

Santa Barbara Papers in Linguistics

Volume 23

Proceedings of the 15th Annual Workshop on
American Indigenous Languages (WAIL)
April 27-28th, 2012

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Foreword

We are pleased to make the proceedings of the 15th annual Workshop on American Indigenous Languages (WAIL) available as the 23rd volume of the Santa Barbara Papers in Linguistics. We are grateful for the continuing support of the University of California, Santa Barbara as a whole and the faculty, staff and students of the Department of Linguistics. We extend our special thanks to our advisor Marianne Mithun who offers us her continued support of our endeavors. We also thank those who come from near and far to attend the conference. Thank you to all of you who helped expand our collective knowledge of the indigenous languages of the Americas.

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Evidence for Language Contact in the Numeral Systems of Quechuan, Aymaran, Cavineña, and Chipaya

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1. Numeral Borrowing

Joseph Greenberg, as part of his extensive work on language universals, made several specific claims about numeral borrowing. First, higher numerals are more likely to be borrowed than lower ones. That is, the more marked the number, the more likely that its numeral expression will be borrowed. Second, numeral loans should be thought of in terms of ‘atoms’ or ‘lexically expressed numbers’ (Denning & Kemmer 1990:305), those numerals which, according to Seiler (1990:190), have ‘simple lexical representations’.

Greenberg also addressed numeral borrowing in his generalization 54 (a ‘diachronic near-universal’), which states:

- *If an atomic numeral expression is borrowed from one language into another, all higher atomic expressions are borrowed.*

For example, Tupi has borrowed the numerals ‘4’¹ through ‘20’ from Portuguese, but ‘21’, ‘22’, and ‘23’ contain the Tupi lexemes for ‘1’, ‘2’, and ‘3’. The fact that Tupi ‘21’ through ‘23’ contain inherited Tupi material does not violate generalization 54 because this generalization applies to the ‘atomic’ numerals, ones that have a ‘simple lexical representation’, which, in Tupi, would include ‘1’, ‘2’, and ‘3’, but not ‘21’, ‘22’, and ‘23’ (Denning & Kemmer 1990:305-6), since the latter are composite rather than atomic. In contrast, ‘24’ and above (until ‘31’, etc.) would be expected to be full loans under generalization 54, since they consist wholly of the borrowed Portuguese atomic numerals ‘20’, ‘4’, ‘5’, ‘6’, etc.

As will be seen below, however, the numeral system of the Andean language Aymara appears to present an exception to generalization 54. Aymara has borrowed ‘3’, ‘5’, ‘6’, and ‘10’ from Quechuan, but no other atomic numeral below ‘100’.

In this study, an attempt will be made to explain this typologically unusual distribution, in light of internal evidence from the inherited Aymara numerals and external evidence drawing on the numeral systems of the neighboring Quechuan, Jaqaru, Cavineña, and Chipaya languages, as well as the relative chronology of and motivations for the numeral loans found in these languages.

2. Types of Numeral Borrowing

For the purposes of the present paper, two types of numeral borrowing can be identified: lexical and analogical. These represent instantiations of broader types of borrowing that apply throughout linguistic systems.

Lexical numeral borrowing involves the full adoption of alien numeral lexemes. For example, many northern Dravidian languages have borrowed Indic numerals above a

certain point. Brahui numerals beginning with ‘4’, Kolami numerals beginning with ‘5’ or ‘6’, and Kurukh numerals beginning with ‘5’ are all direct loans from Indic varieties (Dale 1977:63-4).

Analogical numeral borrowing (which could also be termed ‘numeral calquing’) involves borrowing of numeral system structures (including bases, atypical constituent orders, etc.) from another language without borrowing any actual numeral lexemes. Again, northern Dravidian provides an example. The languages Malto, Kurukh, Pengo, and Kui have all developed vigesimal (base-20) numeral systems under the influence of neighboring (or substrate) Munda languages. Similarly, a dialect of the Indic language Gujarati spoken in the southern Indian state of Tamil Nadu has restructured the formation of its numerals along Tamil lines (it has also borrowed the Tamil numeral lexeme for ‘1’) (Dale 1977: 64-5).

Both types of numeral borrowing are found in the Aymara case. Aymara has adopted direct lexical loans from Quechuan for the numerals ‘3’, ‘5’, ‘6’, and ‘10’, and has also analogically borrowed Quechuan’s decimal system, replacing Aymara’s inherited quinary system.

3. Discontinuous Borrowing

The majority of numeral borrowing seems to neatly follow Greenberg’s universal 54; if one numeral expression is borrowed, all higher numeral expressions are likewise borrowed, following the atomic pattern described above. However, the literature does include many examples of what will be called *discontinuous* numeral borrowing, a pattern where there are ‘gaps’ between borrowed atomic numeral lexemes.

The general Finno-Ugric lexeme for ‘7’ – e.g. Estonian *seitse*, Finnish *seitsemän*, Hungarian *hét* – appears to be a borrowing from an Indo-European source (Sala 1988:154; cf. Latin *septem*, Ancient Greek *heptá*, Sanskrit *saptá*, ‘7’), specifically from a Baltic source for Finnic, and from an Indo-Iranian or Tocharian source for Ugric (Blažek 1997:20). Finno-Ugric ‘8’, ‘9’, etc. do not appear to be borrowings (Blažek 1997:15-17). The Indo-European lexeme for ‘7’ may itself represent a very ancient borrowing from a Semitic source (Blažek 1997:19; cf. Classical Arabic *sabʿ*-, ‘7’).

Benue-Congo languages adopted the numerals ‘2’, ‘5’, and ‘10’ from pre-Niger-Congo Khoisan substrate languages (Sala 1988:154). Pano-Tacanan languages of western South America have borrowed ‘3’ and ‘5’ from Quechuan (Sala 1988:154). The Nafusi (Jerbi) Berber language of western Libya has borrowed ‘7’ from Arabic and possibly all numerals above ‘10’ as well (Souag 2007:239; Ethnologue, 16th edition). Swahili borrowed ‘6’, ‘7’ and ‘9’ from Arabic (Johansen 2003), the motivations for which will be discussed further below. The Kartvelian family has borrowed ‘5’, ‘7’, ‘9’, and ‘10’ from a Semitic source (Manaster Ramer 1995; Blažek 1997:17), and, even more unusually, Kartvelian appears to have borrowed its word for ‘4’ from the Indo-European word for ‘8’, and its word for ‘8’ from the Semitic word for ‘4’ (Manaster Ramer 1995).

Finally, in the Andean region, the Aymara language has borrowed the numerals ‘3’, ‘5’, ‘6’, and ‘10’ from Quechuan, the relative chronology and likely motivations for

which, as well as evidence from borrowed numerals in the Jaqaru, Cavineña, and Chipaya languages, are the subject of this study.

4. The Andean Region

The Andes mountain range stretches from western Venezuela, through Colombia, Ecuador, Peru, and Bolivia, and forms the boundary between Chile and Argentina. The Central Andes comprises the mountain regions of Peru and Bolivia, including the large central plateau known as the Altiplano, in southeastern Peru and western Bolivia.

The dominant language family of the Central Andes is Quechuan; member languages are found from southern Colombia to northern Argentina. The Aymaran language family predominates in the Altiplano; the small Uru-Chipaya family is also found there. Finally, the Tacanan family is found in the Amazonian lowlands of northern Bolivia, to the northeast of the Altiplano (Ethnologue, 16th edition).

i. Quechuan Languages

The Quechuan languages are spoken across the Andean region, from southern Colombia, through highland Ecuador and Peru, the Altiplano of Bolivia, and into northern Argentina and Chile. Estimates of the number of speakers of Quechuan languages range between 8.5 and 10 million (Adelaar & Muysken 2004:168), including 3.2-4.4 million in Peru and 2.2 million in Bolivia (Adelaar & Muysken 2004:13-14). The Quechuan family is divided into two main branches, Quechua I and Quechua II. Quechua II is further divided into sub-branches A, B, and C (Adelaar & Muysken 2004:184-7). Quechuan languages constituted the majority speech of the Inca Empire (*Tawantinsuyu*), as well as a language of evangelization during the Spanish colonial period (Adelaar & Muysken 2004:179,182-3).

ii. Aymaran Languages

The Aymaran language family consists of two languages: Aymara and Jaqaru. Aymara is spoken across the Andean Altiplano in western Bolivia and southeastern Peru. The number of Aymara speakers is estimated at 350,000-412,000 in Peru, and 1.5 million in Bolivia (Adelaar & Muysken 2004:13-14). Jaqaru is spoken in the Tupe district of Yauyos Province, in the Lima Region of Peru. The number of Jaqaru speakers is estimated at 725 (Adelaar & Muysken 2004:171). There is a third Aymaran variety spoken in the nearby village of Cachuy that is often referred to as “Kawki”. Hardman considers Kawki to be a separate Aymaran language, and even considers it to be more closely related to Aymara than to Jaqaru (Hardman-de-Bautista 1978:153). Adelaar and Muysken, however, consider the differences between Jaqaru and Kawki as not exceeding mutual intelligibility (Adelaar & Muysken 2004:171).

iii. Uru-Chipaya Languages

The Uru-Chipaya family consists of two extant languages, Uru and Chipaya. Uru (or *Uchumataqu*) is spoken at the mouth of the Desaguadero River on the southern end of Lake Titicaca in western Bolivia. It is severely endangered, with only one fluent speaker and a few semi-speakers. Chipaya is spoken in the Altiplano of western Bolivia, in the province of Atahuallpa in the department of Oruro. It has around 1,000 speakers (Adelaar & Muysken 2004:363).

iv. Tacanan Languages

The Tacanan languages are spoken in the Amazonian lowlands of northern Bolivia and the southeastern edge of Peru, between the Madre de Dios and Beni rivers (Dixon & Aikhenvald 1999:364). The Tacanan language Cavineña is spoken along the Beni and Biata rivers in the western part of Beni department, northern Bolivia, by around 1,200 people (Guillaume 2008:xxxii,1).

5. Long-Range Genetic Relations

Quechuan and Aymaran have often been assumed to form a larger family, termed “Quechumaran”. This is due mostly to the overwhelming similarity between the two families in phonology and morphosyntax, as well as a great deal of the lexicon. However, a large amount of the core lexicon in each family is not amenable to a common reconstruction. It is assumed that the two families are indeed distinct, but that they passed through a state of intense contact and mutual restructuring in their proto-phases (Adelaar & Muysken 2004:34-6).

In his well-known Amerind classification, Joseph Greenberg included both Quechuan and Aymaran in his “Andean” phylum, a first-order sub-grouping of Amerind. He placed Uru-Chipaya in the “Equatorial” branch of his “Equatorial-Tucanoan” phylum, and Tacanan in the “Macro-Panoan” branch of his “Ge-Pano-Carib” phylum (Adelaar & Muysken 2004:44). A link between the Tacanan and Panoan languages is generally considered likely (Dixon & Aikhenvald 1999:365; Guillaume 2008:7).

A great variety of (often contradictory) other proposals for classification of South American Indigenous languages exists (v. Adelaar & Muysken 2004:36-45).

6. Numerals

i. Quechuan Numerals

Table 1 below gives the numerals ‘1’ through ‘10’ in five Quechuan languages, two from the Quechua IIC branch, one from the Quechua IIB branch, and two from the Quechua I branch.

Table 1: Numerals ‘1’ through ‘10’ in select Quechuan languages

	Quechua IIC		Quechua IIB	Quechua I	
	Bolivian	Cuzco-Collao	Chachapoyas-Lamas	Junin-Huanca	Ancash
1	uk	hoq	suk	huk	huk
2	iskay	iskay	ishkay	ishkay	ishkay
3	kinsa	kinsa	kimsa	kimsa	kimsa
4	tawa	tawa	chusku	trusku, ² tawa	chusku, tawa
5	phisqa	pisqa	pichka	pichqa	pitsqa
6	suqta	soqta	sukta	suqta	suqta
7	qanchis	qanchis	kançis ²	qantrish	qanchis
8	pusaq	pusaq	pusak	pusaq	pusaq
9	hisq’un	isqon	iskun	isqun	isqun
10	chunka	chunka	çunka	trunka	chunka

(Cusihuaman 1976, Paredes Cusi 2009, Bills et al. 1969:76, Taylor 2006, Cerrón-Palomino 1976, Carranza Romero 2003)

Table 2 gives reconstructed forms of these numerals in Proto-Quechuan, after sound correspondences and reconstructed phonemes given in Cerrón-Palomino 1987.

Table 2: Proto-Quechuan numerals

1	*suq
2	*iškay
3	*kimsa
4	*çusku / *tawa
5	*pičqa
6	*suqta
7	*qançiš
8	*pusaq
9	*isqun
10	*çunka

(after sound correspondence and reconstructed phoneme data in Cerrón-Palomino 1987)

Observations

The Quechuan numeral system is decimal in nature.³ All of the first ten Quechuan numerals are monomorphemic and unanalyzable (Urton 1997:42-3)⁴. This suggests a long-standing presence in the language. All Quechuan languages attest the same ten numerals, with no non-Quechuan borrowings; that is, all Quechuan languages attest a set of numerals reconstructable to Proto-Quechuan. The only family-internal lexical variation is Quechua I and IIA/B *çusku versus Quechua IIC *tawa for ‘4’ (Cerrón-Palomino 2000:201[n.9]).⁵

ii. Aymara Numerals

Table 3 gives the first ten Aymara numerals.

Table 3: Aymara numerals

1	maya
2	paya
3	kimsa
4	pusi
5	phisqa
6	suxta
7	paqallqu
8	kimsaqallqu
9	llätunka
10	tunka

(Layme Pairumani 2004)

Observations

Aymara shares the numerals ‘3’, ‘5’, ‘6’, and ‘10’ with the Quechuan family. Below is a comparison of the numerals of reconstructed Proto-Quechuan with those of modern Aymara. Shared numeral lexemes are in bold.

Table 4: Comparison of Proto-Quechuan and Aymara numerals

	Proto-Quechuan	Aymara
1	*suq	maya
2	*iškay	paya
3	*kimsa	kimsa
4	*ĉusku/*tawa	pusi
5	*pičqa	phisqa
6	*suqta	suxta
7	*qanĉiš	paqallqu
8	*pusaq	kimsaqallqu
9	*isqun	llätunka
10	*ĉunka	tunka

Aymara currently utilizes a decimal system: *tunka* ‘10’, *patunka* ‘20’ (< *paya-tunka* ‘2-10’)⁶, *kimsatunka* ‘30’ (*kimsa-tunka* ‘3-10’), etc. But there are strong traces of an earlier quinary system in Aymara: *paqallqu* ‘7’ is composed of *paya* ‘2’ and an element *qallqu*, while *kimsaqallqu* ‘8’ is composed of *kimsa* ‘3’ and the same *qallqu* element. On the basis of the compositional meanings ‘2-*qallqu*’ = ‘7’ and ‘3-*qallqu*’ = ‘8’, we can assume that this *qallqu* element has (or had) the meaning ‘5’, and thus reconstruct an earlier Aymara numeral **qallqu*, ‘5’⁷. This numeral was replaced at some

point by *phisqa* ‘5’, a loan from one of the Quechuan languages (likely a Quechua IIC language due to the presence of *s* – *phisqa* – rather than *č*; cf. Bolivian Quechua *phisqa*).

Furthermore, the presence of *paqallqu* ‘2-5’ for ‘7’, and *kimsaqallqu* ‘3-5’ for ‘8’, implies the prior presence of **ma-qallqu* (<**maya-qallqu*) ‘1-5’ for ‘6’. This postulated numeral would have then been replaced by another Quechuan loan, *suxta* (cf. Proto-Quechuan **suqta*). This appears to be a loan from Quechuan to Aymara and not the reverse given the fact that any original Aymara ‘6’ should be based on the quinary unit **qallqu*, ‘5’: **ma(ya)-qallqu*.

Aymara *tunka* ‘10’ also appears to be a loan from Quechuan, for the same reason; Aymara quinary ‘10’ would be expected to have taken a form similar to **qallqu-qallqu*. However, phonological composition of the word suggests that *tunka* was adopted into Aymara well before *phisqa* was. Modern Aymara /t/ is a result of the neutralization of Proto-Aymaran **t/*, **ty/*⁸, and **tr/* (Cerrón-Palomino 2000:124); Jaqaru has maintained the distinction between these three phonemes. Since Aymara *tunka* corresponds to Jaqaru *trunka*, the Proto-Aymaran form would be reconstructed as **trunka*; this is identical to the Proto-Quechuan **čunka*, but since the Proto-Aymaran numeral system must have been quinary, this lexeme must be Quechuan in origin. Because Aymara and Jaqaru share a regular sound correspondence for this lexeme, it must have been borrowed into Proto-Aymaran before the separation of Aymara and Jaqaru.

Aymara *kimsa* ‘3’ is also reconstructible to both Proto-Aymaran and Proto-Quechuan. However, since its presence is compatible with both a quinary and a decimal system, it is ultimately unclear what the genetic origin of *kimsa* is, Aymaran or Quechuan. This question will be considered further below.

The existence of *paqallqu* ‘7’, *kimsaqallqu* ‘8’, and the assumed **maqallqu* ‘6’, imply a further second-pentad numeral, **pusi-qallqu* ‘4-5’ for ‘9’. However, in modern Aymara, ‘9’ is *llätunka*. This is a composite of *llä-* and *tunka* ‘10’. *llä-* is a dialectal variant of *ñä-*, ‘almost’ (Cerrón-Palomino 2000: 199-200; Layme-Pairumani 2004:113,126). Thus Aymara *llätunka* ‘9’ means ‘almost 10’. Numeral terms for ‘9’ (and ‘8’) based on subtraction from ‘10’ are typologically fairly common (Zytsar 2002:220; although, see Urton 1997:42-3 which says the opposite). Cf. Hindi-Urdu *unnīs* (**un-bīs* ‘1-20’ [?]) ‘19’, *bīs* ‘20’⁹, and Latin *duodēvīgintī* (*duo-dē-vīgintī* ‘2-from-20’) ‘18’, *ūndēvīgintī* (*ūn-dē-vīgintī* ‘1-from-20’) ‘19’, *vīgintī* ‘20’.

iii. Jaqaru Numerals

Table 5 gives the first ten numerals in the Jaqaru language.

Table 5: Jaqaru numerals

1	maya
2	paja
3	kimsa
4	pushi
5	pichqa
6	sujta
7	qántrisi
8	púsaqa
9	isquña
10	trunka

(Belleza Castro 1995)

Observations

Jaqaru shares the numerals ‘3’, and ‘5’, ‘6’, ‘7’, ‘8’, ‘9’, ‘10’ with Quechuan. That is, only ‘1’, ‘2’, and ‘4’ are represented by inherited Aymaran numerals; the rest appear to be Quechuan loans.

Table 6: Comparison of Proto-Quechuan and Jaqaru numerals

	Proto-Quechuan	Jaqaru
1	*suq	maya
2	*iškay	paja
3	*kimsa	kimsa
4	*ĉusku/*tawa	pushi
5	*piĉqa	pichqa
6	*suqta	sujta
7	*qanĉiš	qántrisi
8	*pusaq	púsaqa
9	*isqun	isquña
10	*ĉunka	trunka

Observations

Based on the phonetic shapes, Jaqaru likely borrowed its numerals from a Quechua I language. The only numerals directly and unambiguously reconstructible for Proto-Aymaran are *maya ‘1’, *paya ‘2’, and *puši ‘4’ (Cerrón-Palomino 2000:200). Based on the evidence from Aymara (though not Jaqaru), a tentative reconstruction of *qallqu ‘5’ is possible. A reconstruction of *kimsa ‘3’ is possible, but, as noted above, this is identical to the ‘3’ reconstructed for Proto-Quechuan. This leaves open the

question as to whether **kimsa* is a Proto-Quechuan loan to Aymaran (either at the proto-stage or before the separation of the extant Aymaran languages, Jaqaru and Aymara), a Proto-Aymaran loan to Proto-Quechuan, or a loan to one or both families from an unknown third source. However, since ‘5’, ‘6’, and (as discussed above) ‘10’ are most likely loans from Quechuan to Aymaran, it makes sense to assume, in the absence of evidence to the contrary, that ‘3’ is also a Quechuan loan to Aymaran.

If we assume Proto-Aymaran to have had a quinary system, then these five numerals represent the entirety of the “atomic” Aymaran numerals. Thus, the reconstructed Proto-Aymaran numerals are:

Table 7: Proto-Aymaran numerals

1	2	3	4	5
*maya	*paya	[*kimsa]	*puši	*qallqu

(Cerrón-Palomino 2000:200)

iv. Cavineña Numerals

Table 8 gives the first ten numerals in the Cavineña language.

Table 8: Cavineña numerals

1	peadya
2	beta
3	kimisha
4	pushi
5	pishika
6	shukuta
7	pakaruku
8	kimisakaruku
9	puskuruku
10	tunka

(Guillaume 2008:74;24-9)

Observations

Cavineña has very obviously borrowed its numerals ‘3’ through ‘10’ from Aymara (cf. Guillaume 2008:497-8; though note the difference in ‘9’, discussed below):

Table 9: Comparison of Aymara and Cavineña numerals

	Aymara	Cavineña
1	maya	peadya
2	paya	beta
3	kimsa	kimisha
4	pusi	pushi
5	phisqa	pishika
6	suxta	shukuta
7	paqallqu	pakaruku
8	kimsaqallqu	kimisakaruku
9	llätunka	puskuruku
10	tunka	tunka

Cavineña probably developed a decimal numeral system through contact with Aymara; compare the numerals of the related Tacanan language Ese Ejja, with a (partially) binary numeral system:

Table 10: Ese Ejja numerals

1	owe póji
2	béta / biáwe
3	kuiháta ji-ma
4	béta pi?ái / biáwe biáwe

(Chavarría Mendoza 1980)

The Cavineña word for ‘9’, however, is not taken from Aymara *llätunka* but rather seems to reflect the posited quinary numeral **pusiqallqu* ‘4-*qallqu*’ for ‘9’. This provides the evidence needed to establish the existence of such a numeral in pre-modern Aymara.

Because the Cavineña numerals also reflect Aymara *kimsa* ‘3’, *phisqa* ‘5’, and *suxta* ‘6’, we can place the replacement of *pusiqallqu* with *llätunka* in Aymara later than the adoption of these loans from Quechuan (*llätunka* must post-date the adoption of *tunka* ‘10’ in any case).

v. Chipaya Numerals

Table 11 gives the first ten numerals in the Chipaya language.

Table 11: Chipaya numerals

1	tshii
2	pizk
3	chhep
4	paqpik
5	phisqa
6	sujta
7	paqallaqu
8	kimsaqallaqu
9	llatunka
10	tunka

(Cerrón-Palomino 2006:105)

Observations

Chipaya has borrowed the numerals ‘5’ through ‘10’ from Aymara.

Table 12: Comparison of Aymara and Chipaya numerals

	Aymara	Chipaya
1	maya	tshii
2	paya	pizk
3	kimsa	chhep
4	pusi	paqpik
5	phisqa	phisqa
6	suxta	sujta
7	paqallqu	paqallaqu
8	kimsaqallqu	kimsaqallaqu
9	llätunka	llatunka
10	tunka	tunka

Since Chipaya ‘9’ reflects the modern Aymara *llätunka* rather than the older *pusiqallqu*, Chipaya must have borrowed this numeral (and likely the other numerals) from Aymara after Cavineña did.

Interestingly, Chipaya’s congener, Uru, has maintained all the Proto-Uru-Chipaya numerals, despite having a much smaller speech community in more direct contact with Aymara-speakers. Uru utilizes a decimal system where each numeral is monomorphemic and unanalyzable, much like the Quechuan system (Cerrón-Palomino 2006:105). This suggests that, like those of Quechuan, the Uru-Chipaya numerals are of some antiquity.

Table 13: Comparison of Chipaya and Uru numerals

	Chipaya	Uru
1	tshii	chhi
2	pizk	piski
3	chhep	chhip
4	paqpik	pajpiku
5	phisqa	tojsnuku
6	sujta	tajchuku
7	paqallaqu	tunku
8	kimsaqallaqu	qunku
9	llatunka	sanqi
10	tunka	qhalu

(Cerrón-Palomino 2006:104[n3])

Based on the numeral data given above, we can propose the following relative chronology of numeral borrowing among the Quechuan, Aymaran, Cavineña, and Chipaya languages.

Relative Chronology

Proto-Quechuan: decimal numeral system

Proto-Aymaran: quinary numeral system

Proto-Tacanan: minimal/binary numeral system

Proto-Uru-Chipaya: decimal numeral system

Stage 1: Proto-Aymaran quinary ‘3’ is replaced by Quechuan decimal ‘3’ (or possibly vice-versa).

Stage 2: Proto-Aymaran quinary ‘10’ (i.e. “5-5”) is replaced by Quechuan decimal ‘10’.

Stage 3: Aymara quinary ‘5’ and ‘6’ are replaced by Quechuan decimal ‘5’ and ‘6’.

Stage 4: Cavineña borrows Aymara ‘3’ through ‘10’, thus adopting a decimal system.

Stage 5: Aymara quinary ‘9’ *pusiqallqu* is replaced by decimal “almost 10” *llätunka*.

Stage 6: Chipaya borrows Aymara ‘5’ through ‘10’.

Relative chronology unknown: Jaqaru quinary ‘5’, ‘6’, ‘7’, ‘8’, ‘9’ are replaced by Quechuan decimal ‘5’, ‘6’, ‘7’, ‘8’, ‘9’ (likely together, but possibly individually).

Diffusion Paths

The following diagram summarizes the direction of borrowing of numeral lexemes among the five languages examined in this study:



Genetic Material

The following chart summarizes the genetic origin of each numeral in the series ‘1’-‘10’ for each of the five languages examined in this study. The solid lines within the table indicate the point in the numeral sequence at which all lower terms are inherited, all higher are borrowed (with the discontinuities indicated for Aymara and Jaqaru). The dashed lines indicate the mixed genetic origin of the Aymara numerals *kimsaqallqu* ‘8’ and *llätunka* ‘9’.

Table 14: Genetic source of each first-decade numeral in Quechuan, Aymara, Jaqaru, Cavineña, and Chipaya

	Quechuan	Aymara	Jaqaru	Cavineña	Chipaya
1	*suq	maya	maya	peadya	tshii
2	*iškay	paya	paja	beta	pizk
3	*kimsa	kimsa	kimsa	kimisha	chhep
4	*ĉusku/*tawa	pusi	pushi	pushi	paqpik
5	*piĉqa	phisqa	pichqa	pishika	phisqa
6	*suqta	suxta	sujta	shukuta	sujta
7	*qanĉiš	paqallqu	qántrisi	pakaruku	paqallaqu
8	*pusaq	kimsaqallqu	púsaqa	kimisakaruku	kimsaqallaqu
9	*isqun	llätunka	isquña	puskuruku	llatunka
10	*ĉunka	tunka	trunka	tunka	tunka

Key to Table 14

Quechuan material	Tacanan material
Aymaran material	Uru-Chipaya material
Quechuan material transmitted through Aymara	

7. Motivations for Numeral Borrowing

Three types of motivations for lexical numeral borrowing emerge from the literature. I will call these *structural*, *taboo avoidance*, and *cultural*.

i. Structural

Structural motivations include:

- borrowing of “higher” numerals to elaborate the system
- borrowing of numerals to level or simplify the system
- borrowing of numerals as part of systemic restructuring

Many languages with minimal or incipient numeral systems borrow numeral terms to elaborate the system. For example, many Amazonian languages that lack a decimal system have borrowed decimal Portuguese and Spanish numerals (Epps 2006:260,266,270).

Swahili appears to have borrowed *sita* ‘6’ and *saba* ‘7’ from Arabic (cf. Modern Standard Arabic *sitta*’, *sabʕa*’) so that all first-decade numerals would conform to a CVCV shape; these loans replaced inherited Bantu numerals with trisyllabic non-CVCV shapes (Johansen 2003:101).

In Northern Chumash, a Yokuts word for ‘10’ was borrowed with the meaning of ‘5’, and the Chumashan ‘4’ then shifted its meaning to ‘8’. In effect, the Yokuts loan accompanied (caused?) a restructuring of the Northern Chumash numeral system from a quinary to a decimal one (Manaster Ramer 1995:17).

ii. Taboo avoidance

Taboo avoidance involves replacement of a numeral due to similarity to a taboo word. For example, Swahili may have borrowed *tisa* ‘9’ from Arabic (*tisʕa*’) in order to purge the inherited Bantu *kenda* ‘9’ due to the latter’s similarity to *kende* “scrotum, testicle” (Johansen 2003:102).

iii. Cultural

Cultural motivations include:

- cultural, political, or economic status of the donor language
- cultural or religious importance of (or taboo on) a specific number

Cultural, political, economic, or religious influence can promote the borrowing of numerals just as it does with other parts of the lexicon. Lexical items (including numerals) are more likely to be passed from the more powerful or prestigious group to the less powerful or prestigious one.

For example, Cambodian (Khmer) borrowed all its higher numerals from Thai due to cultural influence from the latter after the fall of the Cambodian Angkor civilization (Jenner 1976:47-8).

The cultural importance of certain numbers may facilitate the borrowing of their numeral expression by languages that join the culture area of the donor language. This may have happened with Proto-Indo-European **septm* ‘7’; if this is not a Semitic loan, it may be a derivation of a PIE root meaning ‘to honor’, indicating its high regard in Indo-European culture (Blažek 1997:21). This in turn *may* explain the borrowing of Indo-European ‘7’ by various Uralic languages.

To return to the Andean case, Cavineña’s borrowing of Aymara numerals beginning with ‘3’ is likely an example of elaboration of a minimal numeral system; the related Ese Ejja language has no inherited numerals higher than ‘4’ (Chavarría Mendoza 1980). It is also to be expected that any relationship between the Aymara-speaking and Cavineña-speaking societies would involve political or economic influence from the former upon the latter, given their relative sizes.

Chipaya’s borrowing of Aymara numerals beginning with ‘5’ is likely an example of borrowing due to cultural, political, or economic influence; the Chipaya speech community is surrounded by Aymara speakers, and it appears that there was much pressure in the past to shift to Aymara (Cerrón-Palomino 2006:21[n8]). Evidence from the related Uru language indicates that Proto-Uru-Chipaya had a full decimal numeral system, so elaboration as a motivation is ruled out (Cerrón-Palomino 2006:104-5).¹⁰

There were likely several distinct motivations for the borrowings of Quechuan ‘3’, ‘5’, ‘6’, and ‘10’ by Aymara.

‘10’

‘10’ was likely borrowed as part of the transition from a quinary to a decimal system; ‘10’ being the decimal base, it is a crucial part of the system, and so is amenable to borrowing in such a context.

There may have been a cultural component as well. As Gary Urton posits in his study, *The Social Life of Numbers: A Quechua Ontology of Numbers and Philosophy of Arithmetic*:

“...I would argue that the organization of labor by, or into, *full decimal units* was a fundamental feature of the “experience of numbers” on the part of native people in local communities throughout the Andes in pre-Hispanic times. Such an emphasis is also evident in the data on Inka age-classes, which were organized by multiples of five and/or ten...”

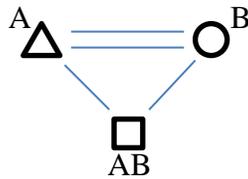
(Urton 1997:183-4; emphasis in original)

‘3’

‘3’, the oldest borrowing, was most likely adopted for cultural or religious reasons. Associations of ‘3’ in Quechua culture include:

“*kinsa*: three; considered a “pivotal” number in counting by dozens.” (Urton 1997:225)

“*kinsa ayllu*.”¹¹



‘three *ayllus*’ (social, territorial, and ritual groups); synonyms of *kinsa ayllu* include: *kinsa ñan* (“three roads”), *kinsa palqa* (“three branches”), *kinsantin palqa* (“three interconnected branches”), and *palqantinkama* (“branching together”)” (Urton 1997:225)

“*kinsaman*: “fracture, fragment, divide or separate into three parts”; e.g., division of the year into three parts or the life cycle into three parts; these two three-part divisions (of the year and the life cycle) are classified as follows:

1. *tarpu* (*muj*): “to plant (seed)”;
 2. *puquchiy* (*wiñay*): “to nurture (to grow)”;
 3. *uqhariy*: “to give forth (bear fruit).” ”
- (Urton 1997:225)

“*pachaqchu*: “having 100”; carries the sense of something done *three times* (three is the number of completion).” (Urton 1997:232; emphasis in original)

“*waranqa waranqa wata*: “millions of years”; the three ages of the world.” (Urton 1997:232)

‘5’, ‘6’, ‘7’

‘5’ and ‘6’ were borrowed later than ‘3’ and ‘10’. They were also likely borrowed together. ‘5’ may have been borrowed for structural reasons – ‘5’ is half of the decimal base ‘10’, and is thus a salient component of the decimal system. However, cultural motivations may also have played a role. One association of ‘5’ in Quechua culture is the following:

“... I would like to discuss certain data that strongly suggest that the model briefly restated above had considerable salience in pre-Hispanic and early colonial Quechua ideology and numerical ontology. In fact, I think we can argue on the basis of this material that groups of *five* had an importance in Andean culture that was comparable, for instance, to the number and groups, or cycles, of *four* in the culture and symbolism of Mesoamerican and Southwestern Puebloan societies.”

(Urton 1997:174, referring to a Quechua narrative in which ‘5’ (people, items, events, etc.) was a recurring motif).

And one association of ‘6’ in Quechua culture:

“*allin kawsa*: “the good/proper way” (=six); i.e., six is the appropriate number of children to have.” (Urton 1997:228).

However, the pattern of ‘5’ and ‘6’ being borrowed but not ‘7’ may have more to do with the cultural conception of the latter number than of the former ones. Compare conceptions of ‘5’ and ‘6’, given above, to the following:

“*qanchis* [‘7’] (negative associations): *qanchis* has many negative associations...” (Urton 1997:229).

“...In Quechua number symbolism, “**seven**” (*qanchis*) is considered to be something of a rascally character; it is the very image of excess, compulsiveness and, by extension, of loutish behavior. The numerical explanation of the nature of *qanchis* begins from the fact that “**three**” (*kinsa*) is considered to be the number of wholeness and completeness (for example, events often happen in cycles of three repetitions). The number “**six**” (*suqta*) constitutes two full units or cycles of three; however, seven is now exposed as “excessive,” for seven is one number/unit in excess of what is considered to be sufficient, whole, and (doubly) complete. It is not surprising, then, to find that the braying of a burro is often likened to the loud repetition of the word for seven: “*qanchis, qanchis, qanchis!*” The excessiveness of seven is here attuned perfectly to the insistent braying of a foolish animal, the burro.” (Urton 1997:39-40)

Thus, the negative conception of the number ‘7’ in Quechua culture may have impeded its borrowing by Aymara. This in turn may have prevented subsequent borrowing of ‘8’ and ‘9’.

To summarize the motivations for the numeral borrowing among Quechuan, Aymaran, Cavineña, and Chipaya, discussed above:

Proto-Aymaran

- ‘3’, the oldest loan, was possibly borrowed due to cultural motivations centered on the importance of the number three in Quechua culture.
- ‘10’, the next loan, was likely borrowed as part of the restructuring of the Aymaran numeral system from a quinary to a decimal system, and possibly also due to the importance of the number ten in Quechua culture.

Aymara

- ‘5’ was borrowed due either to cultural factors centered on the importance of the number five in Quechua culture, or to structural motivations (‘5’ being half of the base ‘10’), or both, and subsequent numerals began to enter.
- However, after ‘6’ was adopted, further borrowing was blocked due to the negative cultural conception of the number seven.

Jaqaru

- ‘5’, ‘6’, ‘7’, ‘8’, and ‘9’ were likely borrowed in sequence under cultural, political, or economic influence from Quechua.

Cavineña

- ‘3’ through ‘10’ were borrowed from Aymara as part of an elaboration of the Cavineña numeral system from minimal/binary to decimal, as well as under cultural, political, or economic influence from Aymara.

Chipaya

- ‘5’ through ‘10’ were borrowed under cultural, political, or economic influence from Aymara.

8. Conclusion

I have endeavored above to explain the typologically unusual discontinuous distribution of numeral loans in the Aymara language, in light of internal evidence from the inherited Aymara numerals and external evidence drawing on the numeral systems of the Quechuan, Jaqaru, Cavineña, and Chipaya languages, as well as the relative chronology of and motivations for the loans found in Aymara, Jaqaru, Cavineña, and Chipaya.

To fully summarize the relative chronologies and motivations discussed above:

- 1: Proto-Aymaran borrows ‘3’, likely from Quechuan, and likely for cultural reasons centered on the importance of the number three in Quechua culture.
- 2: Proto-Aymaran borrows ‘10’ from Quechuan as a first step towards the conversion of the Aymaran numeral system from quinary to decimal, and possibly also due to the importance of the number ten in Quechua culture.
- 3: Aymara borrows ‘5’ from Quechuan as a further move towards a decimal system, and possibly partly due to the importance of the number five in Andean culture.
- 4: Aymara borrows ‘6’ from Quechuan as a further move towards a decimal system.
- 5: The borrowing of ‘7’ from Quechuan is avoided due to negative cultural associations, and further borrowing of Quechuan numerals by Aymara is blocked.
- 6: Cavineña borrows ‘3’ through ‘10’ under cultural, political, or economic influence from Aymara, elaborating its minimal/binary number system into a decimal system.
7. Aymara replaces *pusiqallqu* with *llätunka* for ‘9’.
8. Chipaya borrows ‘5’ through ‘10’ from Aymara, likely due to Aymara cultural, political, or economic influence on Chipaya.

Relative chronology unknown: Jaqaru borrows ‘5’ through ‘9’ from Quechuan sometime after the adoption of ‘3’ and ‘10’, likely due to cultural, political, or economic influence from Quechuan.

9. Questions for Further Research

- Can the true genetic origin of ‘3’ - Quechuan or Aymaran - be determined on the basis of external evidence? And what was the real reason ‘3’ was loaned from one family to the other?
- Why did the Aymaran languages not adopt ‘4’ from Quechuan? Or ‘2’, or even ‘1’ for that matter?
- If the negative conception of ‘7’ in Quechuan culture was what impeded its borrowing into Aymara, why did Jaqaru have no problem borrowing Quechuan ‘7’ (and ‘8’ and ‘9’)?
- What factors motivated the replacement of *pusiqallqu* ‘9’ with *llätunka* in Aymara?
- Sala (1988:154) reports that several Pano-Tacanan languages of western South America have borrowed ‘3’ and ‘5’ from Quechuan. Could the chronology and motivations of these borrowings present another example of a sociolinguistic relationship like the Aymaran one described above? If not, what other factors are involved?
- Why did Chipaya borrow the Aymara numerals from ‘5’ and up, and not some other pattern? Similarly, why did Uru resist borrowing numerals from Aymara, despite a similar contact situation as with Chipaya and Aymara?
- Did Aymara and Jaqaru independently borrow ‘5’ and ‘6’ from Quechuan, or were these numerals borrowed during the period of Aymaran unity and subsequently diverged phonologically in each daughter language?
- Can the Quechuan numerals’ etymologies be traced, either internally or externally?
- Is there any connection between Aymaran **puši* ‘4’ and Quechuan **pusaq* ‘8’?
- Is there any connection between Quechuan **suq* ‘1’ and **suqta* ‘6’?
- How do the following pieces of evidence fit into the picture?
 - Alonso de Huerta (1613) records for the Chinchaisuyo dialect of Quechua a form *pusi* for ‘5’; likewise, Vásquez de Espinosa (1629) records for an unnamed variety of Quechua the form *pacalcó* for ‘8’. These are obviously connected in some way with the Aymara words for ‘4’ and ‘7’, respectively (Cerrón-Palomino 2000:201[n9]).
 - The now-extinct but formerly widespread Andean language-isolate Puquina had the numeral *pesc* ‘1’; likewise, Ch’imu, an extinct Uru-Chipaya language, had the numeral *pisi* ‘1’. These bear a strong resemblance to the Uru and Chipaya words for ‘2’ (Cerrón-Palomino 2006:105[n4]).

10. Acknowledgements

My thanks to Dr. Patience Epps for some helpful suggestions on how to analyze the Aymaran numeral system diachronically, as well as on sources for this study.

Heartfelt thanks also to Samri Tessema for her invaluable assistance in the preparation of this paper.

Notes

¹ Throughout this paper, abstract numeral concepts will be given in the form ‘N’, where N is any numeral (e.g. ‘1’, ‘5’, ‘10’). Numeral lexemes from particular languages will be given in italicized orthography, e.g. *maya*, *phisqa*, *tunka*.

² The symbols <ĉ> and <tr> represent a voiceless retroflex affricate.

³ The Quechuan system is not, however, duodecimal: cf. Cuzco Quechua *chunka hujniyuq* ‘11’, *chunka iskayniyuq* ‘12’, composed of *chunka* ‘10’ and *huj-niyuq*, *iskay-niyuq* ‘1’ and ‘2’, respectively, with a tens-unit-forming suffix (Paredes Cusi 2009:56). Modern Aymara displays a structurally identical system: *tunka* ‘10’, *tunka maya-ni* ‘11’, *tunka paya-ni* ‘12’ (Layme Pairumani 2004).

⁴ Though note the interesting identity between Proto-Quechuan **suq* ‘1’ and **suqta* ‘6’ – possibly a relic of an earlier quinary system where **suqta* was composed of **suq-***ta*, ‘1’-‘5’ (?)

⁵ It’s possible that **tawa*, being found mostly in Quechua IIC, was originally a loan from a non-Quechuan language. Its presence in Quechua I as an alternative to **ĉusku* may be a result of influence from Cuzco Quechua, the Quechua IIC variety used as the state language of the Inca Empire.

⁶ For the elision of *paya* to *pa*, cf. *naya* ‘I’, *nanaka* ‘we (exclusive)’ < *naya-naka* [I-plural]

⁷ Layme-Pairumani gives the translation “cinco aymara antiguo [old Aymara five]. *qallqu*” in the entry for *cinco* (Layme-Pairumani 2004:260).

⁸ /ty/ is a voiceless laminal affricate

⁹ Or Panjabi *unnī* (**un-vīh* ‘1-20’ [?]) ‘19’, *vīh* ‘20’

¹⁰ Unless the Uru language borrowed its higher atomic numerals from another (unknown) language in the past, separately from Chipaya.

¹¹ Diagram reproduced from Urton 1997:225

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