

Vowel Retraction before Glottal Stop in Klallam

Timothy Montler

1. Introduction.¹ Klallam has a sound system generally typical of the Central Salishan languages. It has four contrasting vowels, shown in (1), and a large consonant inventory, shown in (2).

(1) i u
 ə
 a

| | | | | | | | | | |
|-----|----|----|----|----|------------------|----------------|----|-----------------|---|
| (2) | p | t | c | č | (k) ² | k ^w | q | q ^w | ? |
| | p̣ | ṭ | c̣ | č̣ | λ̣ | k ^w | q̣ | q̣ ^w | |
| | | s | | š | ł | x ^w | x̣ | x̣ ^w | h |
| | m | n | | y | (l) | w | ɲ | | |
| | ṃ | ṇ | | ỵ | | ẉ | ɲ̣ | | |

Each of the vowels in (1) occurs phonetically with some variation both stressed and unstressed with unstressed [i] and [u] deriving from the homorganic glides. Underlying [i] and [u] appear only when stressed; unstressed they reduce to [ə]. Pitch is not distinctive. Neither is length distinctive though stressed [ə] is significantly shorter on average than stressed [i], [u], or [a]. Since [ə] and [a] show considerable acoustic overlap, as can be seen in the plot of F₁ and F₂

¹ Klallam is a Central Salishan language spoken on the north shore of the Olympic Peninsula in western Washington and on the southern tip of Vancouver Island. It is very closely related to the Northern Straits language spoken on southern Vancouver Island, the San Juan Islands, and areas near Bellingham, Washington. Saanich is a dialect of Northern Straits. All Klallam and Saanich data in this paper are from field work supported by grants from the Jacobs Funds of the Whatcom Museum, NSF, NEH, and the University of North Texas.

² /k/ and /l/ occur only in a few loan words.

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values shown in Appendix A³, the length difference is an additional cue to the contrast. Unstressed underlying [i], [u], and [a] generally reduce to schwa which is higher or lower, rounded or unrounded depending on the immediate consonant environment. Unstressed underlying [ə] deletes. With some dialect variation, an excrescent schwa breaks up certain clusters involving sonorant consonants, but long clusters of voiceless obstruents are not unusual.

2. Klallam retraction. Thus far, this description, with fairly minor and well understood variation, fits any Central Salishan language. Significantly, though the Wakashan languages to the west and the Interior Salishan languages to the east all have series of pharyngeal consonants, none of the Central Salishan languages do. In fact the presence of pharyngeals is a key diagnostic feature for distinction between the Interior and Central Salishan groups (see, for example, van Eijk 1985:iii).

An unusual feature of Klallam phonology, not recorded for any other Central Salishan language, is a process whereby the quality of a vowel is altered by the presence of a following glottal stop. This vowel lowering process was first reported for Klallam by Thompson, et al. 1974. In this process non-low vowels are lowered when followed by [ʔ]: i → ε, u → o, ə → a.

The alternation can be seen especially in the ‘imperfective/actual’ aspect, which is usually indicated by a glottal stop infix after a stressed /i/, /u/, or /a/, and in the ‘diminutive’, which involves reduplication and glottal stop infixation.

| | |
|-----------------------|-----------------------|
| (3) ʔíʔən ‘eat’ | ʔéʔɪn ‘eating’ |
| (4) ʔípt ‘brush it’ | ʔéʔpt ‘brushing it’ |
| (5) p̌íxʷŋ ‘overflow’ | p̌éʔxʷŋ ‘overflowing’ |
| (6) ʔítt ‘sleep’ | ʔéʔtt ‘sleeping’ |
| (7) šúpt ‘whistle’ | šóʔpt ‘whistling’ |

³ All measured vowel samples were taken from field recordings of two closely related male speakers. Beginning with a sample of 100 utterances selected for appropriate phonetic environment, a total of 92 measured vowels were used. Some recordings were too faint or noisy to measure. The chart in Appendix A shows values for 11 words with stressed [i], 9 for [u], 28 for [ə], 12 for [o], and 32 for [a]. Measurements were made using Praat version 4.0.46 (Boersma and Weenink 2003).

- | | |
|---------------------------|--|
| (8) ʔúpt ‘slurp it’ | ʔóʔpt ‘slurping it’ |
| (9) k̠úx̠n ‘dancing pole’ | k̠aʔ k̠óʔx̠n ‘small dancing pole’ ⁴ |
| (10) k̠íct ‘butcher it’ | k̠éʔct ‘butchering it’ |

A root /a/ is not affected by the following glottal stop:

- | | |
|-----------------------|--------------------------|
| (11) ʔpátəŋ ‘is felt’ | ʔaʔpátəŋ ‘is being felt’ |
| (12) smácn ‘skunk’ | smaʔmáʔcn ‘small skunk’ |

This retraction is clearly synchronic; it is exceptionless and applies to recent loans as well as to native words:

- | | |
|--------------------------------------|---------------------------|
| (13) písmən ‘fish with rod and reel’ | péʔsmən ‘fishing’ |
| (14) ʔípən ‘apron’ | ʔeʔéʔpən ‘small apron’ |
| (15) číkən ‘chicken’ | čaʔčéʔkən ‘small chicken’ |
| (16) músməs ‘cow’ | maʔmóʔsməs ‘small cow’ |

A plot of average F₁ and F₂ for Klallam [i], [ɛ], [u], [o], [ə], and [a] is presented in Appendix B. Vowels for these measurements were selected in environments that would minimize effects of following consonants. Thus these values show, with the exception of [ɛ] and [o], the vowels followed by anterior obstruents and mostly /p/ and /p̚/. The F₁ and F₂ values for [ɛ] and [o] plotted in Appendix A and Appendix B are all cases of high vowels lowered by a following glottal stop.

Vowel lowering does occur in other Salishan languages. The Interior Salishan languages have a striking and regular lowering of vowels in the environment of and especially before uvulars and pharyngeals. This has been described for all of the Interior languages: Moses-Columbia (Kinkade 1967), Spokane (Carlson 1972), Shuswap (Kuipers 1974), Colville-Okanagan (Mattina 1979), Lillooet (van Eijk 1985), Coeur d’Alene (Doak 1992), and Thompson (Thompson and Thompson 1992).

Although the retraction effect in Klallam is similar to that found in the Interior languages, the cause appears to be quite different. Unlike

⁴ The first unstressed [a] in these diminutive forms is presumably a schwa that has been lowered by the following glottal stop. In Klallam there are no cases of schwa before glottal stop. C₁aʔ- reduplication with -ʔ- infix after the stressed vowel is the regular pattern for diminutives in Klallam.

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the vowel retraction found in the Interior Salishan languages, uvulars do not effect Klallam retraction. In (17) and (18) the uvular following the stressed /u/ or /i/ has no discernable effect on it, but in the ‘actual’ aspect the glottal stop infix causes the vowel to lower:

(17) ʔúx^w ‘go to’ ʔóʔx^w ‘going to’

(18) síxt ‘move it’ séʔxt ‘moving it’

Furthermore, the glottal stop does not effect vowel lowering in the Interior Salishan languages. Bessell (1992) shows specifically and convincingly that glottals in the Interior Salishan languages do not have a retracting effect on vowels.

In fact, it is well known that glottals are not supposed to affect vowels in this way since laryngeal articulation is physically largely independent of tongue articulations. For example, in speculations on the quality of the Indo-European ‘laryngeals’ often *h_l* is assumed to be ʔ (e.g. Beekes 1995) precisely because it is this ‘laryngeal’ that affects only the quantity, not the quality, of the preceding vowel. In most modern models of feature geometry (e.g. Sagey 1986) the Laryngeal node is separate from all of the other articulator nodes precisely to capture the universal generalization that oral and laryngeal articulations are independent. Yet in Klallam it does indeed seem to be laryngeal articulation that affects the quality of preceding vowels.⁵

Interactions of tongue and laryngeal articulations are not unheard of, however. Halle (1995) has introduced a Guttural node in feature geometry covering tongue root and laryngeal articulations citing a number of studies that indicate an association of laryngeal features such as creak, breathiness, and voicing with tongue root articulation.

The spectrograms⁶ of native Klallam speech in Appendix C show the non-actual/actual pair given in (3). The segment following the stressed vowel (the area indicated between the arrows) is actually not a complete stop. The entire stressed vowel shows the pulsations typical of

⁵ This lowering in Klallam occurs only before glottal stop. It cannot be determined whether [h] effects lowering since there are no cases of stressed vowels before [h] in Klallam.

⁶ The spectrograms in Appendixes C and D were created using the Praat program version 4.0.46 (Boersma and Weenink 2003). Sound files used for these spectrograms can be found in Montler 2003.

creaky voice, and following the vowel there is no complete cessation of the creaky voicing. Rather than an abrupt cessation of voicing as expected of a stop, there is a more or less gradual transition from creaky vowel to creaky glide where the pulses become farther apart. The transition in the spectrogram looks more like a laryngealized sonorant than a stop.

The situation in Klallam may be similar to that in Jalapa Mazatec found by Ladefoged, et al. (1988). They have discovered a tendency in that language for creaky or laryngealized vowels to have a slightly higher first formant. This higher F1 is caused, presumably, by the raising of the glottis during creaky articulation. A higher F1 produces the impression of a lower vowel.

Ian Maddieson (p. c.) suggests that when environmentally triggered vowel lowering is observed, one should look for pharyngeal involvement. The Klallam posttonic glottal stop is not perceptually comparable to the Interior Salishan pharyngeals, nor does the glottal stop in spectrograms such as in Appendix C look like the spectrograms of pharyngeals in Bessel 1992. It may be that what seems to be a glottal stop is actually epiglottal. In that case one would expect an effect on the preceding vowel by tongue root retraction. Confirming such a conjecture would require the kind of laryngoscopic study presented by Esling, et al. 2002.

In Klallam the creakiness in vowels is also often caused by a following laryngealized glide. For some speakers, especially those from the western end of Klallam territory, laryngealized /y/ and /w/ but no other glottalized consonants, cause retraction of a preceding stressed vowel. But this does not happen as consistently as retraction before glottal stop. (19) is one example.

(19) mohóy ~ muhúy ‘basket’

3. Klallam compared to Saanich. In the closely related Saanich dialect of Northern Straits, spoken on Vancouver Island, the ‘actual/imperfective’ is also regularly marked by a glottal stop infix after the stressed vowel. Example (19) is cognate with the Klallam [ʔéʔɬn] in (3).

(20) Saanich ʔíʔɬən ‘eating’

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In Saanich, in contrast to Klallam, a glottal stop after a stressed vowel gives the impression of involving a complete cessation of voicing much as a /p/ or any other voiceless stop. The spectrograms in Appendix D, however, show that, although the Saanich stressed vowel is not laryngealized before the glottal stop, the post-tonic glottal stop is also a series of glottal pulses. These pulses in Saanich, as shown in this spectrogram between the arrows, are typically less energetic than the corresponding pulses in Klallam. In Saanich, as in the other Central Salishan languages, vowels never lower before glottal stop. The difference between Klallam and Saanich in this feature is similar to the difference between the Interior languages, which have retraction before uvulars, and Klallam, which does not. The phonetic environment is there for preglottal retraction in both Klallam and Saanich, but the process is inhibited in Saanich.

4. A possible areal feature. Although Klallam seems to be alone among the Central and Interior Salishan languages in having glottal induced vowel lowering, there is at least one Salishan language of the Tsamosan branch that has vowel lowering before glottal stop: Upper Chehalis. Kinkade (1963:193) reports that the phoneme /o/ ([o] ~ [u]) in Upper Chehalis is lowered to [ɔ] before [ʔ] or [h]. In Kinkade (1992:12) entry number 109 is cognate with and phonemically identical to the Klallam and Saanich words for ‘eat’ as shown in (3). All of the FB (Franz Boas) forms in that entry are consistent in showing [e] before [ʔ] and [i] elsewhere.

Upper Chehalis, which historically borders the Klallam speaking area to the southeast, shares with Klallam a higher propensity for consonant clustering than their Salishan neighbors (see Kinkade (1963:186) on clusters in Upper Chehalis). For example, the word for ‘cat’, originally from Chinook Jargon *pišpiš*, appears in Klallam and Upper Chehalis as *pišpš* with a three-obstruent cluster, while in Northern Straits and neighboring Lushootseed (Bates, et al. 1994) it appears with two vowels as in the Chinook Jargon original. These two locally unique phonological similarities together with evidence for lexical diffusion from Upper Chehalis into Klallam (Montler 1997) suggests a strong areal tie between these two distantly related languages of the Olympic Peninsula.

5. Conclusion. In summary, Klallam has regular, synchronic lowering of stressed vowels before glottal stop. The Interior Salishan languages have characteristic, regular process of vowel lowering, but in those languages the lowering is triggered by proximate pharyngeal consonants, not by glottal stop. There is no evidence of pharyngeal segments in Klallam comparable to those found in the Interior Salishan languages.

The stressed vowel before the glottal stop in Klallam is laryngealized and the laryngeal pulses slow but do not stop throughout the articulation of the glottal stop. It seems that it is this laryngealization that produces the impression of a lowered vowel.

Saanich is very closely related to Klallam, but it shows no vowel lowering. The distantly related Upper Chehalis, however, does. Klallam and Upper Chehalis, contiguous languages of the Olympic Peninsula, show evidence of areal diffusion of this vowel retraction as well as other lexical and phonological features.

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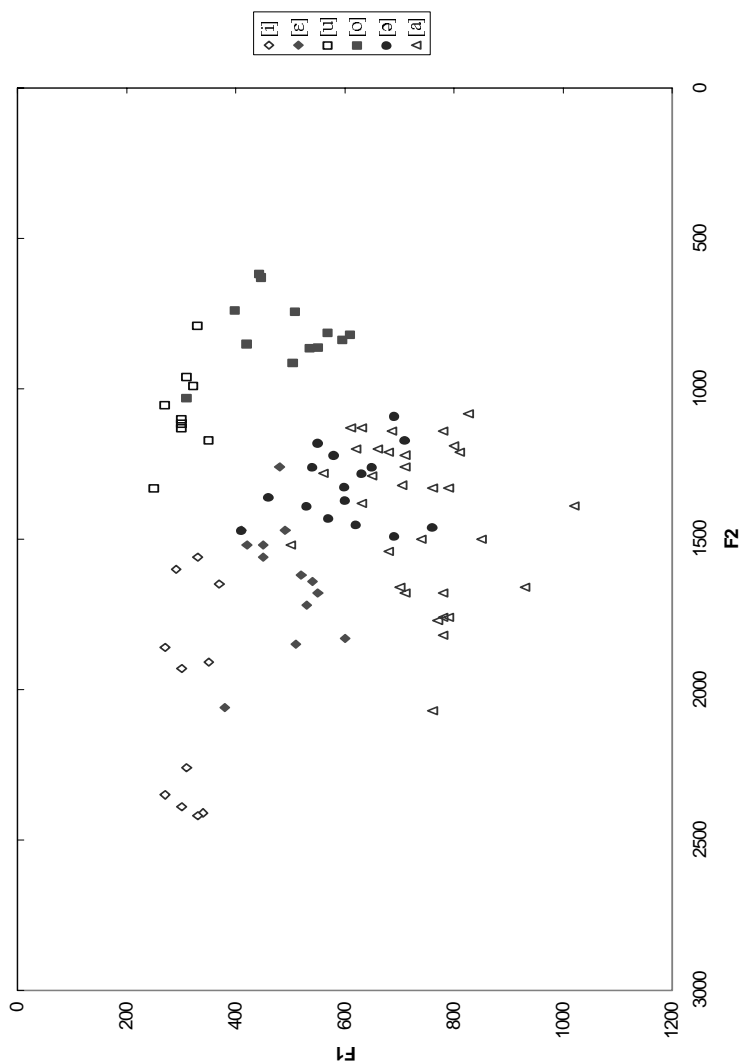
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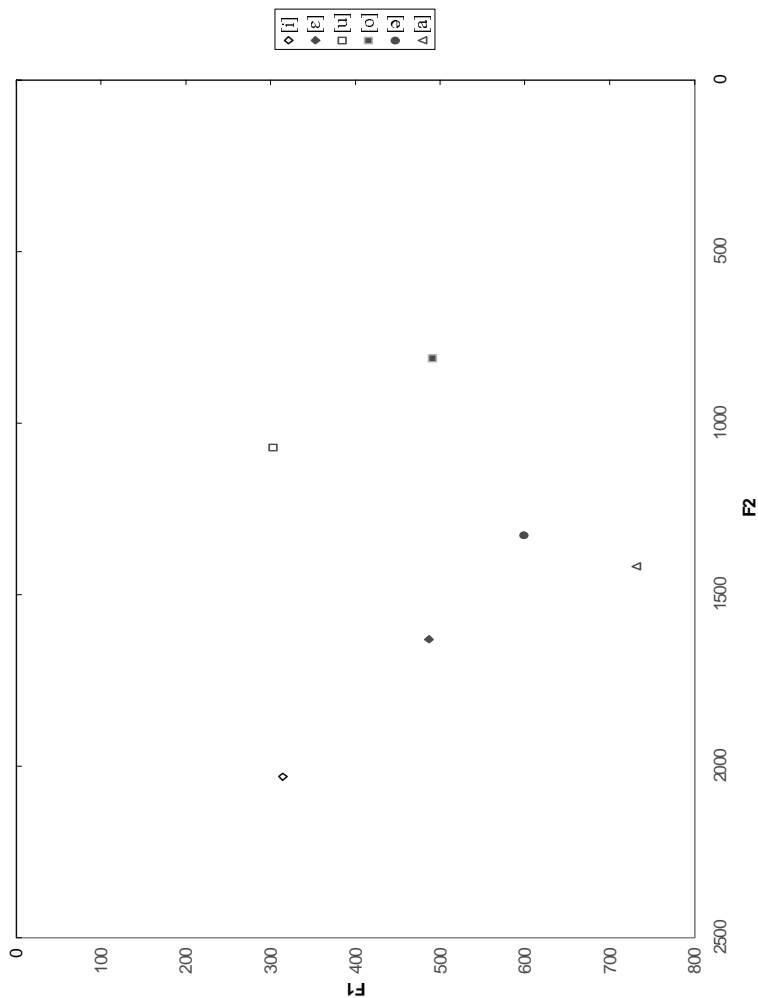
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Appendix A Plot of F_1 and F_2 for Klallam Vowels



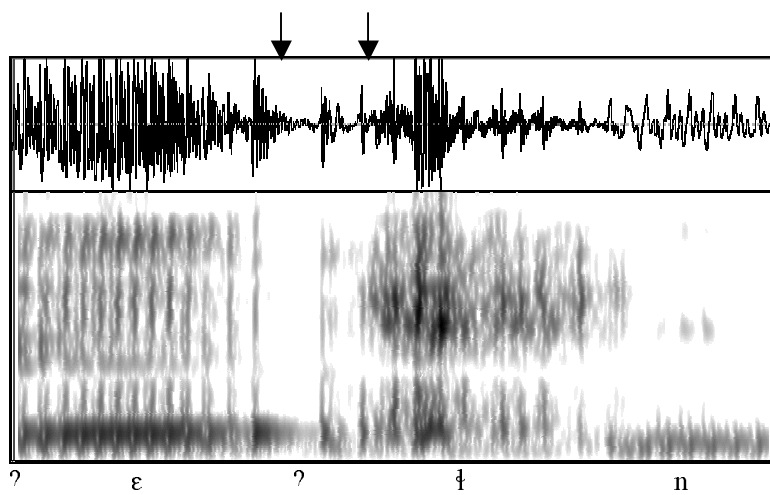
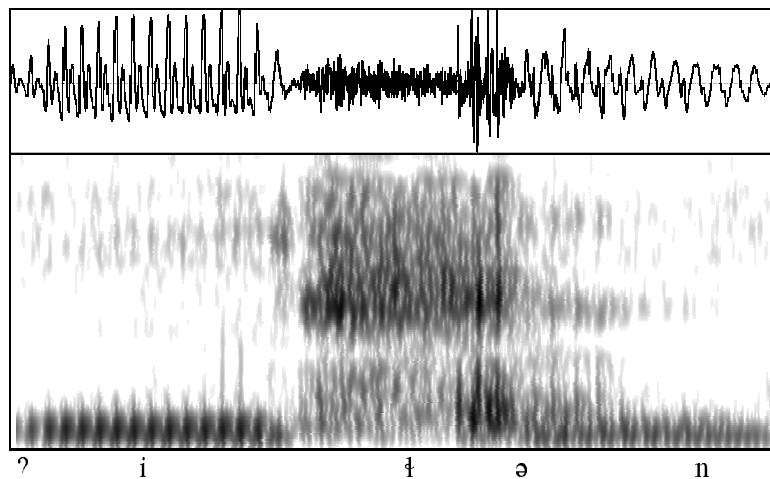
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Appendix B
Average F₁ and F₂ Values for Klallam Vowels



Appendix C

Klallam [ʔíʔn] ‘eat’ and [ʔéʔn] ‘eating’



Appendix D

Saanich [ʔɪlən] ‘eat’ and [ʔiʔɪn] ‘eating’

