

a) Consonant and Vowel Charts

The Squamish data seemed best to show in two different versions of a consonant chart. This first is without diacritics:

	Bilabial	Labio-dental	Dental	Alveolar	Post-alveolar	Retroflex	Palatal	Velar	Uvular	Pharyn-geal	Glottal
Plosive	p			t				k	q		ʔ
Nasal	m			n							
Fricative				s				x	χ		
Affricate			ts	tʃ							
Lateral Affricate			tʃ								
Approximant								w			
Lateral Approximant				l					ɭ		

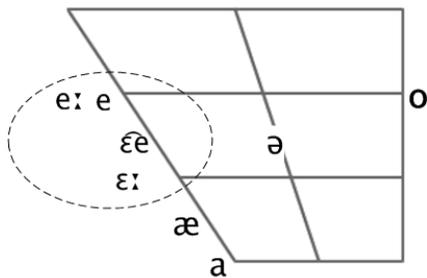
This next version of the consonant chart contains diacritical marks and shows the full range of the transcriptions used in the sample data. This chart shows at a glance the preponderance of speech sounds at the uvula and to a lesser extent, the velum, all of which include variants (glottalized, labialized, and in some cases, both). Some of the diacritical-marked consonants may well be different phonemes or simply allophones of one or more other phonemes, but as I was able to find only one minimal pair [(1) [tseʔ] “there is” and (7) [tseʔ] “feel cold”], I didn’t pursue this further (besides, I don’t think it helps answer the questions posed.)

	Bilabial	Labio-dental	Dental	Alveolar	Post-alveolar	Retroflex	Palatal	Velar	Uvular	Pharyn-geal	Glottal
Plosive	p			t				k	q		ʔ
<i>Plosive'</i>	p'			t'					q'		
<i>Plosive^w</i>								k ^w	q ^w		
<i>Plosive^w'</i>								k ^w '	q ^w '		
<i>Plosive_l</i>				ɬ							
Nasal	m			n							
<i>Nasal_l</i>	m̥										
<i>Nasal_l</i>				ɳ							
Fricative				s				x	χ		
<i>Fricative^w</i>								x ^w	χ ^w		
Affricate			ts	tʃ							
Lateral Affricate			tʃ								
Approximant								w			
Lateral Approximant				l					ɭ		
<i>Lateral Approximant_l</i>				ɭ							

=No actual data showing unmarked [p].

w = voiced *labial-velar* approximant

Vowels



(b) Discussion of the Allophones [e:], e, ε:, ε̃e] and Identification of the Base Phoneme /e:/

This table shows the distribution of all allophones and environments. It's fairly immediately obvious that vowel [e] occurs only before the glottal stop [ʔ], and that something is going on with [ε:] and [ε̃e] with respect to uvular sounds. In fact, the consonant pattern that follows [ε:] seems to “mirror” the consonant pattern that precedes [ε̃e]. For [e:], on the other hand, no predictable pattern emerges; [e:] appears in the context of bilabial, alveolar, dental, velar, and glottal sounds (stops, nasals, affricates, lateral approximants)--there seems to be no discernable pattern--other than that [e:] never appears before or after a uvular.

Environments

[e:]	[e]	[ε:]	[ε̃e]
/ ts _____ x ^w 6. [tse:x ^w]	/ ts _____ ? 1. [tseʔ]	/ t' _____ q ^w 3. [t'ε:q ^w]	/ q' _____ t 2. [q'ε̃eʔ]
/ k ^w _____ ɲ 8. [k ^w ε:ɲ]	/ s _____ ? 7. [tseʔ]	/ χ ^w _____ q ^w 4. [χ ^w ε:q ^w]	/ χ _____ p' 5. [χε̃ep']
/ l _____ x ^w 13. [le:x ^w]	/ n _____ ? 23. [neʔtʃ]	/ w _____ t 9. [we:tq ^w t]	/ t _____ t 12. [x ^w aʔε̃eʔɲ]
/ tʃ _____ tʃ 17. [tʃe:tʃ]	/ ts _____ ? 24. [k ^w tseʔts]	/ q' _____ t 11. [ɲəq'ε:ʔos]	/ χ _____ ? 18. [q'ε:χε̃eʔ]
/ m _____ x ^w 19. [tmε:x ^w]		/ tʃ _____ q 14. [tʃε:q]	/ q' _____ ? 21. [sq'ε̃eʔ]
/ ʃ _____ m 20. [qʃe:m]		/ χ _____ q 16. [χε:q]	/ χ ^w _____ ? 22. [χ ^w ε̃eʔ]
/ t _____]word 10. [te:]		/ q' _____ χ 18. [q'ε:χε̃eʔ]	/ q _____ n 27. [nsqε̃enɲ]
/ ? _____]word 15. [ʔe:]		/ l _____ t 25. [sle:t]	/ q _____ w 28. [stəqtaqε̃ew]
		/ χ ^w _____ t 26. [χ ^w ε:tʃ]	
		/ m _____ χ 29. [me:χætʃ]	

This proves to be the case. The environments shown above can be summarized as follows:

- [e] appears *before* the glottal stop [ʔ] only
- [ε:] appears *before* uvular stops, fricatives, and the lateral only
- [ε̃e] appears *after* uvular stops, fricatives, and the lateral
- [e:] appears elsewhere--stops, nasals, affricates, word-final, approximant

Or, more succinctly:

- [e] / _____ [ʔ]
- [ε̃e] / [uvulars] _____

[ɛ:] / _____ [uvulars]

[e:] /elsewhere

Underlying (Base) Form

Given that the long e [e:] has the most wide-ranging distribution (disparate contexts, no predictable pattern), it makes sense to choose it ([e:]) as the base phoneme from which the other allophones emerge, given the proper circumstances.

Using Features to Describe the Environments for Each Allophone

The uvular sounds [q, χ, ʔ] can be described as a set using just two features:

[+ consonantal]

[+ back]

Here's a table based on Hayes' book listing just the allophones in terms of vowel features.

	[e:]	[e]	[ɛ̄ɛ]	[ɛ]	[ɛ:]
high	-	-	-	-	-
low	-	-	-	-	-
tense	+	-	α ??	+	-
front	+	-	+	+	+
back	-	-	-	-	-
round	-	-	-	-	-
long	+	-	-	-	-

The [ɛ] column is darkened because I'm not considering that as part of the vowel inventory, but it's just for comparison purposes. I'm not at all sure how to handle the diphthong [ɛ̄ɛ] in terms of adding and subtracting features from the base /e:/, or even if I should be trying. It seems clear that the uvular sounds influence vowel height and tenseness, but not completely clear how to discuss in terms of "features that might be applied" to create the diphthong. The pattern seems to be that the height of the vowel (allophone /e:/) is lowered when the allophone follows a uvular, becoming the diphthong [ɛ̄ɛ]. When a uvular follows the allophone, it is lowered to a further point (relative to the other allophones in this system), is de-tensed, and emerges as [e:ɛ:] (feature [+ long] is retained).

So to recast my environmental summary statements about the allophones and environments in terms of features:

[+ long, -tense] / [+ consonantal, + back] _____

[-long, α tense] / _____ [+ consonantal, + back]

[-long, + tense] / _____ [+ constricted glottis]

[+ long, + tense] /elsewhere

