An unexpected gap in Gitksan consonant cluster phonotactics*

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This short paper outlines the consonant cluster phonotactics of Gitksan (Tsimshianic) by attempting a summary of the generalizations presented in Rigsby (1986). The phonotactics of word-initial bi- and tri-consonantal clusters are discussed, and a stop + sonorant sequence gap is identified. This gap is unexpected, since fricative+sonorant sequences are tolerated by the language. This gap is discussed in the contexts of both sonority and perceptual similarity.

1 Introduction

While many languages of the world are very limited in what kind of consonant clusters are tolerated by their phonologies, many other languages allow extensive clustering of consonants. Gitksan, an Interior Tsimshianic language of British Columbia, Canada, allows relatively extensive clustering of consonants. Word-initial position, which is the focus of the present study, yields many combinations of possible consonant sequences in the language. For example, in word-initial bi-consonantal clusters, stops can be sequenced before fricatives, and they can even be sequenced before stops. Fricatives exhibit a similar distribution, where they can be sequenced before both stops and fricatives. Curiously, sonorant consonants can be sequenced after fricatives (fricative + sonorant) in word-initial position, but there is a gap corresponding to stop + sonorant sequences. This gap extends beyond word-initial position: there are no stop + sonorant sequences present in the language (i.e. this type of sequence is missing in word-initial, word-medial, and word-final positions). This gap is unexpected, given that fricative + sonorant sequences are tolerated in the language.

This paper is structured as follows: Section 2 lays out the general phonotactics of consonant clusters in the language, focusing on word-initial position. This includes discussion of initial bi- and tri-consonantal clusters. This section also discusses the stop + sonorant consonant gap. Section 3 provides a discussion, where aspects of sonority and perceptual similarity are entertained as possible explanations for this gap.

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2 Consonant cluster phonotactics

This section aims to outline the phonotactic patterns found in word initial consonant clusters in Gitksan. The generalizations presented here are a summary of the observations made in Rigsby (1986) (some of these generalizations are also discussed in lesser detail in Wickstrom 1974). The generalizations presented are as follows: first the general properties and restrictions of word-initial consonants are discussed, followed by both bi-consonantal and tri-consonantal word-initial consonant clusters.

2.1. General phonotactics for word-initial position

In his observations about word-initial segments, Rigsby (1986) notes that any consonant except /l'/, /p'/, /x/, and /x^{w}/ can occur as a singleton word-initial consonant. The absence of the velar fricatives falls out squarely from a generalized restriction in the language. There is an alternation whereby /x/ and /x^{w}/ alternate with the glides /j/ and /w/ when in prevocalic position, which is illustrated in (1) below.

(1)	wa:x	'paddle'	wa:jin	'your (sg.) paddle'
	mux^{w}	'ear'	muwin	'your (sg.) ear'

In this case, the restriction is one that generally holds in prevocalic position for these segments, and is not special to word-initial contexts.

The absence of ejective /p'/ in word-initial position is more than likely due to its overall rarity in the lexicon. For instance, in the Gitksan Lexical Database compiled by the author (cf. Brown 2008), there are a total of 6 instances of [p'] out of a number of 1601 entries (including morphemes and words). This contrast with /p/, where there are 48 instances word initially (as the prevocalic allophone [b]). Thus, since /p'/ is rare to begin with, the non-existence of this particular segment in initial position is not surprising. The lack of /l'/ in this position is somewhat surprising, due to the high numbers of this segment in word medial and final positions (31 total occurrences in the database, which is comparable to the other glottalized sonorants in non-word-initial position). There seems to be no principled reason behind this gap at this point, so it will here be considered accidental (and not a systematic gap). Finally, identical consonant sequences are prohibited (i.e. no geminates), a restriction that is reinforced in roots (Brown 2008).

In terms of legal word-initial clusters, according to Rigsby, there can be either bi- or tri-consonantal clusters. Sonorants and glottalised segments occur as rightmost members:

(2)	<u>Singleton initial</u>		<u>In a cluster</u>	
	laqs	'wash (one's body)'	χ**l**ilst	'to cough'
	malk^{w}	'burn (up)'	χ**m**eɬatx^{w}	'bile'
	ne:q	'hoof'	s**n**aχ	'thornberry'

Rigsby (1986) makes the observation that sonorants are always flanked by a vowel. Thus, there are no cases of sonorant + sonorant sequences, nor of sonorant + obstruent sequences.

The properties of word-initial bi- and tri-consonantal clusters are outlined below in sections 2.2. and 2.3, respectively.

2.2 Initial bi-consonantal clusters

Rigsby (1986) notes some manner restrictions present in word-initial bi-consonantal clusters. The first, which was mentioned above, is that the cluster must begin with an obstruent, specifically a stop or a fricative. There is also a more specific restriction, whereby if a fricative such as [χ] [s] or [ɬ] is the first member of a cluster, then it must be followed by either a stop, fricative, sonorant, or glottal stop.

In addition to these manner restrictions exist place restrictions. Stops that are found in these clusters include [p] or [t]. [p] can participate in the following sequences: [pt-] [pts'-] [ph-]. If the first member of the cluster is [t], it can precede either a dorsal glottalised stop, a dorsal fricative, or laryngeal [h][1], but not plain stops. Plain dorsal stops [k], [k^w], and [q] are absent in all initial clusters, and dorsal fricatives [x] [x^w] are only followed by stops and non-dorsal fricatives

The inventory of all permissible word-initial bi-consonantal clusters in Gitksan is provided in (3) below. It should be noted here that the stop + sonorant sequence type is missing from this inventory.

[1] Rigsby (1986) analyzes the small set of aspirated stops in the language as stop+h sequences. This analysis is reflected here.

(3) Inventory of permissible word-initial bi-consonant clusters (summation of Rigsby 1986)

Sequence	Example	
Stop+Stop	pdoʔo	‘door’
	pts’ajtx^{w}	‘comb one’s hair’
	tk’iɬx^{w}	‘child’
	tk’u	‘around (pvb)’
	tq’a	‘skin, hide’
Stop+Fricative	tχalpχ	‘four (things, animals)
	tχaː	‘entirely, all’
	thoːst	‘belongings, gear’
Stop + Sonorant	***	
Fricative+Stop	sgan	‘pitch’
	sq’eːχx^{w}	‘dark’
	xbaːw̲	‘jaw’
	x^{w}dax	‘be hungry’
	χdax	‘eat with (someone)’
Fricative+Fricative	xsiːp	‘(fine) sand’
	x^{w}sit	‘fall, autumn’
	χɬaːɬ	‘red willow’
Fricative+Sonorant	smax	‘meat, flesh, black bear’
	sm’intsx^{w}	‘a winter game’
	sjan	‘be tainted, affected’
	s̲jun	‘glacier’
Fricative+ʔ	sʔin	‘bottom’
	χʔanaːx	‘eat some bread’
Fricative+h	χhun	‘eat some salmon’

2.3 Initial tri-consonantal clusters

As with the initial bi-consonantal clusters, there are manner restrictions with initial tri-consonantal clusters. Rigsby (1986) notes that tri-consonantal clusters almost always begin with fricatives, specifically the dorsal fricatives /x/ or /χ/. In addition, the second member is typically one of the coronal fricatives /s/ and /ɬ/. These clusters can have a stop, fricative, sonorant, or glottal stop as the right-most member. The inventory of permissible word-initial tri-consonantal clusters in Gitksan is given in (4), where it can again be noted that stop+sonorant sequences are completely absent, just as in bi-consonantal clusters.

(4) Inventory of permissible word-initial tri-consonantal clusters (summation of Rigsby 1986)

Sequence	Example
Fricative+Fricative+Stop	xsGOːq 'be first'

Since the stop + sonorant gap is prevalent in these initial clusters, this aspect of the phonology will be further explored below.

2.4 Stop + sonorant sequences

A generalization that can be drawn about both the bi- and tri-consonantal clusters is that stop + sonorant sequences are not allowed as a permissible sequence. In fact, stop + sonorant sequences are lacking across the ENTIRE LEXICON. There is no independent set of factors that will conspire to achieve this banned configuration. (The most promising area in this regard is affixation. For instance, stop-final stems could be suffixed with sonorant-initial suffixes. However, in these cases, epenthesis repairs these clusters).

There are to my knowledge two exceptions to the stop + sonorant ban, both of which receive a straightforward analysis. One exception is [liblɛːt] 'priest' with the stop+sonorant sequence [bl] word-internally. This form is a loanword (ultimately from French), and is now archaic; none of my consultants recognized this form. The other exception is [gloq], which can be loosely translated as 'shame'. Bruce Rigsby (personal communication) suggests that [gloq] may be derived from the form [tɬ'aq'], and perhaps ultimately from Coast Tsimshian [dloq']. Rigsby notes that [tɬ'aq'] has a nominal or deverbative sense, and which signifies the inner lower lip, perhaps also the inner membrane of the lips and the eyelid and bottom cover (the pointing of the lower lip is a gesture of shame). Thus, reanalysis of the [tɬ'] phoneme (which is rare in the language) or a foreign [dl] sequence by more recent generations may have resulted in the present existence of the stop + sonorant sequence [gl].

Beside these genuine exceptions, there are many apparent exceptions to the stop+sonorant gap, which are presented in (5) below.

(5) [gʷla] 'blanket'
[gʷneːqxʷ] 'to be cold'
[gʷn'a] 'to ask for, beg'
[gʷn'us] 'newborn baby'

These are only apparent exceptions, and can be shown to have an underlying vowel intervening between the stop and sonorant. Evidence for this comes from the behavior of these words under pluralization. One (relatively marginal) pluralization strategy in the language is an ablaut process whereby a short vowel becomes a long vowel. As it happens, almost all of the forms in (5) are pluralized using this strategy:

(6)	singular	plural
	g^{w}la	g^{w}i:la
	g^{w}ne:qx^{w}	g^{w}i:ne:qx^{w}
	g^{w}n'a	g^{w}i:n'a

Since the plural forms have a long vowel, it is reasonable to posit a short vowel in the singular forms. The examples in (6) indicate that the underlying representations of these words have a short [i] between the stop and sonorant, as in (7):

(7)		
	/g^{w}ila/	'blanket'
	/g^{w}ine:qx^{w}/	'to be cold'
	/g^{w}in'a/	'to ask for, beg'
	/g^{w}in'us/	'newborn baby'

Furthermore, when consultants are asked to pronounce these words with a slower or monitored tempo, the vowel re-appears. Thus, the forms in (5) are surface forms, and the stop + sonorant sequences are the result of a fast-speech vowel deletion. This is reminiscent of schwa deletion in English (Zwicky 1972, Hooper 1978, Davidson 2006), where the fast-speech deletion of a schwa results in surface consonant clusters that defy the general phonotactics of the language (for instance, derived initial stop-stop clusters like *pt-* from words like *potato*).

Given this, these forms are not true exceptions to the generalization that stop + sonorant sequences are absent from the language.

3 Discussion

The stop+sonorant gap in consonant clusters is a peculiar one, especially since (to my knowledge) this type of gap is not reported for other languages. One potential explanation could be based in something like the Sonority Sequencing Principle (cf. Clements 1990), which states that syllable peaks will be highest in sonority and syllable margins will be lowest, with the closer a consonant is to a peak, the higher the sonority (with sonority determined by a sonority hierarchy). Clements (1990) notes that large sonority differences are preferred in onsets, while small sonority differences are preferred in codas. It may be the case that in Gitksan, having a stop-sonorant sequence may be dispreferred to having a higher sonority rise, such as a stop-vowel sequence. Given this sonority approach to word-initial clusters, the problem surrounding Gitksan immediately presents itself: Why would stop + sonorant be ruled out, and frictative + sonorant, with a smaller difference in sonority, be acceptable? Or, for that matter, why would a sonority plateau (such as a fricative + fricative sequence), or even a sonority fall (such as a fricative + stop sequence) be tolerated more than a stop + sonorant sequence? Simple appeals to sonority are not the answer here.

Another, more promising possibility is that the gap is due to some diachronic pressure associated with perceptual factors. Following Fleishhacker (2005), I entertain the idea that *similarity* is what is responsible for the gap. Fleishhacker claims that stop + sonorant clusters are oftentimes subject to skipping and intrusion in reduplication and loanword adaptation. The reason for this is due to similarity with a base form and pressures from other phonotactic constraints. For example, Fleishhacker uses the example of *pa* sounding more like *pra* than *pira* in experimental contexts, and how in loanword adaptation, we tend to find *pa* substituted for *pra*, and not *pira*. This is supported by evidence from alliteration, loanword adaptation, reduplication[2], puns, etc. If this analysis is correct for the stop + sonorant gap in Gitksan, where stop + sonorant sequences are more highly confusable with stop + vowel sequences, then this extends Fleishhacker's observations into the lexicon. In other words, this perceptual bias can be a morpheme structure constraint, since there is nothing in the theory to rule this out. This is in itself problematic, as the analysis depends on perceptual similarity between two forms, or two correspondents. The Gitksan restriction is static, and not isolated to reduplication or loanword adaptation. So the question is, Are different *candidates* being compared? Are the possible (hypothetical) outputs *ba* and *bla* too similar to each other, with the distinction between b-bl being absolutely neutralized? The immediate diachronic question that follows is: Is this traceable as a case of historical merger? Only experimentation and detailed historical reconstruction will tell here. With lack of overt evidence in the lexicon, tapping into speakers' judgments/intuitions and re-tracing the history of the language will be the only ways to tell.

5 Conclusion

This paper has explored the initial consonant clusters of Gitksan, where the discussion in Rigsby (1986) concerning the inventory of possible bi-consonantal and tri-consonantal clusters was summarized. It was shown that there is an unexpected gap in these word-initial clusters (and in consonant sequences generally in the language): stop + sonorant sequences are completely absent. It was shown that this gap presents a problem for sonority-based accounts of syllable structure and consonant clusters, and instead, it was proposed that a perceptual account may be more desirable.

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[2] Incidentally, Fleishhacker cites Coast Tsimshian reduplication as evidence for this perceptual account.

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