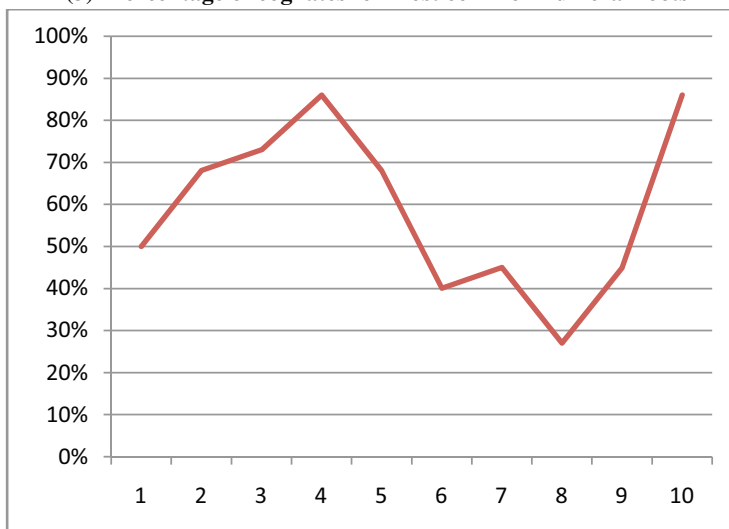
It is noteworthy that Kuipers (2002) gives no reconstructed Proto-Salish roots for seven, eight, or nine. Anderson (1999) mentions that reduplicated people-counting forms for 7, 8, and 9 are not reconstructible for Proto-Salish. The reconstructed roots for 7-9 in (2) are Proto-Coast-Salish roots not shared with the interior languages, and while *t'əx̌ is in fact a Proto-Salish root, the interior languages do not use this root for 6. Anderson (1999) suggests that the lack of reduplicated roots for 7-9 may be the result of a taboo; however, this could also be due to the lack of basic forms for 7, 8, and 9. The main problem in using this as evidence of a restricted numeral system is that the word for 10 is easily reconstructible for Proto-Salish, with only three languages lacking a reflex of PS *(ʔu)pan. However, *a priori* it seems possible for a numeral system to be restricted and yet still have a numeral signifying the number of fingers, since counting tends to be digital in nature (Eells 1913:264). More importantly, this evidence does not necessarily suggest that the Proto-Salish system ended at 4. While 4 has the most cognates of any numeral except for 10, the most precipitous drop occurs between 5 and 6, meaning that any argument for a restricted count based on the percentage of cognates lends itself almost as strongly to positing 5 as the highest number. The next section looks at the issue of analyzability in higher numerals, which further supports a system ending at four rather than five.

3.2   Analyzability of higher numerals

The analyzability of higher numerals provides another piece of evidence that the Proto-Salish counting system was at one time restricted. Unanalyzable forms are likely to be older than analyzable ones, which can be more recent additions. Thus it is expected that lower numerals will be less likely to be analyzable. Bagge (1906) mentions several restricted numeral systems from the Americas and Australia ending at 3 and 4, but not 5. The prevalence of proto-systems ending at or below four receives support from cognitive studies, which indicate that children can cognitively process the numerals 1-4 before counting principles have been acquired, whereas higher numerals come only later (Le Corre & Carey 2007). If the evolution of language in any way parallels child language acquisition (there is evidence that humans and animals share certain aspects on nonverbal counting, see Whalen et al. 1999), then this is a strong case for positing that all numeral systems were restricted at an early point in their development, and that the highest a restricted numeral system can go is the numeral 4. Bagge (1906) presents evidence that Proto-Indo-European had an earlier restricted counting system ending at four, based primarily on the declinability of the numerals 1-4 and thus their classification as adjectives, and the indeclinability of the numerals 5-10, and thus her classification of them as nouns. Bagge argues that the Indo-European numerals over 4 "are in all probability finger-names" (p. 260). One interesting feature of Salishan numeral systems is the widespread presence of the root for 'hand' or 'finger' in numerals between five and ten, e.g., Colville-Okanagan *cilkst*, '5,' Lillooet ƛ'*áq'əmkst*, '6,' Saanich *tθ'a'kʷəs*, '7,' Samish *té'səs*, '8,' Squamish *c'əs*, '9,' Shuswap *'úpəkst*, '10' (where the suffix -*kst* or -*əs* means 'hand'). In some cases numerals are the same as finger names, e.g., Lillooet *cúɬakaʔ*, Thompson *cúɬkeʔ*, Coeur d'Alene *cúnčtəm*, '7', lit. 'pointing finger'. This supports the hypothesis that Proto-Salish at one time had only basic numerals for 1-4, and that at some later point expanded its counting system with reliance upon the digits used in counting, which fits with the findings of Le Corre & Carey (2007) that only the numerals 1-4 are easily mapped onto nonverbal cognition, and parallel's Bagge's (1906) claim that Proto-Indo-European began with a restricted numeral system and later expanded its vocabulary with finger-names. (4) gives a visual representation of the percentage of Salishan numerals that are multimorphemic.

(4) Percentage of Salishan numerals consisting of multiple morphemes.
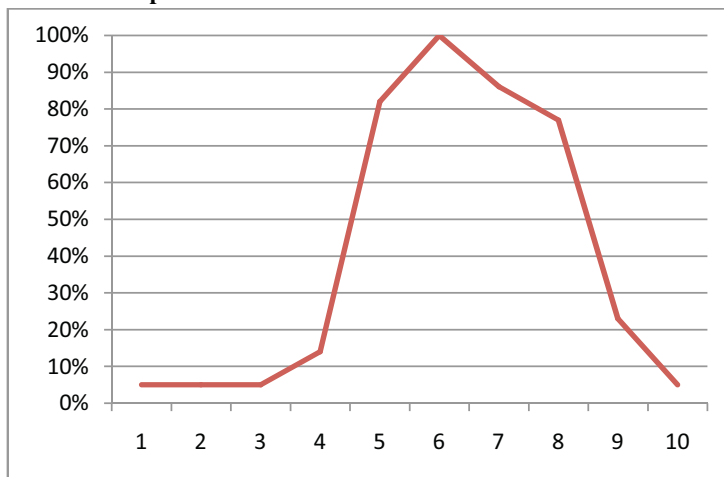
As shown in (4), numerals 5-8, and to a lesser degree 9 are much more often composed of multiple morphemes. Only Bella Coola has multimorphemic forms for 1-3 (and 10), whereas every language has an analyzable form for 6 (typically from PS *t'əx̌, 'open up, branch out' or *t'aq', 'cross over'). While we might expect analyzability to increase for higher numerals, the sharp increase in multi-morphemic forms between 4 and 5 requires some explanation. However, if Proto-Salish only had terms for the numerals one through four, the analyzability and diversity of numerals over four becomes expected.

3.3   Forms for 4 from Proto-Salish *x̌əc, 'ready/completed'

Counting systems often have analyzable forms for the number on which their system is based, e.g., a morpheme for 'full', 'completed', or 'all' in the base numeral or any system, or the word for 'hand' as 5 in a quinary system. This is not the case for the current Salishan decimal system, in which all modern languages but Bella Coola have a reflex of the Proto-Salish root *(ʔu)pan, which is both monomorphemic and unanalyzable. Interestingly, the only other Proto-Salish root with as widely distributed reflexes is the root for 4, posited here to have been the highest numeral in the original Proto-Salish counting system. If we look through forms for 4, we find that there is evidence of a root for 'ready/completed'. Kuipers (2002) lists *x̌əc as 'ready/completed', and its derivative *x̌əʔuc as "complete count: four" (p. 123). This root has three modern reflexes: Squamish x̌aʔúcn, Halkomelem x̌əʔáθəl, and Lillooet x̌ʷʔúcin.

Unless *x̌əʔuc is actually unrelated to *x̌əc, the use of the morpheme for 'completed' seems strong evidence for the hypothesis that the Proto-Salish counting system ended at four. It is tempting to suggest that Columbian x̌ʷcmákst contains this root, the second element of which could be from Chinookan makʷšt, '2', but this seems a stretch without a more careful morphological analysis of the Columbian form, which more likely contains the lexical suffix -akst, 'hand/arm'.

3.4   A subtractive form for 3

As mentioned in the previous section, a strong indicator of the base of a counting system is the presence of a morpheme 'full', 'completed', or 'all'. Another is the presence of subtractive forms. While there is no reason why a subtractive form could not be formed from any numeral root, there seem to be few if any cases in which a subtractive form indicates subtraction from anything except the base of the numeral system. Thus the Shuswap word for 9 contains the root for 1, to indicate that nine is ten minus one. Bella Coola has subtractive forms for both nine and eight, incorporating the roots for 1 and 2, respectively. Other languages take things still further, with Miluk having subtractive forms for 6, 7, 8, and 9, incorporating roots for 4, 3, 2, and 1 respectively. However, in Bella Coola there is an additional subtractive form: ʔasmús, 3, meaning 'being next to 4' (Nater 1984). It would be possible to count this as a counter-example to the general tendency for subtractive numerals to reference only the counting base, but given the other evidence discussed above for a restricted numeral system ending at four, it seems likely that this is a hold-over from the earlier system, when 4 was the highest numeral in the system.

While such a form would be useful evidence in any language, it is especially meaningful that it occurs in Bella Coola. Bella Coola is a basal language, in that it as a language is at the same genetic sublevel as the other branches of the Coast Salish branch. Mattina (2005) in fact takes this a step further, representing Bella Coola as basal to the entire family. While this does not mean that Bella Coola is necessarily closer to Proto-Salish than other daughter languages, Bella Coola does seem in many respects to be more conservative. While many languages have undergone several phonological changes, e.g., Lushootseed and Twana *m>b, *n>d, Central Salish, Tsamosan, Tillamook, and Coeur d'Alene *k>č, *x>š, Comox, Squamish, Northern Straits, Klallam, Thompson *l>y, the Bella Coola phonological inventory has stayed quite similar to Proto-Salish (Kuipers 2002). Thus it is perhaps not unexpected that Bella Coola should have a form more closely akin to the original proto-system.

4   Origins of the Salishan decimal system

If we accept the proposal that Proto-Salish had a restricted counting system that ended at 4, it becomes necessary to discuss the origins of the current decimal system. Such a system was likely at least in development if not fully extant by the time the Salishan languages began to split off from each other, as indicated by the easily reconstructible form for 10. However, numerals for the numbers seven through nine are more difficult to reconstruct, with Kuipers (2002) listing reconstructions only for the individual branches, rather that Proto-Salish as a whole. While it does not seem possible that individual numerals for seven through nine could have been borrowed, because of their analyzability, it is possible that the concept of a decimal system is a loan from a neighboring language. Aoki (1975) suggests that Proto-Sahaptian may have had a decimal system. Since there is a long history of interaction, both cultural and linguistic, between Salishan and Sahaptian peoples (see Aoki 1975, Rigsby 1965, Ray 1939, Teit 1930), this seems like a plausible scenario, though many other decimal systems border the Salishan languages, including Blackfoot (Holterman et al. 1996), the Chinookan languages (Boas 1911), and the majority of northern Athapaskan languages (see, e.g., Patrick & Tress 1991, Goddard 1917, Rice 1978).

Another question still remaining is the possibility of a quaternary system rather than a restricted numeral system. If Proto-Salish originally had a restricted count ending at four, it may have transitioned to a quaternary system before being replaced by a decimal system borrowed from Sahaptian. However, most of the arguments for a restricted numeral system ending at four do not transfer to a base four system. One exception is the subtractive form for '3' in Bella Coola, which seems to fit better with a quaternary system. However, in a quaternary system, we should expect to find numerals above four regularly containing lower numeral roots corresponding to the difference between the higher numerals and four, e.g., '7' should contain the root for '3' (or possibly '1' in the case of a subtractive form). By way of example, (5) compares the numerals 1-7 for Barbareño Chumash, Upper Chehalis (Tsamosan) and Okanagan (Southern Interior).

(5) Numerals 1-8 in Barbareño, Okanagan, and Upper Chehalis

	Barbareño	Okanagan	Upper Chehalis
1	pak'a	naqs	ʔóʔc's
2	ʔiškóṁ	ʔasíl	sáli
3	masix	kaʔłís	čáʔłi
4	skuṁu	mus	mús
5	yitipak'a	cilkst	cílačs
6	yitiškóṁ	t'aq'mkst	t'axɔ́m
7	yitimasix	sisp'lk'	c'óːps
8	malawa	timł	cámus

In Barbareño, the numerals 5-7 contain the roots for 1-3, because Barbareño had a quaternary system in which lower roots were added to four to form higher numerals. Okanagan, on the other hand, shows no such base four evidence. Rather than being based on four, higher numerals are simply generally analyzable, which points to a former restricted count rather than a base four count. Upper Chehalis does have a form for '8' based on '4', but as shown in (5), this is not necessarily a feature of a quaternary system: Barbareño has a unique term for '8' (and '16') despite having a solidly quaternary system, and many quinary and decimal languages utilize a pairing schema for '6' and '8', using the roots for '3' and '4' to form these numerals. Thus the evidence points to a restricted count ending at four for Proto-Salish, rather than a former quaternary system.

5   Conclusions

This section summarizes the main claims put forth in this paper, and outlines some directions for future research.

5.1   Summary

This paper has considered the hypothesis that Proto-Salish had a restricted numeral system ending at four. This has been hinted at in the literature, including a suggestion by Thompson & Thompson (1992:187) of "an archaic system based on four, overlain by a later decimal system". Kuipers (2002:123) records *$x̌əc$ as 'ready/completed' and its derivative *$x̌əʔuc$ as "complete count: four", and also fails to list any Proto-Salish reconstruction for the numerals 7-9. The existence of a restricted count ending at four explains the fact that Salishan languages have widely varying numerals above four, and the fact that higher numerals are often analyzable, either in whole or in part. Common elements include 'to cross' or 'to branch out' for 6, and 'to point' for

7. Supporting this general trend is a Bella Coola subtractive form for 3, incorporating the root for 4. This supports a system ending at 4 because subtractive forms seem to always reference the base of a counting system, rather than intermediate numerals. Such a restricted count, originally ending at four but with later expansion based on the digits, has also been proposed for Proto-Indo-European by Bagge (1906). The fact these systems end at four appears to have a basis in the nonverbal processing of numerals (Le Corre & Carey 2007, Whalen et al. 1999). Though some of the evidence presented could also support the existence of a former quaternary system, the fact that higher numerals in modern Salishan languages are not based on '4' (with the exception of '8', which is often based on '4' in a pairing schema) lends support to the claim that Proto-Salish had a restricted numeral system ending at four, rather than a base four system.

5.2   Future research

This paper attempted to outline a case for positing a restricted numeral system in Proto-Salish, but more research is necessary. Plans are in motion to obtain data on Pentlatch, which has not received any treatment in recent publications, to supplement the incomplete data on Nooksack and Lower Chehalis. These additions will make possible a fuller study of Salishan numerals, rather than studying only a sample. This research is also intended to pursue Kuipers' (2002) reconstructions of Proto-Salish numerals in light of the current theory of a restricted numeral system in Proto-Salish. While the morphological analysis of many forms presented here is suggestive, a fuller analysis of all the forms in all the languages would likely add to our knowledge of the composition of Salishan numerals. Further research into the cognitive basis of numeral processing may also be helpful in claims of restricted numeral systems in Proto-Salish and other languages, including Proto-Indo-European and many Australian languages.

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