Some notes on stem phonology and the development of affricates in Tahltan (Northern Athabaskan)

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Abstract. A survey was conducted to investigate the development of four Proto-Athabaskan obstruent series, **ts/tš/š^{r}/k*, into present day Tahltan. Survey results from seven native speakers and quantitative analysis of a large stem list establish *tθ/ts/ts/tš* as the standard obstruent system, and further document two alternate systems that pattern with neighboring languages. These findings support the long-held view that the mergers and shifts in these series do not reflect deep phonological differences among Northern Athabaskan languages, but instead constitute areal influences. Clarification of the standard and alternate systems also informs contemporary lexicographic and language learning efforts.

Keywords: sound change, series mergers, palatal shifts, coronals, linguistic classification, linguistic documentation, Athabaskan, Tahltan

1. Introduction

A recurring theme in Athabaskan linguistics is that the task of classifying Athabaskan languages into historically meaningful subgroups is fraught with a myriad of contact phenomena. While some differences between Northern Athabaskan languages and other Athabaskan languages further south must be due to change in isolated groups, the degree of areal influence among Northern Athabaskan languages is quite significant. A case in point is the well-known series shifts and mergers in Athabaskan obstruents. Classic work has assumed that these sound changes reflect deep phonological differences among languages, and it has proposed historical subgroupings based on them (Hoijer 1963). However, more recent work has clarified a number of problems for these tree-based models, and has argued that the shifts and mergers are, at least in part, due to areal influences in a wave model of language change (Krauss 1964; Krauss 1973). The language complex of Tagish/Tahltan/ Kaska (British Columbia and Yukon, Canada) provides an important source of evidence for this argument. These languages are nearly identical in lexicon and grammar, but they appear to have three different obstruent systems, defying analyses that the shifts and mergers reflect deep differences (Krauss & Golla 1981). The present work contributes to this issue by presenting a comprehensive analysis of the changes affecting obstruents in Tahltan.

An analysis of the developments leading into Tahltan are of importance for two reasons. First, there are conflicting reports as to how the obstruents series developed into Tahltan (Story (1975), Krauss & Golla (1981), cf. Hardwick (1984), Nater (1989)), and the complete set of facts has never before been fully documented. We present the results of a survey designed to elicit obstruents in the four relevant place series, across four manner classes (section 3). In particular, we document three distinct developments of the ancient **ts/tš/š^{r}/k* series: the standard system *tθ/ts/ts/tš*, and two alternate systems, *tθ/tš/tš/tš* and *ts/ts/ts/tš*. Combined with a quantitative analysis of a list of 455 Tahltan stems (section 4), we assemble a set of features for comparing and contrasting Tahltan varieties with neighboring languages. The larger picture emerging from this comparative analysis is that Tahltan exhibits three distinct obstruents systems, two of which are identical to those found in neighboring Tagish and Kaska, which supports Krauss and Golla's argument for areal influence. Beyond this historical-comparative analysis, this article also has practical value to linguists and learners alike. A conceptual basis for understanding speaker variation can lead to better written

records of Tahltan and reduce the frustration learners may experience when confronted with apparently inconsistent phonological patterns. Thus, we seek to provide a careful description of Tahltan obstruents, and stem phonology in general, with the goal of supporting both comparative analysis and contemporary research on the language.

2. Background

The reconstructed PA consonant system in (1) recognizes eight places of articulation and two manner classes in obstruents. Stops have a three-way contrast, opposing voiceless unaspirated, aspirated, and ejective stops, and fricatives have a two-way voiced/voiceless contrast. The retroflex-palatal, reconstructed originally as the fronted velar series, *$\underset{\wedge}{k}^{w}$, in Krauss (1964), contains a retroflex component to explain the *ts: tr* opposition in certain Alaskan languages like Minto and Ingalik.

(1) Proto-Athabaskan consonants (Krauss 1964; Krauss & Golla 1981; Leer 1979; Rice 1994)

Obstruents	dental	lateral	alveolar	palatal	retro-pal	velar	uvular	glottal
vls unasp stop	d	dl	dz	dž	dž^{r}	g	G	ʔ
vls asp stop	t	tɬ	ts	tš	tš^{r}	k	q	
ejective stop	t’	tɬ’	ts’	tš’	tš’^{r}	l’	q’	
vls fricative		ɬ	s	š	š^{r}	x	χ	h
vd fricative		l	z	ž	ž^{r}	ɣ	ʀ	

Sonorants		
w		y
m	n	ŋ

No descendent of Proto-Athabaskan retains the entire set of consonants. The dental, lateral, and glottal series tend to be stable historically, but the other five place series have undergone several shifts and mergers that are often used as features for classifying the daughter languages. These sound changes usually apply to all obstruents in the series, and not in piecemeal fashion. A sampling of these shifts in Northern Athabaskan, excluding the uvulars, is shown below.

(2) Sample developments from Krauss (1973) and Krauss and Golla (1981)

*ts	*tš	*tš^{r}	*k	Language	Pattern Class
tθ	ts	tr	k	Ingalik	I
ts	tš	k	k	Eyak	IIa
ts	ts	pf	tš	Tsetsaut	IIb
tθ	ts	ts	tš	Kaska	IIc
ts	tš	tš	tš	Tahltan	IIIca
ts	ts	ts	ts^{y}	Tagish	IIIcb
ts	ts	ts	tš	Sarcee	IIIcb

Athabaskan stems are usually monosyllablic and tend to be CV(C) in shape. That is, they typically begin with a consonant and have a single vowel, and they may be closed with a consonant. The full inventory of PA consonants in (1) was available stem-initially. However, stem-finally, the three-way contrast in stops was neutralized in PA to a two-way contrast between voiceless unaspirated stops and ejectives. Also, palatal and retroflex-palatals merged stem-finally. A host of other neutralizations occurred stem-finally in the daughter languages and constitute another set of features for classifying languages. For example, stops became fricatives stem-finally in Chipewyan (Li 1946), and the plain stop/ejective contrast was lost in many Northern Athabaskan languages, including Tahltan, Kaska, and Sekani (Krauss & Golla 1981).

The development of the affricate series into Tahltan is somewhat unclear. The data supporting the **ts/tš/tš^{r}/k > ts/tš/tš/tš* analysis in Story (1975) in (2), and adopted by Krauss and Golla (1981), was collected by Kenneth Hale and Geoff O'Grady from a Tahltan elder, Pete Henyu, in 1965. Pete was 79 at the time of the recording, so the data he provided illustrates the language of an elder born 14 years before the turn of the century. Since this research, two studies have collected data that support a different analysis. Hardwick (1984) reexamines the development of affricates with data from several elders from the Telegraph Creek area and argues for a more conservative historical analysis **ts/tš/tš^{r}/k > tθ/ts/ts/tš*, retaining the distinction between **tš: k.* Nater (1989) comes to a similar conclusion, based on his extensive study of Tahltan spoken in Iskut.

The conservative analysis of Hardwick and Nater has informed linguistic documentation work conducted in the 1980's and 1990's, including the children's dictionary and the creation of an orthography (Carter & Council 1994; Leer 1985). The interdentals, which are not posited in Story's analysis, are used in the standard pronunciations of many words. The contemporary Tahltan sound inventory given below with phonetic symbols reflects this standard (see Carter (1994) and Alderete and Blenkiron (2014) for the conversions of these sounds to the Tahltan orthography).

(3) Tahltan consonants

b		d t t'			g k k'	(q) (q')	ʔ
					g^{w} k^{w}		
	dð tθ tθ'	dz ʦ ʦ'		dž tš tš'			
		dl tɬ tɬ'					
	θ	s	ɬ	š	x x^{w}	(χ)	h
	ð	z	l	ž	ɣ ɣ^{w}		
m		n n̥ n' n̥'					
w		y					

Following standard practice in Athabaskan, the aspirated/unaspirated distinction is written *t: d* and *k: g*, though *b* is actually a voiced stop (Bob 1999). Also, uvulars seem to be more characteristic of an older generation, as many speakers today have merged them with the corresponding velars and some Tahltan uvulars seem to have come from Tlingit (Hardwick 1984, Nater 1989).

This background seems to cast some doubt on Story's original analysis **ts/tš/tš^{r}/k > ts/tš/tš/tš*. Furthermore, the first author has played the original tapes of Pete Henyu to several Tahltan elders, and many have commented on the unusual nature of Mr. Henyu's speech. It is described as having an uncharacteristic rhythm, the use of unknown particles, and double subject marking not found elsewhere. If it is true that this pattern is not representative of a larger group, then this finding would weaken somewhat the claim that the diverse series mergers found in the Tagish/Tahltan/Kaska are superficial in nature. The developments **ts/tš/tš^{r}/k > tθ/ts/ts/tš* into Tahltan would seem to be just one of a number of features it has in common with Kaska and other languages further east, including Sekani and Beaver dialects, a point emphasized in Hardwick (1984). On the other hand, if we find further evidence for the Henyu system within Tahltan, this would provide even stronger evidence for the superficial nature of the series mergers and shifts. It would show that the variation exists at the subdialectal level as well. It is against this background that we investigate the variation in the obstruent systems in more detail.

3. The development of affricates

How did the Proto-Athabaskan affricate series develop into present-day Tahltan, and what is the range of variation among speakers? To answer this question, we constructed a 46-word questionnaire designed to elicit the four principal place series (alveolar, palatal, palatal-retroflex, velar) in stem-

initial stops and fricatives. The questionnaire was based on the PA reconstructions given in the appendix and shown in the data table headers below.[1] The data were collected by the first author in 1999 and 2000 with seven fluent speakers. In each interview, he attempted to gain an initial purchase of the data, checking for non-cognate forms and pronunciation detail. Once the facts were reasonably clear, a second run through the questionnaire was recorded with a tie-clip lavaliere microphone. Four of the native speakers had either been raised in Telegraph Creek or had strong associations with this community. The remaining three speakers were from Iskut. The age of the native speakers ranged from 59 to 83, so these speakers were born between 1917 and 1941. To confirm the transcriptions, each interview was checked by one of the other authors.

As expected, the predominant pattern is a merger of the two palatal series and a wholesale shift forward in the mouth. This is the standard obstruent system used by language practitioners and linguists. This pattern is illustrated below in (4) with the speech of an Iskut elder. He was born in Telegraph Creek on the reserve across from Dry Town, but immigrated to Iskut later and attended school there for ten years. This elder had historical ties with Bear Lake Sekani people and may have been influenced by speakers of Sekani. However, the same conservative pattern of retaining a three-way contrast is also found in three other speakers, two of which have rather different backgrounds, including being raised in Telegraph Creek and having had significant contact with Tlingit.

(4) Speaker profile I: the *tθ/ts/ts/tš* standard (representative of four speakers)

	*ts > tθ	*tš > ts	*tš^{r} > ts	*k > tš
vls asp	tθe: ‘stone’ -tθiʔ ‘head’ tθen’ ‘meat’ detθoɪ ‘yellow’	tsaʔ ‘beaver’ -tsiye ‘grandfather’ detsi:ts, detsi:dzi ‘red’	tsà:ʔ ‘excrement’ tsets ‘firewood’ -tsex ‘cry’	-latšɪne ‘wrist’ -ketšɪne ‘ankle’ tša: ‘rain’ -laštšo: ‘thumb’
vls eject	tθ’aʔ ‘plate, dish’ tθ’è: ‘thread’ tθ’enh ‘bone’ tθ’a:tl ‘diaper’	ts’ah ‘hat’ ts’ede ‘blanket’ ts’u: ‘spruce’ -ts’iʔe ‘guts’	nats’ih ‘wind blows’ -ts’əse ‘kidney’	tš’ohe ‘porcupine quills’ tšɪde ‘veins, gristle’
unasp	dðeł ‘mountain (over-hanging bluff)’	dzeh łen ‘pitch’ -dzeke ‘inner ear’	dzeneθ ‘day’ -dze:ʔ ‘heart’ -dza:ke ‘shin’	nedžɪt ‘he’s scared’ tšošk’aʔe ‘Canadian Jay’ dža:ni ‘here’
fric	-ðet ‘liver’ -ðà:t ‘mouth’ θa: ‘sand’	sɪni ‘I/me’	sa: ‘sun’ sek ‘saliva’	xɪn ‘song’ xoh ‘brown bear’ xɪθ ‘hill, knoll’ sʌs ‘black bear’ xʌs ‘scar’

While most of the place/manner classes shifted forward, the velar fricatives did not; see e.g., ‘song’, ‘brown bear’, etc. Our reconstructed velar fricatives are ‘front velars’ and not uvulars (see appendix), because uvulars would not be expected to shift. In this context, *sʌs* ‘black bear’ is interesting because if the stem-initial had shifted, e.g., ***xəš* > *šʌs***, it would have produced a disharmonic root, contrary to

[1] We are grateful to Michael Krauss for assistance in making the questionnaire, and our native speaker consultants, Robert Quock, Charles Quock, Peggy Quock, Margery Inkster, Patrick Carlick, Edith Carlick, and Rose Dennis, for their participation.

the regular rules of coronal harmony (Hardwick 1984; Shaw 1991). As we shall see in the next section, Tahltan does not have any stems beginning with palatal fricatives, so it must be that **š* shifted forward, e.g., 'sun', 'saliva', but the velar fricatives do not, leaving this slot empty.

There is a subtle variation on this pattern that relates to the next speaker profile below. The speech of a Telegraph Creek elder is broadly similar to profile I, but retains the ancient palatals in stem-initial voiceless aspirated stops. Thus, instead of the alveolar affricates shown above in (4), this speaker says *tša?* 'beaver', *-tšiye* 'grandfather', *tših* 'red ochre', and *tšetš* 'firewood', and varies between *-tsex* and *-tšex* for 'cry', cf. *tsà:?* 'excrement'. It seems that in this case the shift of the palatals to alveolars only occurred in unaspirated stops, ejectives, and fricatives.

This piecemeal pattern is of interest because another speaker from Telegraph Creek has the same pattern with all the palatal stops, with a few exceptions. This elder's speech is illustrated below in (5). She was 83 at the time of the interview, the oldest of our consultants, and was born in Shesley, which is a Kaska-speaking area of British Columbia. However, she always had strong associations with Tahltan people from Telegraph Creek. This elder is also had significant contact with both Tlingit and Haida.

(5) Speaker profile II: *tθ/tš/tš/tš*

	*ts > tθ	*tš > tš	*tš^{r} > tš	*k > tš
vls asp	tθe: 'stone' -tθiʔ 'head' tθen' 'meat' detθoɪ 'yellow'	tša? 'beaver' -tšiye 'grandfather'	tšà:ʔ 'excrement' tšetš 'firewood' eš-tšaɪ 'I cry'	-latšine 'wrist' -ketšine 'ankle' tša: 'rain' -laštšo: 'thumb'
vls eject	tθ'aʔ 'plate, dish' tθ'è: 'thread' tθ'enh 'bone'	tš'ede 'blanket' tš'u: 'spruce' -tš'iʔe 'guts' cf. ts'ah 'hat'	cf. -ts'ese 'kidney'	tš'ohe 'porcupine quills' tšide 'veins, gristle'
unasp	dðeł 'mountain'	-džešbʌtle 'ear' džè:tl'en 'pitch'	-dže: 'heart' cf. -dzodze 'shin'	nedžɪt 'he's scared' tšo:sk'aʔe 'Canadian Jay' dža:n 'here'
fric	-ðet 'liver' -ðà:t 'mouth, throat' θa: 'sand'	sini 'I/me'	sa: 'sun'	

We list 'hat', 'kidney', and 'shin' as exceptions here (they shifted instead of retaining the ancient palatal), but we actually find them difficult to classify. They might best be described as intermediate between *ts* and *tš*. We also note that this elder has particularly clear examples of low-marked tone, e.g. 'thread' and 'mouth', as well as a reluctance for lax *ɪ* in words like 'wrist' and 'I/me', which is found in most other speakers.

The third pattern of development is similar to profile I, except the **ts* series does not shift forward to interdentals. Thus, this speaker lacks interdentals altogether and simple opposes *ts: tš*. This elder was 73 at the time of the interview and was married to a speaker with an obstruent system similar to profile I. She was multi-lingual, with fluent or near fluent command of English, French, Tahltan, as well as Cree (her mother was a Cree native speaker) and Sekani (her father spoke Sekani). It is not known at what point she learned Tahltan, but her fluency was confirmed in the interview.

(6) Speaker profile III: *ts/ts/ts/tš*

	*ts > ts	*tš > ts	*tš^{r} > ts	*k > tš
vls asp	tse: ‘stone’ -tsiʔ ‘head’ tsen’ ‘meat’ detsoɪ ‘yellow’	tsaʔ ‘beaver’ -tsiye ‘grandfather’ tsih ‘red ochre’	tsà:ʔ ‘excrement’ tsets ‘firewood’ -tsex ‘I cry’	-latšıne ‘wrist’ -ketšıne ‘ankle’ tša: ‘rain’ -laštšo: ‘thumb’
vls eject	ts’aʔ ‘plate, dish’ ts’èh ‘thread’ ts’enh ‘bone’ ts’a:tl ‘diaper’	ts’ah ‘hat’ ts’ede ‘blanket’ ts’u: ‘spruce’ -ts’iʔe ‘guts’	nats’ih ‘wind blows’ -ts’ese ‘kidney’	
unasp	eya dzełe ‘high mountain’	dzehe ‘pitch’ -dzeke ‘inner ear’	dzeneθ ‘day’ -tseʔ ‘heart’ -dzada ‘shin’	nedžıt ‘he’s scared’ dža:n ‘here’
fric	-zet ‘liver’ -zat ‘mouth sa: ‘sand’	sıni ‘I/me’	sa: ‘sun’ sek ‘saliva’	xın ‘song’ xıs ‘hill, knoll’ sʌs ‘black bear’ xʌs ‘scar’

The table below summarizes the results of our survey with profiles I-III, and compares them with Pete Henyu’s speech (IV), who would have been 114 in year 2000, or two generations older than most of our consultants. The three patterns differ in the number of resulting place contrasts (three vs. two) and the extent of the shifts. Interestingly, it is not really possible to collapse the profiles by community, as profile I has representatives, even with this small sample, from both communities.

(7) Individual differences in shifts (I=Iskut, TC=Telegraph Creek)

profile	community	age at 2M	*ts	*tš	*tš^{r}	*k
I	I	70	tθ	ts	ts	tš
I	I	78	tθ	ts	ts	tš
I	TC	59	tθ	ts	ts	tš
I	TC	61	tθ	ts	ts	tš
I-II	TC	72	tθ	tš/ts	tš/ts	tš
II	TC	83	tθ	tš	tš	tš
III	I	73	ts	ts	ts	tš
IV	TC	(114)	ts	tš	tš	tš

Given the uniformity of the shift from velars to palatals and the merger of the two palatal series, we posit an ancestor to Tagish, Tahltan, and Kaska, ‘Proto-Kaska’, with the following characteristics. The ancestor language to Tahltan merged the two palatal series, but a three-way place contrast was preserved: *t̪s* is assumed to have a more anterior pronunciation than *ts*, and *t̠s* is posited as a slightly post-alveolar affricate. This three-way contrast is continued today as standard Tahltan I, as well as Kaska, Sekani, and Doig River Beaver, where the latter language continues **ts* as a post-dental series intermediate between dentals and alveolars (Story 1989), rather like the anterior series *t̪s* we posit for Proto-Kaska. The other two patterns found in Tahltan, i.e., profiles II and III, can be understood as either an anterior or posterior merger, as shown graphically below in (8). Thus, profile II involves a merger of Proto-Kaska *t̠s* and *tš*, as well as a shift of *ts* to *tθ*. This profile provides

further empirical support for Story's analysis of Pete Henyu, because they are identical aside from **ts>tθ* in II, which could very well be due to interaction with standard Tahltan speakers and Kaska speakers. The speaker representing Tahltan II is also the oldest, and is therefore closest in age to the generation of Telegraph Creek speakers with the *ts/tš/tš/tš* pattern. Finally, Tahltan III resembles Tagish and can be accounted for as an anterior merger of Proto-Kaska *ts* and *ts̠*.

(8) Assumed developments within Tahltan and neighboring languages

Proto-Athabaskan

ts	tš	tš^{r}	k

Proto-Kaska

ts͡	ts̠	tš

Tahltan I, cf. Kaska

tθ	ts	tš

Tahltan IV and II

ts	tš
tθ	tš

Tahltan III, cf Tagish

ts	tš

This analysis shows that both of the logically possible mergers from Proto-Kaska are in fact attested in Tahltan, and that patterns I and III relate straightforwardly to those of other languages in the area.

4. Stem phonology

Let's now situate the analysis of affricates in a larger discussion of stem phonotactics. What are the restrictions on consonants in Tahltan stems, and how do they relate to the development of affricates and other features that cross-classify Athabaskan languages?

To describe stem phonotactics, we constructed a stem list from a larger wordlist of 1,038 words created from our own fieldwork, other primary linguistic descriptions of the language ((Hardwick 1984; Nater 2006; Nater 1989), and the children's dictionary (Carter & Council 1994). We excluded grammatical morphemes and function words, and also adjectives and adverbs, which are often morphologically complex. This resulted in a list of 455 stems from nouns, verbs, and postpositions. Stems in Athabaskan languages are usually monosyllabic, so polysyllabic words had to be examined for morphological complexity, including looking for known prefixes and the stem increment *–e*. For many disyllabic words, removing these resulted in a CVC stem, which was then included in the stem list.

The tables in (9) give counts of stem size and shape. In particular, they show the frequencies of stems sorted by the number of syllables and their CV shape. These frequencies show that there are several disyllabic stems, e.g., *hodzih* 'caribou' and *keneθ* 'raft', but most stems are monosyllabic (92.7%). As for stem shape, most stems end in a consonant (81.5%).

(9) a. Stem size frequencies

1	2	3
422	29	4

b. Stem shape frequencies

CV	CVV	CVC	CVVC	CVCC
11	67	220	121	3

These facts support the monosyllabic CVC structure as the canonical stem shape. They also confirm the (near total) lack of clusters stem-finally, an important areal trait characteristic of most of the neighboring Northern Athabaskan languages.

Moving on to distribution of consonants in a stem, counts of different consonants are given below, sorted by initial and final stem position. Given the rarity of certain sounds, and transcription

inconsistency across sources, we had to collapse a few sounds into a single category. For example, there are only 3 instances of rounded velars, so these were collapsed into their corresponding unrounded velars, and only three instances of *χ*, so these were grouped with the voiceless velar fricative. The collapsing of these categories is motivated empirically, however, because rounded velars and uvulars are either lost or nearly so. For example, uvulars are only used by very old native speakers (Nater 1989). Finally, voiceless and glottalized nasals were collapsed with the alveolar nasal, and again, there were only a handful of these.

(10) Consonant frequencies

	b	m	w	dð	tθ	tθ'	ð	θ	d	t	t'	dz	ts	ts'	z	s	n
initial	12	5	0	1	11	13	16	8	51	27	23	7	12	10	2	8	7
final	0	4	2	1	6	0	1	23	16	33	0	3	6	0	5	24	56
total	12	9	2	2	17	13	17	31	67	60	23	10	18	10	7	32	63

	dl	tɬ	tɬ'	l	ɬ	dž	tš	tš'	ž	š	j	g	k	k'	x	ɣ	ʔ	h
initial	7	4	15	18	9	6	23	5	0	0	16	21	15	23	13	14	21	0
final	3	4	0	7	44	3	3	0	1	8	0	2	7	0	4	1	38	41
total	10	8	15	25	53	9	26	5	1	8	16	23	22	23	17	15	59	41

We do not attach any special significance to these frequencies, but it is clear that certain sounds have a much higher frequency than others, which is an important part of the description of the consonant system. We sort consonants arbitrarily into bins based on multiples of 20 below, to give a rough sense of the relative frequencies.

(11) Frequency classes

- High (n>40): *t d ɬ n ʔ h*
- Medium (20< n<39): *θ t' l s tš g k k'*
- Low (3<n<19): *b m tθ tθ' ð dz ts ts' dl tɬ tɬ' z dž tš' š j x ɣ*
- Very rare (n≤2): *w dð ž*

These counts, however, need to be qualified by restrictions on position. *h* has a rather high frequency, but it only occurs in stem-final position. Likewise, *š* and *ž* never occur stem-initially. These phonemes, especially *ž*, are questionable as phonemes of the language (see Hardwick (1984)), and may be predictable from the regular rule of consonant harmony (Hardwick 1984; Shaw 1991)). There are also sounds that never occur stem-finally: *b*, *j*, and ejectives as a class. The frequencies above clearly show, therefore, that the two-way distinction between plain and ejective stops in Proto-Athabaskan stem-finals has been lost in Tahltan, a fact that is also true of Kaska and Sekani (Krauss & Golla 1981). The absence of stem-final *b* is not a surprise, however, because this is probably a voiced stop, distinct from plain non-labial stops (Bob 1999). Thus, this gap could be related to the general avoidance of voicing in coda position, a position that stem-final consonants frequently find themselves in. We also note that velars as a class are rare stem-finally. Most velars are medium frequency, but they are clearly preferred stem-initially.

We can get a sense of the robustness of the affricate series by giving counts of the anticipated reflexes in the standard obstruent system, as shown below in (12). These numbers suggest that most of the affricates and fricatives are well-represented stem-initially. The three cases with very low counts include, *dð*, which is rare both stem-initially and finally, *z*, also rare in general, and the palatal fricatives, which never give an appearance stem-initially. The reconstructed forms for speaker profiles I and III above show that velar fricatives did not shift in most cases, which accounts for the gap in the anticipated palatal fricative slot.

(12) Stem-initial affricates

*ts		*tš		*k	
tθ	11	ts	12	tš	23
tθ’	13	ts’	10	tš’	5
dð	1	dz	7	dž	6
θ	8	s	8	š	0
ð	16	z	2	ž	0

Finally, we can get a sense of the interaction among the affricate series, as well as the robustness of the coronal harmony rule, by examining the co-occurrence of the consonants in the affricate series in a CVC stem. Such facts can potentially shed light on the etymology of words like *sʌs* ‘black bear’, because a prohibition on disharmonic roots could rule out the default fronting of both stem-initial and final consonants, as in the unattested: **xəš* > *šʌs*. The co-occurrence of the obstruent series in (1) is shown below, excluding glottals. Note that the palatal and palatal-retroflex series have merged as the alveolar series here. The ancient velar and uvular series also have merged, but only in fricatives where they appear as velars. The velar/uvular distinction in PA stops and affricates is retained in Tahltan as a palatal vs. velar contrast, discussed in section 3.

(13) Co-occurrence of consonants (row: stem-initial, column: stem-final)

		dent	lat	int-dent	alv	pal	vel
dental	*d t t’*	5	14	8	10	3	2
lateral	*dl tɬ tɬ’ l ɬ*	9	5	1	2	0	4
interdental	*dð tθ tθ’ ð θ*	11	11	7	0	0	1
alveolar	*dz ts ts’ z s n*	4	2	0	8	0	2
palatal	*dž tš tš’ ž š j*	4	7	0	0	9	1
velar	*g k k’ x ɣ*	11	11	11	13	1	5

For the most part, the place series freely combines with one another. However, the coronal place classes referred to by the coronal harmony rule, i.e., interdental, alveolar, and palatal, do not freely co-occur. As shown in the 3-by-3 boxed region, same-place coronal categories do combine rather frequently, but different-place categories are categorically avoided, which is clearly significant. The different-place categories are of course just those combinations that would be ruled out as disharmonic roots. The lateral and dental series are not restricted in this way, consistent with their transparent nature. These restrictions are expected synchronically if coronal harmony is active in roots, but they are also predicted historically, because Proto-Athabaskan stems have been shown to avoid certain different-place combinations, including **ts* and **tš* (Krauss 1964).

5. Discussion

This article has given a comprehensive account of the development of the affricate and velar series into present-day Tahltan, documenting three patterns of individual variation in these developments. The principal finding is that while the standard Tahltan obstruent system is much like Kaska **ts/tš/tš^{r}/k* > *tθ/ts/ts/tš*, there are two other systems, *ts/tš/tš/tš* and *tθ/tš/tš/tš*, the latter of which is similar to the Henyu pattern documented in prior research. We have also investigated a stem list to examine these patterns and other features quantitatively, and assembled a collection of features that characterize Tahltan stem phonology, shown below for two Tahltan systems and other related languages.

(14) Phonological features of Athabaskan languages in Northwestern British Columbia

	Tagish	Tsetsaut	Tahltan II	Tahltan I	Kaska	Sekani
tone	absent	absent	low	low	high	low
C2 obstruent allowed	no	no	yes	yes	yes	yes
C2 clusters	NA	NA	no	no	no	no
C2 ejectives	NA	NA	no	no	no	no
*ts > tθ	no	no	no	yes	yes	yes
*ts *tš merge	yes	yes	no	no	no	no
*tš *tš^{r} merge	yes	no	yes	yes	yes	yes
*ts *tš *k merge	yes	yes	yes	no	no	no
*ts/tš/tš^{r}/k became:	ts ts ts ts^{y}	ts ts pf tš	ts/tš/tš/tš	tθ/ts/ts/tš	tθ/ts/ts/tš	tθ/ts/ts/tš

The relationship between Tahltan I (the standard system) and Kaska in terms of the obstruent system and stem shape in general is very strong, differing only in the development of tone. Sekani is identical to Tahltan I in its features, though it may differ in some vowel developments (Krauss & Golla 1981). The non-standard Tahltan II obstruent system resembles Tagish the most, though the merged palatals shifted in Tagish and they did not in Tahltan. However, Tahltan II differs from Tagish and Tsetsaut greatly in stem shape, because it retains many stem-final obstruents. Another Tahltan variety documented in section 3, III, is even closer to Tagish in having an anterior merger, *ts/ts/ts/tš*, but it nonetheless differs greatly from Tagish in stem shape, like all Tahltan varieties. The larger picture emerging from this survey is thus that the series mergers and shifts cannot reflect deep phonological differences among neighboring daughter languages. Tahltan varieties are more like an index of the variation that exists in the entire region.

These results also provide some practical suggestions for linguistic documentation and language learning. They point to the existence of a standard obstruent system, similar to that of Kaska, and also analyze three alternate obstruent systems, II, III, IV, that can be recorded in dictionaries as alternate pronunciations of standard forms. The systems given in (8) provide a template for these alternate pronunciations, but other variable patterns may also exist. As for learning, the distinct obstruent systems given in (8) can help language learners grapple with the inter- and intra-speaker variation that exists in Tahltan communities. Learners can use these profiles as templates for understanding the speech of their teachers, and how they differ from other native speakers they communicate with.

Finally, these results raise a few questions for further research. First, why do certain series change as a group, and others in more piecemeal fashion? In one speaker, it was found that the palatals only shift in two stop classes, ejectives and plain stops, but aspirated stops resisted the shift. Likewise, all speakers seem to avoid shifting velar fricatives to palatals, which is unlike other fricatives and also unlike velar stops, which did shift. The lack of shifts in velar fricatives can be explained in part by appealing to two separate shifts, one affecting affricates and a later shift in which velars are pulled into the palatal slot just vacated (see Leer (1996)). However, an explanation for why the latter process only affected stops is required. Second, we wonder if other Northern Athabaskan languages have patterns of inter-speaker variation similar to those found in Tahltan. Are there distinct Kaska varieties with different obstruent systems, for example, and if so, how do they compare with Tahltan varieties? Investigation along the same lines as those given here might provide further support, or document additional problems, for our reconstructed ancestor language in (8), as well as clarify existing variation for language learners.

Appendix

The four tables below consolidate the information about the forms in the affricates questionnaire, essentially expanding on each of the four columns from the charts in section 3. For each word, we give the historically reconstructed Proto-Athabaskan form (based on commonly cited references, including Leer (1979), Leer (1987), and Krauss (1979/2005)), the phonetic forms illustrating the observed variation (the first phonetic form is the standard), and finally the orthographic form of the standard form; see Carter (1994) and Leer (1985) for details of the Tahltan spelling system. Conventions: V^T = vowel constriction.

(A) Proto-Athabaskan alveolar series **ts*

	Reconstructed form	Phonetic forms	Orthographic form
a. vls asp	tse: 'stone'	tθe:, tse:	ts̲ē
	-tsi^{T}ʔ 'head'	-tθiʔ, -tsiʔ	ts̲i'
	tsə^{T}n' 'meat'	tθen', tsen'	ts̲en'
	lə+tsʊɣ 'yellow'	detθoɪ, detsoɪ,	dets̲oy
b. vls eject	ts'a^T:k' 'dish'	tθ'aʔ, ts'aʔ	ts̲'a'
	ts'e^T:χ 'thread'	tθ'è:, ts'èh	ts̲'ē
	ts'ən 'bone'	tθ'enh, ts'enh	ts̲'enh
	ts'a:tl' 'diaper'	tθ'a:tl, ts'a:tl	ts̲'ātl
c. unasp	dzeł 'mountain'	dðeł, eya dzełe 'high mountain'	dz̲eł
d. fricative	sə^{T}t' 'liver'	-ðet, -zet	z̲et
	-sa^T:d 'mouth'	-ðà:t, -zat	z̲āt
	sa:xy 'sand'	θa:, sa:	s̲ā

(B) Proto-Athabaskan palatal series **tš*

a. vls asp	tša ʔ 'beaver'	tsaʔ, tšaʔ	tsa'
	-tšə^{T}yə 'grandfather'	-tsiye, tšiye	tsiye
	tšixy '(red) ochre'	tsi:ts, tsi:dzi, tsih	tsīts
b. vls eject	tš'əχd 'hat'	ts'ah	ts'ah
	tš'ədəʔ 'blanket'	ts'ede, tš'ede	ts'ede
	tš'əwə 'spruce'	ts'u:, tš'u:	ts'ū
	-tš'i:k' 'guts'	-ts'iʔe, -tš'iʔe	ts'i'e
c. unasp	dže^T:χ 'pitch'	dzehłen, džè:tl'en, dzehe	dzehłen
	-džəɣəʔ 'inner ear'	-dzeke, -džešbʌtle 'ear'	dzeke
d. fricative	ši: 'I/me'	sɪni, sini	sini

(C) Proto-Athabaskan retroflex-palatal series **tš^r*

a. vls asp	tš^{r}a^T:n' 'excrement'	tsà:ʔ, tšà:ʔ	tsā'
	tš^{r}ətš^r 'firewood'	tsets, tšetš	tsets
	∅+tš^{r}əχ 'cry'	-tsex, -tšaɪ	tsex
b. vls eject	tš^r'əy/tš^r'i: 'wind/blow'	nats'ih	nats'ih
	-tš^r'ətš^r' 'kidney'	-ts'əse, -ts'ese	ts'ese
c. unasp	dž^{r}e:n 'day'	dzeneθ	dzene̲s
	-dž^{r}e:yəʔ 'heart'	-dze:ʔ, -dže:, -tseʔ	dzē'
	-dž^{r}a:dəʔ 'shin'	-dza:ke, -dzodze, -dzada	dzāke
d. fricative	š^{r}a: 'sun'	sa:	sā
	š^{r}e^T:χ 'saliva'	sek	sek

(D) Proto-Athabaskan velars **k*

a. vls asp	la+kən ‘wrist’	-latšıne, -latšine	lachine
	ke+kən ‘ankle’	-ketšıne, -ketšine	kechine
	ka:n ‘rain’	tša:	chā
	la+kʊ^{T}ts’ ‘thumb’	-laštšo:	lashchō
b. vls eject	k’əx ‘porcupine quills’	tš’ohe	ch’ohe
	k’u^{T}:ts’ ‘veins, gristle’	tšıde, tšide	chide
c. unasp	n+lə+gu^{T}:d ‘be afraid’	nedžıt	nejit
	gi^{T}zə ‘Canadian Jay’	tšošk’aʔe,	choshk’a’e
	ga ‘here’	dža:ni, dža:n	jāni
d. fricative	xən ‘(shaman’s) song’	xın	khin
	x…ts’ ‘brown bear’	xoh	khoh
	xə^{T}ts’ ‘hill, knoll’	xıθ, xıs	khiṣ
	xɑ^{T}t’ ‘scar’	xʌs	khas
	xəš ‘black bear’	sʌs	sas

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