ON THE PHONETICS OF SCHWA IN SLIAMMON (M. COMOX SALISH): IMPLICATIONS FOR THE REPRESENTATIONS OF SALISH VOWELS

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1. INTRODUCTION[1]

This paper presents the results of an acoustic study of schwa ([ə]) in Mainland Comox (Homalco/Klahoose/ Sliammon). We investigated [ə] as compared to the other, 'full' vowels ('V's) in the language, in stressed and unstressed position. Vs in unstressed position are typically called 'reduced', given the crosslinguistically common finding that Vs are shorter, quieter, and more central in quality in unstressed than in stressed position [2, 3]. Previous work has shown that reduced Vs are often [ə], or [ə]-like, in quality [2]. Our aim is to determine the distinction, if any, between [ə] and the reduced variants of the full Vs in Sliammon. In this language, [ə] behaves very differently from the full Vs: e.g., it lacks prosodic 'weight', whereas the full Vs are weight-bearing [1], a pan-Salish distinction [4, 5]. We thus set out to discover if the weight distinction is altered under V reduction.

2. LANGUAGE

M.Comox (Homalco/Klahoose/Sliammon) is the northernmost of the Central (Coast) Salishan languages and is currently spoken in an area ranging from Campbell River on Vancouver Island to Cortes Island, and southeastward to Sliammon on the Malapina Penninsula. The language is critically endangered.

The Sliammon V inventory, typically Salish, is shown in (1) [1, 5, 6].

(1) i a u ə

The distribution of [ə] is predictable and therefore [ə] is argued to be epenthetic [1]. It is inserted to satisfy morphophonological requirements, e.g., that a prosodic foot must be properly headed, that consonants are syllabified, and that roots meet prosodic minimality requirements [1]. The full Vs and [ə] have a range of surface variants triggered by adjacent consonants and Vs [1, 6]. The language also has an 'excrescent' [ə] ([ᵊ]), i.e., a very brief transitional [ə]-like vocoid that speakers produce with some variability. This is also a typical Salish phenomenon [5].

3. METHOD

3.1 Data

The acoustic data were produced by a female native speaker, aged 68 years, Sliammon Elder MH. Recording took place at Anywhere Studios in Campbell River, BC. The V data were produced in the carrier forms in (2). MH was asked to produce each word six times in isolation, and six times in the context of the phrase in (3) with each word from (2) inserted in the position of the underscore.[2] Our elicited dataset comprised 12 tokens each of the underlined Vs in (2). The analyzed Vs are the same per carrier word; in (2a) they are both /i/ [ɛ], in (2b) they are both /a/, in (2c) they are both /u/ [o], and in (2d) they are both [ə]. The first V in each word bears primary stress whereas the V to its right occurs in unstressed post-tonic position. Our dataset thus comprised, for each V, 12 tokens in stressed position, and 12 tokens in unstressed position. A total of 95 V tokens were analyzed.[3]

(2)	carrier form		analyzed V
a.	ʔɛ́ɬʔɛɬtən	'eating'	i
b.	p'áʔp'aʔač	'nets'	a
c.	t'ᶿót'ᶿosos	'getting dark'	u
d.	qə́k'ʷqək'ʷƛ̕'ačtən	'aprons'	ə

(3) čenuxw čehots kw ____. ('He said ____ six times.')

3.2 Acoustic analysis procedure

Recording used a professional unidirectional microphone. The data were digitally captured at 44.1 kHz sampling rate, using *Pro Tools*. Acoustical analysis used *Multi-Speech 3700*. Segmentation was based on waveform and wideband spectrogram displays, checked with audio playback of the waveform. Vs were measured for quality: F_1 and F_2. Formant centre frequency was taken as the average of the formant centre frequency values obtained from wideband and narrowband spectrogram displays per V, using the formant readings provided by *Multi-Speech 3700* with visual placement of the cursor on the estimated formant centre. Formant measurements were at V midpoint. Vs were also measured for duration, with the beginning of the V identified as the beginning of its first glottal pulse and the end as the end of its last glottal pulse. They were also measured for amplitude, based on the values provided by *Multi-Speech* with visual placement of cursor on the amplitude peak. Amplitude values are reported as duration of unstressed tokens relative to duration of stressed tokens per V.

4. RESULTS

4.1 Quality

A F_1, F_2 plot of the Vs is presented in Fig. 1. All tokens are shown. Ellipses are centered around the mean F_1, F_2 values per V, with the length of the *x* and *y* axes equal to the

[1] 'Sliammon' is used here as a cover term for the Central (Coast) Salishan language spoken by the Homalco, Klahoose and Sliammon people. As Elders explain, they were one people with one language [1].

[2] The forms in (2) and (3) are presented in broad phonetic transcription using the Northwest Phonetic Alphabet.

[3] MH inadvertently produced only five tokens of (2b) in phrasal context.

F_2 and F_1 standard deviations (SDs), respectively. The solid shapes plot tokens in stressed position; the hollow shapes plot tokens in unstressed position. Each V symbol associates with the set of tokens (stressed or unstressed) nearest to it. Fig. 1 shows that all Vs are backed when unstressed; [i] and [a] are also centralized. The data indicate that the reduced V inventory involves no neutralization in quality: there is no collapsing of the reduced Vs with each other, unlike in other languages, like English, in which the reduced variants of a range of Vs are all [ə].

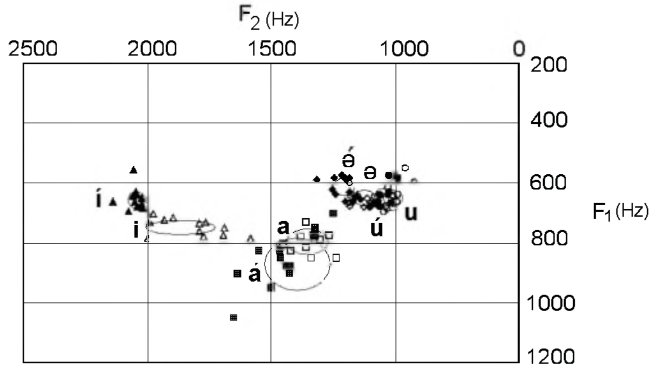

Fig.1. F_1, F_2 plot of Sliammon Vs tokens. Solid shapes = tokens in stressed position. Hollow shapes = tokens in unstressed position. Ellipses centered around means per V.

4.2 Duration

Fig. 2 shows the duration of the Vs, in stressed and unstressed position. The dots plot mean values. SD per V is shown by the length of the vertical lines, with ½SD above the dot and ½SD below it. For each V, the tokens in unstressed position are shorter than those in stressed position. Unstressed [ə] is shorter than unstressed [i] and unstressed [u]. It is 39% shorter than unstressed [i], and 47% shorter than unstressed [u]. It is not shorter than unstressed [a] in our data. Our data included tokens of the excrescent V, which is always unstressed: in 10 of the 12 tokens of *ʔɛ́ɬʔɛɬtən*, the speaker produced *ʔɛ́ɬᵊʔɛɬtən*. Duration data for excrescent [ᵊ] are included in Fig. 2. The mean duration of the excrescent schwa tokens is 39 msec.

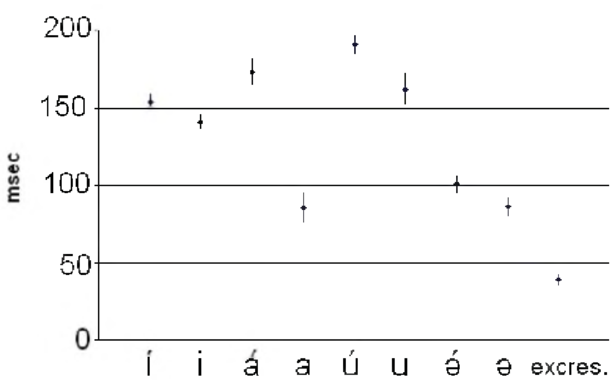

Fig.2. Duration of Sliammon Vs tokens. Dots plot means. Vertical bars show SDs.

4.3 Amplitude

Figure 3 presents the difference in amplitude between the unstressed vs. stressed tokens per V. Unstressed [i] is 8% quieter than stressed [í]; unstressed [a] is 8% quieter than stressed [á]; unstressed [u] is 13% quieter than stressed [ú]; and unstressed [ə] is 5% quieter than stressed [ə́].

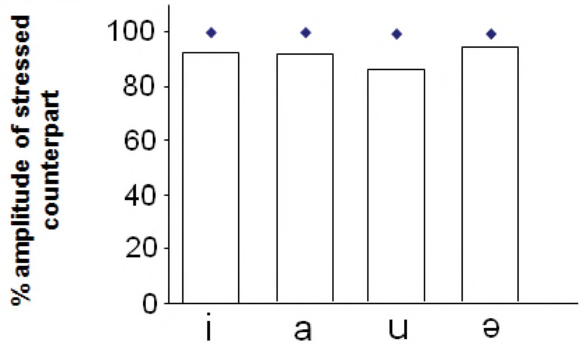

Fig.3. Relative amplitude of unstressed vs. stressed V tokens

5. DISCUSSION

Our results support previous crosslinguistic findings that Vs are shorter and quieter when reduced, but show that V reduction does not always involve neutralization of quality contrast. Sliammon has no such neutralization. This indicates a functional limitation on V reduction, that it is blocked if the language has a very small V inventory and so must preserve phonemic contrasts between Vs. Our study found that reduced [ə] is distinct from the reduced full Vs in quality, and distinct from two of them in duration. Its short duration when unreduced supports analysis of unreduced [ə] as prosodically weightless, i.e, lacking a mora (μ). The shortening of the full Vs when reduced indicates that they are weight-bearing, i.e., moraic, when unreduced and weightless (non-moraic)–like [ə]–when reduced. This supports the representations in (4) [1]. In (4), angle brackets around μ represent μ loss; 'F' represents feature structure. We suggest that (4) applies to Salish languages in general, although future acoustic study should test this hypothesis.

(4)

full Vs	reduced full Vs	ə	reduced ə
μ	<μ>		
[F]	[F]	[F]	[F]

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