The Long Schwa Paper: Stressed Schwa Epenthesis in nłeʔkepmxcín*

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Abstract: Stress in nłeʔkepmxcín is sensitive to both phonological and morphological factors; schwa is predictable based on phonological factors. In this paper, we present a description and a constraint-based analysis of stress assignment that accounts for strong, ambivalent, weak, and unstressable morphemes. With the correct assumptions about the interactions between different morphemes and stress, the position of schwa in the language falls out from general constraints on well-formed prosodic structure in the language.

Keywords: nłeʔkepmxcín, stress, schwa epenthesis, syllabification, phonological analysis

1 Introduction

1.1 Language Information

This paper provides an analysis of stress assignment and schwa epenthesis including a previously unrecognized pattern of stress-induced schwa epenthesis in nłeʔkepmxcín (Thompson River Salish, ISO 639-3: thp). nłeʔkepmxcín is a Northern Interior Salish language spoken in South Central British Columbia along the Fraser Canyon and the Nicola and Thompson rivers. As is typical of Salish languages (Czaykowska-Higgins & Kinkade 1998:7), nłeʔkepmxcín has a simple vowel

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inventory and a much larger consonant inventory. Thompson and Thompson (1992) state that the primary vowels are /i, u, e, ə/ with /ị, o, a, ə̣/[1] as their retracted counterparts (see Table 1).

Table 1. Thompson and Thompson's (1992) proposed vowel system

i ị		u
e	ə ə̣	o
	a	

The retracted vowels are less common and described as "to some extent" (Thompson & Thompson 1992:11) being allophones of the primary vowels, which leaves uncertainty as to their phonemic status (see, e.g., Thompson & Thompson 1992:11; Jimmie 1994:6). Each vowel in this proposed system has variation with respect to phonetic realization (Thompson & Thompson 1992; Khalaji Pirbaluti 2023), but we assume that the primary vowels, apart from schwa, are the key set of underlying phonemes.

1.2 Schwa Across Salish

Schwa ([ə]) is a common vowel across Salish languages. Kinkade (1998) describes four types of schwa across Salish languages: underlying, derived, epenthetic, and excrescent. We assume that epenthetic and excrescent schwas are present in nɬeʔkepmxcín. Epenthetic schwas are inserted to ensure a well-formed prosodic word or to satisfy requirements on permissible consonant clusters (i.e., to ensure a rising or falling sonority profile within an onset or coda; see Matthewson 1994 for a discussion of nuclear but non-moraic schwa). Excrescent schwas are argued to be purely phonetic in nature and serve as a transition between two segments, often between an obstruent and following resonant (Parker 2011). Both epenthetic and excrescent schwa occur in predictable environments and are typically assumed to be absent from the underlying vowel inventory of a language (Kinkade 1998; Blake 2000; Shahin 2007). While both epenthetic and excrescent schwas may surface in predictable environments, they differ in frequency. Shahin (2007) found that excrescent schwa in St'át'imcets is variable in occurrence, whereas epenthetic schwa required by the phonology of the language is not.

We assume based on the predictability of schwa in nɬeʔkepmxcín that epenthetic and excrescent schwas are not part of the underlying representation. This directly contradicts previous documentation of nɬeʔkepmxcín phonology by Jimmie (1994) and Thompson and Thompson (1992) that include epenthetic schwa as underlying phonemes.[2] We set aside the pattern of excrescent schwas from our analysis as we assume that their presence is governed entirely by phonetic considerations. Excrescent schwas are likely phonetically distinct from epenthetic schwas, and do not seem to interact with stress or other levels of prosodic organization. In the rest of this paper, we show that the epenthetic schwas that were previously assumed to be part of the underlying

[1] Thompson and Thompson (1992:21) suggest that unlike the other retracted vowels, retracted schwa is more often its own vowel rather than the retracted counterpart of schwa. The near-minimal pairs below are used as evidence of a contrast between schwa and retracted schwa.

ʔesnk̓ə̣́ɬ 'dirty, muddied' : *ʔeskə́ɬ* 'detached'
pmə̣́p '[canoe] gains speed' : *qmə́p* 'get warm, heated'

[2] Neither Jimmie (1994) nor Thompson and Thompson (1992) assume excrescent schwas as part of the underlying representation. Thompson and Thompson specifically state "transition vowels which are clearly predictable and do not contrast with their absence are not written" (1992:20).

representations of nłeʔkepmxcín are predictable based on the phonological grammar of the language; they do not need to be represented in the lexicon.

The remainder of this paper is organized as follows. Section 2 provides background on the data and how it is presented, syllabification in nłeʔkepmxcín, and the patterns of stress assignment, including stress-induced schwa epenthesis. Section 3 outlines the analysis and how it accounts for schwa epenthesis for syllabification, stress assignment, and stressed schwa epenthesis. Section 4 provides a discussion on deviant cases and future areas of research. Section 5 presents our conclusions.

2 Description of the Patterns

2.1 Data

There are two types of data used in the present analysis: dictionary entries and recorded speech. The dictionary entries come from the nłeʔkepmxcín dictionary (Thompson & Thompson 1996) and grammar (Thompson & Thompson 1992). We use the abbreviated form "T&T" to mark data that comes from the dictionary and the grammar. We first identified roots from the dictionary before searching through the nłeʔkepmxcín-to-English side of the dictionary to find specific stems and stress behaviours. Different derivations of each root provide support for stress and schwa epenthesis patterns.

In addition to the dictionary and grammar entries, we also used three main sources of recorded speech from elicitations with three fluent speakers of nłeʔkepmxcín: Bev Phillips (BP), k^wałtèzetk^{w}uʔ (Bernice Garcia; KBG), and c̓úʔsinek (Marty Aspinall; CMA). Most of the recorded speech comes from the stories '*x^{w}íʔ k^w páq* (You Will Be Sorry)' (Hall & Phillips 2024) and '*ł cutés us ł qəłmín ł tmíx^w* (When Old One Created the Earth)' (Hall & Phillips *this volume*), written and narrated by Bev Phillips. '*x^{w}íʔ k^w páq* (You Will Be Sorry)' was recorded in-person using a head-mounted microphone connected to a Zoom H6 digital recorder and '*ł cutés us ł qəłmín ł tmíx^w* (When Old One Created the Earth)' was recorded using the video conferring program Zoom. Additional examples were taken from a recorded conversation between KBG and CMA that was facilitated and recorded using the video conferencing program Zoom. All recordings made with Zoom made use of the speakers' built in laptop microphones. Speech from the story and conversation sources has been transcribed in the North American Phonetic Alphabet (NAPA) as employed by Thompson and Thompson (1992; 1996), translated into English with input from the speakers, and glossed using nłeʔkepmxcín specific morpheme-by-morpheme glossing conventions established by the University of British Columbia nłeʔkepmxcín Lab (nłab). Additional samples of recorded speech come from targeted elicitations with all three consultants as parts of previous projects (Reid 2023) or to verify aspects of the pattern of stressed schwa epenthesis. Preliminary acoustic analyses of these three recording sources were conducted using Praat (Boersma & Weenink 2025). A small number of sample spectrograms are provided throughout the paper where relevant with additional spectrograms provided in Appendix B.

2.1.1 Data Presentation

We provide a gloss for each example separated into three columns. Unless otherwise specified, these columns consist of a segmented underlying representation surrounded by forward slashes / / and a gloss line in the left column; a surface representation surrounded by square brackets [ ] in the middle column; and an English translation in single quotes ‘ ’ in the right column. An example of this is shown below in (1).[3]

(1) /cún-t-íyxs-n_1-t-em/ [cun.$\underset{\smile}{\text{íy}}_N$x.$se_1$.$tm_N$] ‘They were told by him.’
tell-TR-3PL-CTR-TR-PASS (Hall & Phillips *this volume*)

We note the use of a few specific conventions shown in (1) that we will use throughout in our phonological representations. In underlying representations (indicated by / /):

i. Accent, i.e., underlying stress, is represented by an acute accent diacritic on accented vowels, e.g., /cún/ and /-íyxs/ in (1). This convention should not be understood as a claim about the phonological nature of accent, which we analyze as underlying mora structure in Section 3, but rather follows the convention of Thompson and Thompson (1992, 1996) for indicating accent.

ii. Numbers in subscripts show correspondence between underlying and surface representations by giving corresponding input and output segments the same number in cases where these correspondences might be difficult to determine without prior knowledge of the language, especially in cases of resonant vocalization, e.g. /n_1/ and [e_1] in the example above.

In surface representations (indicated by [ ]):

i. Primary stress is represented by an acute accent diacritic on the stressed vowel, e.g. [í] in (1). (While this overlaps with the use for representing underlying accent, it is unambiguous as it exclusively occurs in surface representations.)
ii. Syllable boundaries are represented by a period . between syllables. The location of these boundaries has been determined based on on a combination of typological expectations, arguments made by Jimmie (1994), and evidence from schwa epenthesis and word boundaries in the present analysis. We have also confirmed many of these syllabifications through comparison with speaker intuitions provided by the three speakers in elicitations.
iii. Syllabic consonants (i.e., consonants serving as syllable nuclei) are represented with a subscript N (for nucleus), e.g., [m_N] in (1). Diphthongs (i.e., nuclei comprised of vowel-glide sequences) are shown using a tie bar beneath the segments and the subscript N, e.g., [$\underset{\smile}{\text{íy}}_N$] in the above example.

[3] Glossing abbreviations follow Leipzig Glossing Rules with the following additions: COS = change-of-state reduplication, CTR = control, D/C = determiner-complementizer, INCH = inchoative, INDEP = independent pronoun, INDR = indirective applicative, IMM = immediate, LC = limited control, MID = middle, RLT = relational applicative. Affix boundaries are indicated with a hyphen (-). Infix boundaries are indicated with angle brackets (< >). Reduplication is indicated with a tilde (~). Clitic boundaries are marked with an equal sign (=). All null morphemes are omitted from the data for clarity. Glossed data from published sources used in this paper has been adapted as necessary to conform with these conventions.

iv. Coloured schwas (i.e., schwas which may be pronounced more like other vowels in certain consonantal environments) will always be transcribed as schwa.[4]

v. Schwas that we analyze as epenthetic rather than excrescent are indicated, even in cases where they may not be represented in transcriptions of a given form by Thompson and Thompson (1992; 1996).[5] These decisions were informed by phonetic analysis. To verify the presence of epenthetic schwas, individual words were annotated in Praat (Boersma & Weenink 2025). Vowel epenthesis was identified auditorily and confirmed by the presence of clear formants in the spectrogram and a period pattern in the waveform.

Finally, we occasionally make use of following schematic representations:

- V – vowel;
- C – consonant;
- R – resonant (synonymous with sonorant, used here only to refer to consonants);
- O – obstruent;
- G – glide;
- L – liquid;
- N – nasal;
- F – fricative; and
- K – stop (which we use synonymously with plosive to exclude nasal stops, while including affricates).

2.2 Syllabification in nłeʔkepmxcín

We first summarize the patterns about syllable structure to be shown in this section.

We do not provide specific evidence for the following rules. While they are true in the language generally, we will not attempt to analyze repair processes or conditions under which exceptions are permitted (see Thompson & Thompson 1992 and Jimmie 1994 for further discussion of general phonological patterns in the language).

- Syllables must possess onsets.
    - A notable exception to this involves the locative prefix /n-/, which frequently forms the nucleus of an initial syllable with no onset, e.g., in the word *ntéwmn* 'store'.
- Nuclei must consist of single segments.

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[4] The environments that condition schwa colouring are listed below based on orthographic conventions used by Thompson and Thompson (1992; 1996).

[e] / __ʔ, h
[i] / __y, y̓
[u] / __kʷ, k̓ʷ, w, w̓, xʷ
[a] / __q, q̓, x̣, ʕ, ʕ̓
[o] / __qʷ, q̓ʷ, x̣ʷ, ʕʷ, ʕ̓ʷ

[5] Thompson and Thompon's (1992; 1996) orthography generally only includes schwas that are the second segment in a root, the nucleus of a reduplicated syllable, or the host of primary stress. For orthographical representations written in *italics*, we stay faithful to these conventions.

- Our analysis allows an exception to this rule for accented vowels, which can form a diphthongal nucleus with a following glide.

We will demonstrate that the following rules apply without exception in nłeʔkepmxcín:

- Onsets clusters of three or more consonants are prohibited.
  - E.g., *[kłx-].
- Onset clusters containing a resonant are prohibited, including:
  - [RO-] onset clusters, e.g., *[mƛ̓-],
  - [OR-] onset clusters, e.g., *[py-], and
  - [RR-] onset clusters, e.g., *[ʕʷy-].
- Coda clusters containing a resonant after another consonant are prohibited, including:
  - [OR-] coda clusters, e.g., *[-tn], and
  - [RR-] coda clusters, e.g., *[-nm].
- Liquids in nuclei are prohibited.
  - E.g., *[l_{N}].

We will further demonstrate that the following marked structures are tolerated in nłeʔkepmxcín:

- Onset clusters containing two obstruents are tolerated, including:
  - [KK-] onset clusters, e.g., [pt],
  - [KF-] onset clusters, e.g., [kł], and
  - [FK-] onset clusters, e.g., [łk].
- Coda clusters containing one or more obstruents after another consonant are tolerated, including:
  - [-RO(O)] coda clusters, e.g., [-ns] or [-nsc] and
  - [-OO(O)] coda clusters, e.g. [-kp] or [-ƛ̓qt].
- Glides in nuclei are tolerated, including:
  - vocalized glides, e.g., /y/ → [i] and
  - glides in diphthongal nuclei, e.g., [$(\mathrm{ew})_{\mathrm{N}}$].
- Nasals in nuclei are tolerated, including:
  - syllabic nasals, e.g., [n_{N}] and
  - vocalized nasals, e.g., /m/ → [e].

2.2.1 Onset clusters of three or more consonants are prohibited

The example in (2) demonstrates how the onset cluster [kłx-] in the illicit form *[ʔes.kłxə́n] is avoided by inserting a schwa. Evidence of schwa epenthesis is provided in Figure 1.

(2) /ʔes-kł-xn/	[ʔes.kəł.xə́n]	'have one's shoes off'	
STAT-separate-foot			BP

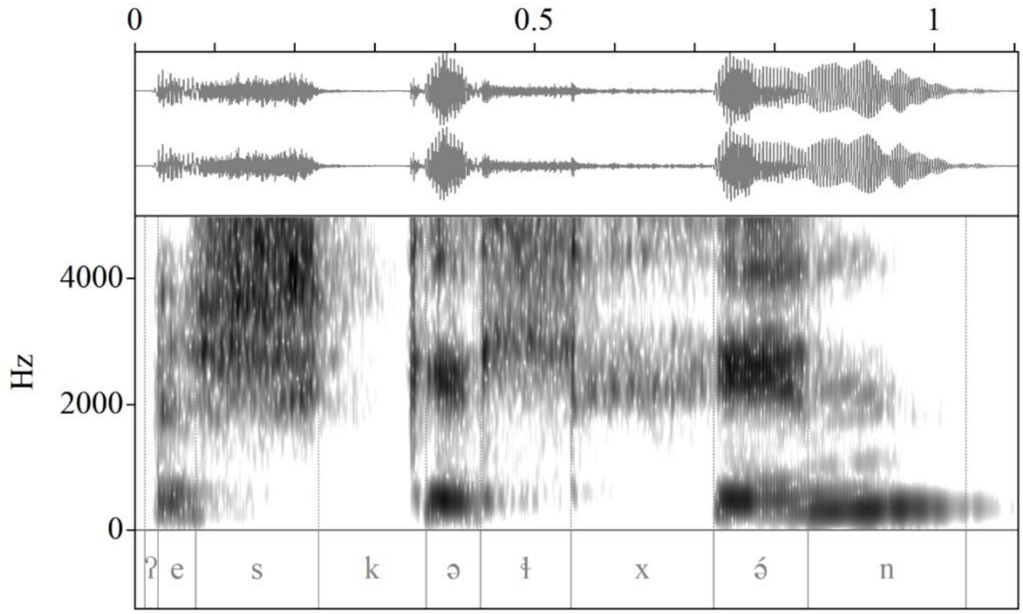

Figure 1. Waveform and spectrogram showing epenthetic schwas in *ʔeskəɬxə́n* ‘have one’s shoes off’ produced by BP

2.2.2 Onset clusters containing a resonant are prohibited

The examples in (3)–(7) demonstrate that onset clusters containing a resonant are avoided by inserting a schwa. This includes [OR-] onset clusters as in *[mƛ̓-] in the illicit form *[mƛ̓ə́q̓ʷ]; [RR-] onset clusters as in *[ʕʷy-] in the illicit form *[ʕʷyə́p] and *[wm-] in the illicit form *[wméx]; and [OR-] onset clusters as in *[sl-] in the illicit form *[slə́k] and *[py-] in the illicit form *[pyépst]. Evidence of schwa epenthesis in the word *slə́k* ([sə.lə́k]) ‘turn’ is provided in Figure 2.

(3) /mƛ̓q̓ʷ/ [mə.ƛ̓ə́q̓ʷ] ‘dislocated’
dislocate (T&T 1996:204)

(4) /ʕʷy-p/ [ʕʷə.yə́p] ‘become burned’
burn-INCH (Hall & Phillips 2024:150)

(5) /wméx/ [wə.méx] ‘live’
live (Hall & Phillips 2024:151)

(6) /slk/ [sə.lə́k] ‘turn’
turn BP

(7) /pyépst/ [pə.yépst] ‘you (plural)’
2PL.INDEP (Hall & Phillips *this volume*)

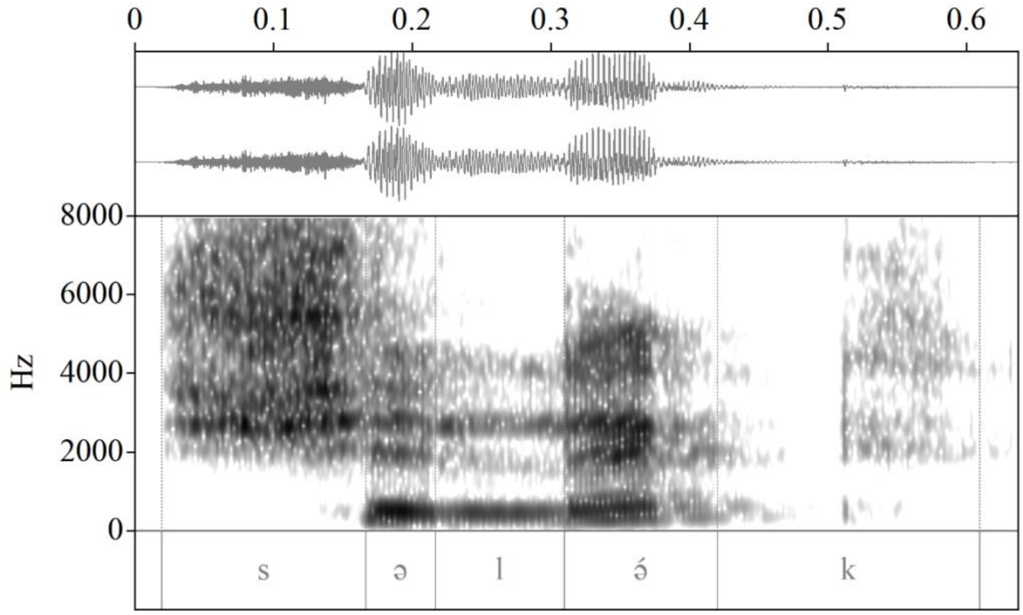

Figure 2. Waveform and spectrogram showing epenthetic schwas in *sləˊk* ‘turn’ produced by BP

2.2.3 Coda clusters containing a resonant following another consonant are prohibited

Examples (8)–(11) demonstrate how coda clusters containing a resonant following another consonant are avoided through either inserting a schwa or allowing a nasal to be syllabic. This includes [-OR] coda clusters as in *[-tn] in the illicit form *[máʕ.xetn] and *[-kʷlxʷ] in the illicit form *[ʔíkʷlxʷ], and [-RR] coda clusters as in *[-nm] in the illicit form *[kénm] and *[-ʔnxʷ][6] in the illicit form *[qʷúʔnxʷ].

(8) /máʕ-xn$_1$-tn/ [máʕ.xe$_1$.tn$_N$] ‘moon’
light-foot-INS BP, CMA, KBG

(9) /ʔíkʷlxʷ/ [ʔíkʷ.ləxʷ] ‘dream’
dream CMA

(10) /kénm/ [ké.nəm] ‘what happened/why?’
do.what BP, CMA, KBG

(11) /qʷúʔ-n-t-exʷ/ [qʷúʔ.nəxʷ] ‘You watered it.’
water-CTR-TR-2SG.ERG (Hall & Phillips *this volume*)

In [ʔíkʷ.ləxʷ] ‘dream’, there is simply no nasal present, while in [qʷúʔ.nəxʷ], if the nasal formed the nucleus of a new syllable, that syllable would need an onset, leaving a stressed open syllable and violating the weight minimality requirement discussed later in Section 3.4.1. The example

[6] [ʔ] is phonologically a resonant in the Salish family (see Davis 2020).

[ké.nəm] ‘what happened/why?’ is a less clear case, as the coda could be repaired as a syllabic nasal, as in the illicit form *[ké.nm$_{\text{N}}$]. It seems likely that there are additional well-formedness restrictions for syllables with nasal nuclei (here, probably a prohibition on nasal onsets), but we leave an exploration of these restrictions to future work. Figure 3 shows the presence of schwa in the word *kénm* ‘what happened/why?’.

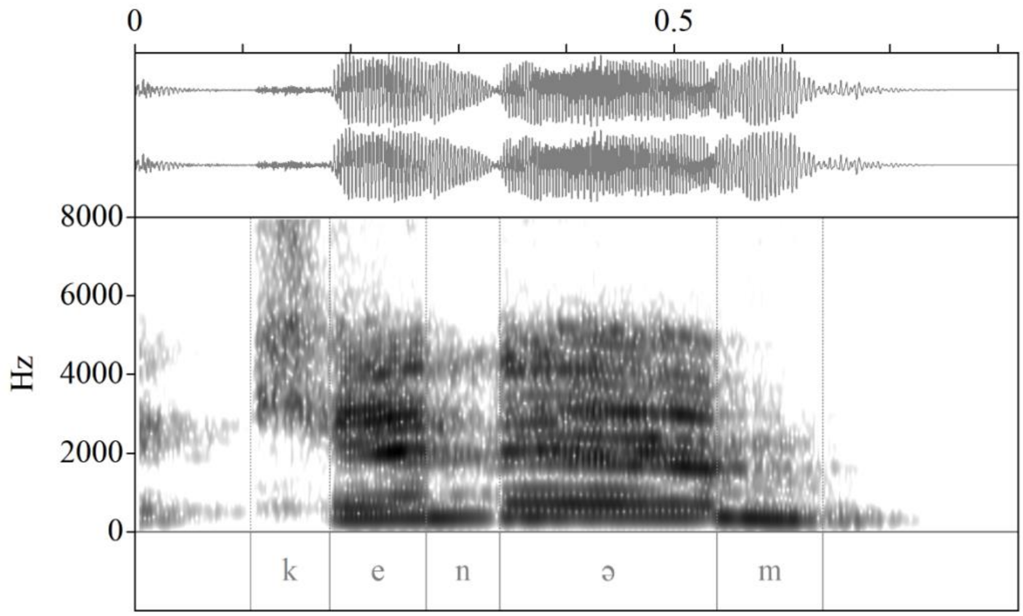

Figure 3. Waveform and spectrogram showing epenthetic schwa in *kénm* ‘What happened? / why?’ produced by BP

Glide-nasal sequences, such as [-wm] in [zéw$_{\text{N}}$m], seem to be an exception to the prohibition on coda clusters containing a resonant followed by another consonant. However, as we will discuss in Section 2.2.7, there is evidence that glides immediately following vowels can be analyzed as part of the nucleus in certain circumstances; they therefore do not represent genuine examples of [-RR] coda clusters.

It could also be argued that the repair of these illicit coda clusters can be explained as avoidance of superheavy syllables (i.e. syllables with more than two moras, as discussed below in Section 3.2. However, comparison with examples containing non-prohibited coda clusters shows that superheavy syllables are tolerated in the analogous examples [síƛ̓q̓t] ‘day’ and [ɬək̓ʷ.míns] ‘He/she/they remembered it.’. Moreover, in the illicit form *[máʕ.xetn], we analyze the vowel [e] as non-moraic since it is a vocalized nasal, so [xetn] is not actually a superheavy syllable.

2.2.4 Liquids in nuclei are prohibited

Example (12) shows that liquids may not be syllabic, even when a syllabic /l/ would allow for the avoidance of schwa epenthesis and create otherwise unmarked syllable structure, as in the illicit form *[sl$_{\text{N}}$.ke.tés].

(12) /slk-n$_1$-t-es/ [səl.ke$_1$.tés] 'He/she/they turned something around.'
turn-CTR-TR-3ERG (T&T 1996:321)

2.2.5 Onset clusters containing two obstruents are tolerated

Examples (13)–(17) demonstrate that tolerated onset clusters include [KK-] onsets like [pt-], [KF-] onsets like [kɬ-] and [cx̣ʷ-] (note that [c] is an affricate), [FK-] onsets like [st-] and [ɬk-], and [FF] clusters like [ɬx̣ʷ]. Evidence of an obstruent-obstruent cluster in the word *ɬkép* 'pot/pan' is provided in Figure 4.

(13) /pt-eyep-tn/ [pté.yep.tn$_N$] 'rug'
cover-mat-INS BP

(14) /kɬ-p/ [kɬə́p] 'become separated'
separate-INCH (Hall & Phillips *this volume*)

(15) /cx̣ʷ-p/ [cx̣ʷə́p] 'start to drip'
drip-INCH (Hall & Phillips *this volume*)

(16) /ɬkep/ [ɬkép] 'pot/pan'
pan BP, CMA, KBG

(17) /ɬx̣ʷ-p/ [ɬx̣ʷə́p] 'escape'
escape-INCH (T&T 1996:163)

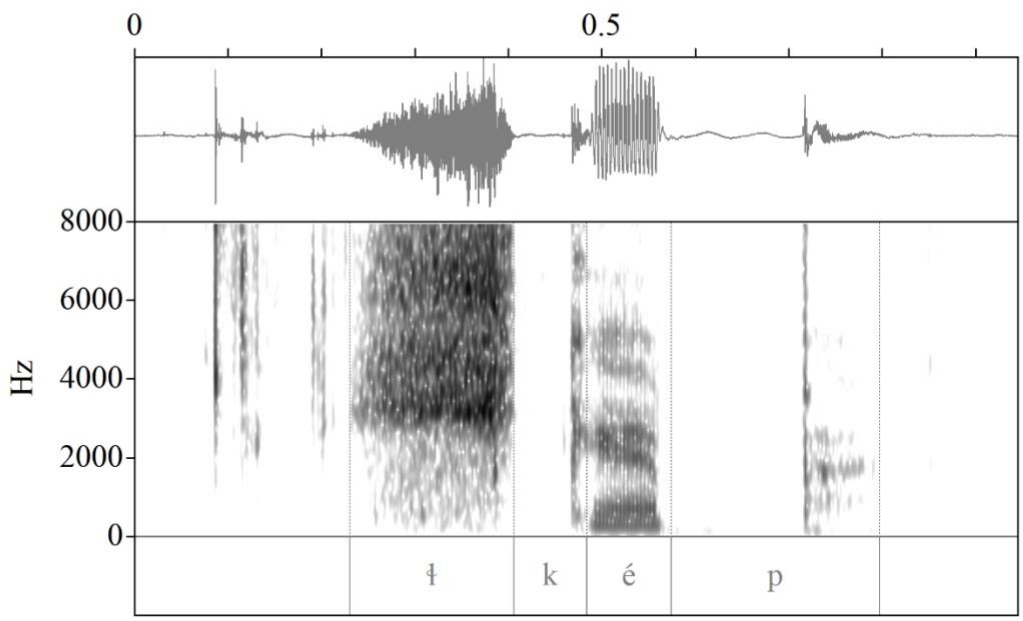

Figure 4. Waveform and spectrogram showing an obstruent-obstruent onset cluster in the word *ɬkép* 'pot/pan' produced by BP

2.2.6 Coda clusters containing one or more obstruents after another consonant are tolerated

Examples (18)–(24) demonstrate that tolerated coda clusters include: [-ROO] codas like [-nsc] in (18); [-RO] codas like [-ns] in (19); [-OOO] coda clusters [-ƛ̓qt] in (20) and [-pst] in (7) earlier in this section; and [-OO] coda clusters like [-kp] in (21) and (22), [-kc] in (23) ([c] is an affricate derived from underlying /ts/ through consonant coalescence), and [-xs] in (24) ([y] is parsed into the nucleus with the preceding vowel, and therefore does not form part of the coda cluster). Evidence for these complex coda clusters is shown in Figure 5 for the word *ʔustíyxs* ‘They discarded it.’

(18) /ʔes-ɬk̓ʷ-min-s-t-es/ [ʔes.ɬək̓ʷ.mínsc] ‘He/she/they memorized it.’
STAT-remember-RLT-CAUS-TR-3ERG (T&T 1996:150)

(19) /ɬk̓ʷ-min-t-es/ [ɬək̓ʷ.míns] ‘He/she/they remembered it.’
remember-RLT-TR-3ERG (T&T 1996:150)

(20) /síƛ̓q̓t/ [síƛ̓q̓t] ‘day’
day BP, CMA

(21) /x̣k-p-s-t-és/ [x̣əkp.stés] ‘He/she/they found out that…’
know-INCH-CAUSE-3ERG (T&T 1996:421)

(22) /sk-p-s-t-es/ [səkp.stés] ‘He/she/they managed to hit it with a club.’
hit-INCH-CAUS-TR-3ERG (T&T 1996:320)

(23) /wík-t-es/ [wíkc] ‘He/she/they saw it.’
see-TR-3ERG (Hall & Phillips 2024:136)

(24) /ʔús-t-íyxs/ [ʔus.tíy͜$_{N}$xs] ‘They discarded it.’
discard-TR-3PL (Hall & Phillips 2024:141)

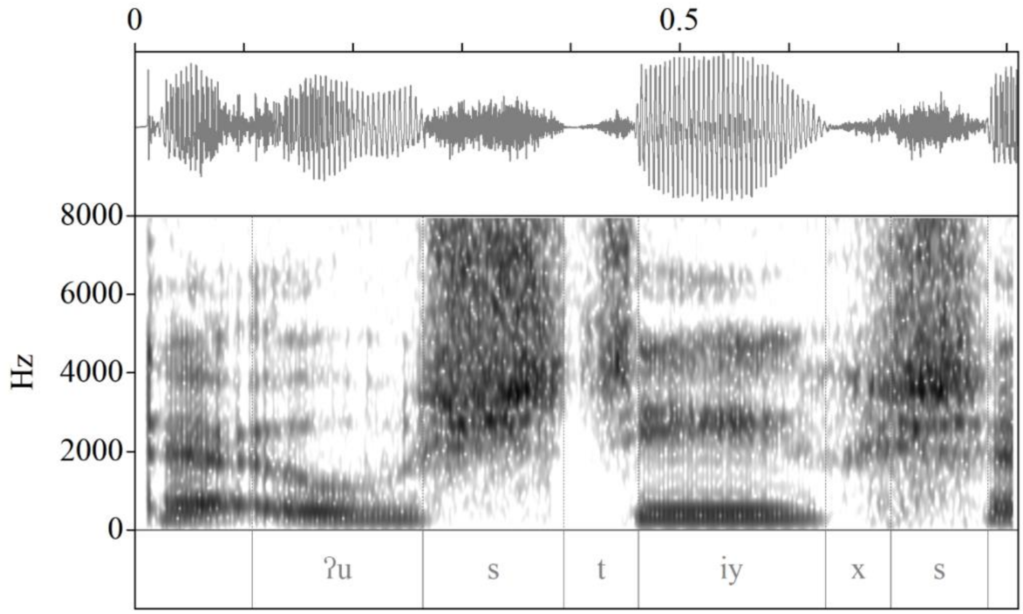

Figure 5. Spectogram and waveform showing complex coda in *ʔustíyxs* ‘they discarded it’ produced by BP

2.2.7 Glides in nuclei are tolerated

Glides can be a part of nuclei in two different ways. The first way involves a glide forming a diphthong in combination with a preceding vowel, as in [é͜y$_N$] and [é͜w$_N$] in examples (25) and (26).

(25) /séytkn-emx/ [sé͜y$_N$t.kn$_N$.məx] ‘Indigenous person / people’
Indigenous-person BP, CMA, KBG

(26) /zéw-m/[7] [zé͜w$_N$m] ‘go dipnetting’
scoop-ctr.mid BP, CMA, KBG

Figure 6 shows a nuclear glide in the word *séytknmx* ‘Indigenous person/people’. While there is only direct evidence of this occurring with vowels that are both underlyingly accented and stressed on the surface, it is reasonable to assume that diphthongization can occur with any underlyingly accented vowel, regardless of whether it bears stress on the surface. There is no evidence pertaining to whether diphthongization can occur with underlyingly unaccented vowels, but they cannot occur with epenthetic schwa specifically, even when it bears stress. We will discuss the evidence and reasoning behind this analysis further in the discussion of moraic structure in Section 3.1.

[7] The underlying representation of the control middle is hard to be certain of since the three allomorphs are [-m], [-ə́m], and [-me]. T&T (1992) assume the underlying representation is /-əme/, but it is not obvious that the final vowel is underlying. For the present purposes, we are only concerned with the allomorphs [-m] and [-ə́m], so we assume the underlying representation: /-m/.

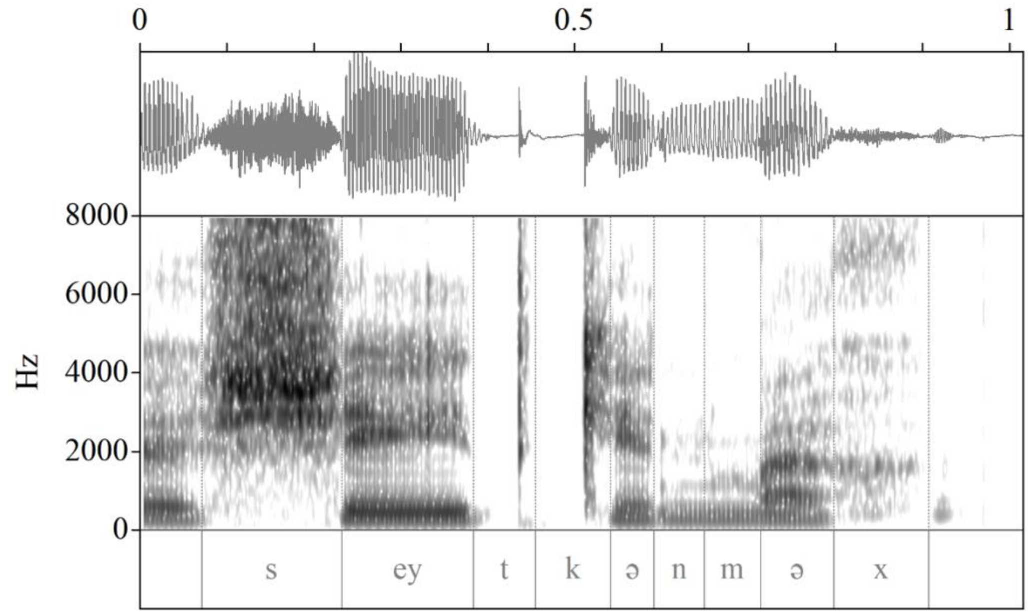

Figure 6. Waveform and spectrogram showing a glide as part of the nucleus in *séytknmx* ‘Indigenous person’ produced by BP

The second way glides can be part of nuclei is when a glide itself forms the nucleus of a syllable. When this happens, the glide always surfaces as a vowel, as in /w/ → [u] in (27) and /ỷ/ → [iʔ] in (28) and (29). Note that in the latter case, the glottalization which was underlyingly part of the glide is written as, and is perceptually identical to, a glottal stop immediately following the vowel. We do not take a stance on the prosodic status of this glottal stop (e.g., whether it is a separate segment, whether it is moraic, or whether it belongs to the nucleus or the coda).

(27) /cw$_1$-t-es/ [cu$_1$.tés] ‘He/she/they made something.’
do-TR-3ERG (Hall & Phillips *this volume*)

(28) /ƛ̓ỷ$_1$kʷ-m/ [ƛ̓i$_1$ʔ$_1$.kʷə́m] ‘take something down from above’
descend-CTR.MID (T&T 1996:178)

(29) /ʕʷó<ʕʷ>ỷ$_1$t/ [ʕʷó.ʕʷi$_1$ʔ$_1$t] ‘take a nap’
sleep<DIM> (T&T 1996:480)

2.2.8 Nasals in nuclei are tolerated

Nasals can be realized as nuclei in two different ways. The first way a nasal can be a nucleus is when it is a syllabic nasal, which is demonstrated twice in [n$_N$.té͜w$_N$.mn$_N$] ‘store’ in (30). When this happens in a prefix, which is outside of the domain for stress assignment, it yields a syllable with no onset; this is one of the few exceptions to the rule that syllables always possess onsets. The second way is through nasal vocalization, where in specific conditioning environments, nasals may surface as the vowel [e], like /m/→[e] in [qéc.kep] ‘your (guys’) older brother’ in (31). The conditioning environment is between two consonants where the following consonant shares the place of articulation of the nasal (Thompson & Thompson 1992:43), like [k_p] for /m/ in (31), or [x_t] for [n] in /máʕ-xn$_1$-tn/ → [máʕ.xe$_1$.tn$_N$] 'moon'.

(30) /n-téw-min/ [n$_N$.tée͜w$_N$.mn$_N$] 'store'
LOC-sell-INS BP

(31) /qéck-m$_1$p/ [qéc.ke$_1$p] 'your (guys') older brother'
older.brother-2PL.POSS (T&T 1992:43)

2.3 Stress Assignment in nłeʔkepmxcín

Apart from a brief description of nłeʔkepmxcín stress in the grammar (Thompson & Thompson 1992: 27-30), there is only one published theoretical analysis (Coelho 2002). In nłeʔkepmxcín, stress is largely morphologically determined, such that morphemes are lexically specified with respect to whether they preferentially host stress. The accentedness, or underlying stress feature, of vowels in each morpheme determines where primary stress will fall within a word.

Roots fall into two categories depending on their accentedness: "strong" and "weak".[8] Strong roots contain an accented full vowel in their underlying representation. Weak roots generally lack underlying vowels and are therefore unaccented. While there do appear to be some weak roots with full vowels in nłeʔkepmxcín[9], we set these aside since they don't interact with stress the same way as roots composed only of consonants. Throughout the rest of the paper "weak" can be defined as any stressable morpheme whose underlying representation lacks a (full) vowel.

Suffixes fall into four categories: "strong", "ambivalent", "weak", and "unstressable". Like strong roots, strong suffixes contain an underlying accented full vowel. Ambivalent suffixes contain an underlying full vowel which is unaccented. Weak suffixes lack full vowels and are therefore unaccented, but can host primary stress when they surface with a stressed schwa.[10] Unstressable suffixes, as the name suggests, are not able to host primary stress under any circumstances, though they may have underlying full vowels or be composed only of consonants.[11]

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[8] The labels strong, weak, ambivalent, and unstressable introduced in this section are all from Thompson and Thompson (1992).

[9] Consider the example below of a weak root with full vowels. Notice that in (i) stress is on the initial vowel [i], proving that it is underlying, not an vocalized glide. Notice that in (ii) stress is on an ambivalent suffix, proving that the root is weak.

i.	/k̓ʷinex/	[k̓ʷí.nex]	'how many/much?'	(T&T 1996:133)
ii.	/k̓ʷinex-esq̓t/	[k̓ʷi.ne.xésq̓t]	'how many days?'	(T&T 1996:133)

[10] While it may be confusing to say that weak morphemes "host" stress, since they are composed only of consonants and consonants are unable to host stress, this terminology makes more sense within the analysis of Thompson and Thompson (1992) because they analyze the stress-hosting schwas as underlying. We preserve this label in our descriptions for convenience of comparison with past work, and will consider a morpheme to be hosting stress when stressed schwa surfaces immediately preceding a consonant in its exponent.

[11] Thompson and Thompson (1992) analyze unstressable suffixes as having underlying consonants only (e.g. the immeditate /-t/) or vowels with an underlying secondary stress feature that prevents them from hosting primary stress (e.g. the imperative /-e/).

Prefixes and clitics are never able to host primary stress. Table 2 summarizes these categories and their defining characteristics.

Table 2. Accentedness and stressabiity of nłeʔkepmxcín morphemes.

Category	Morpheme Type	Accented?	Vowels in UR?	Stressable?
Strong	Roots	Yes	Full	Yes
	Suffixes	Yes	Full	Yes
Ambivalent	Suffixes	No	Full	Yes
Weak	Roots	No	None	Yes
	Suffixes	No	None	Yes
Unstressable	Suffixes	No	Any	No
	Prefixes/Clitics	No	Any	No

Between these categories, there is a hierarchy of preference for which morpheme is the best host of stress. To summarize Thompson and Thompson's (1992:27–30) and Coelho's (2002) descriptions of the stress pattern, strong suffixes are preferred over strong roots as the stress host. Strong roots are preferred over ambivalent suffixes. Ambivalent suffixes are preferred over weak suffixes which in turn are preferred over weak roots. Examples (32)–(35) highlight this order of preference. Recall that underlyingly stressed (accented) vowels are indicated with an acute accent in their underlying forms.[12]

strong suffix preferred over strong root:

(32) /wík-t-íyxs/ [wik.tíy͜ₙxs] 'He/she/they saw it.'
see-TR-3PL (Hall & Phillips 2024:149)

strong root preferred over ambivalent suffix:

(33) /wík-t-es/ [wíkc] 'He/she/they saw it.'
see-TR-3ERG (Hall & Phillips 2024:136)

ambivalent suffix preferred over weak suffix:

(34) /x̣k-p-s-t-es/ [x̣əkp.stés] 'He/she/they found out that…'
know-INCH-CAUS-3ERG (T&T 1996:421)

weak suffix preferred over weak root:

(35) /cx̣ʷ-p/ [cx̣ʷə́p] '(start to) drip'
drip-INCH (Hall & Phillips *this volume*)

When multiple suffixes of the same stress category are present and no other morpheme is present which takes preference over them, only one of them can receive primary stress. Stress will

[12] Contra Thompson and Thompson (1992), we assume that the control directive /-n/, the causative /-s/, and the transitivizer /-t/ are all weak. This is a result of our assumption, explained later in this section, that unstressable suffixes are outside of the phonological domain where stress is assigned.

surface on either the initial or final preferred suffix, depending on the stress category. If multiple strong suffixes are present, stress surfaces on the final one. If multiple ambivalent suffixes are present, and no strong root or strong suffix is present to take preference over them, stress surfaces on the initial suffix—in other words, stress surfaces on the first underlying vowel in the absence of accented morphemes. Examples of words with multiple strong suffixes are given in (36) and (37), and examples of words with multiple ambivalent suffixes and no accented morphemes are given in (38) and (39).

(36) /wík-nwéṅ-t-íyxs/ [wi.kn$_{\mathrm{N}}$.weṅ.tí͜y$_{\mathrm{N}}$xs] 'They managed to see it.'
see-LC-TR-3PL BP

(37) /kʷénme-t-íyxs-n$_{1}$-t-íyxs/ [kʷen.me.ti͜y$_{\mathrm{N}}$x.se$_{1}$.tí͜y$_{\mathrm{N}}$xs] 'They judged them.'
judge-TR-3PL-CTR-TR-3PL (T&T 1992:81)

(38) /kɬ-p-ekst-min-t-es/ [kəɬ.pék.stm$_{\mathrm{N}}$s] 'He dropped it.'
separate-INCH-hand-RLT-TR-3ERG BP

(39) /cw$_{1}$-xi-t-es/ [cu$_{1}$.xíc] 'They made it for someone.'
do-INDR-TR-3ERG (T&T 1996:42)

Notice that in the above examples, the unstressed unaccented vowels in ambivalent suffixes are deleted while the vowels in strong morphemes surface even if they don't host primary stress. In either case, the first underlying vowel always surfaces.[13] Surprisingly, this generalization holds even when the first underlying vowel is unstressed and unaccented (e.g., when the root is weak, the first suffix is ambivalent), and a subsequent suffix is strong. Examples of this are shown in (40) and (41).

(40) /ʔes-kɬ-p-ekst-min-t-íyxs/ [ʔes.kəɬ.pek.stm$_{\mathrm{N}}$.tí͜y$_{\mathrm{N}}$xs] 'They dropped it.'
STAT-separate-INCH-hand-RLT-TR-3PL (Hall & Phillips 2024:134)

(41) /cw$_{1}$-xi-t-íyxs-n-t-ene/ [cu$_{1}$.xi.tí͜y$_{\mathrm{N}}$x.sne] 'I made it for them.'
do-INDR-TR-3PL-CTR-TR-1SG.ERG (Hall & Phillips 2024:140)

If the root and all suffixes are weak,[14] then there is no vowel present in the underlying representation which is capable of hosting stress, so one must be epenthesized. In these cases, stress always surfaces on a schwa preceding the final consonant of the word. Examples (42)–(52) demonstrate this pattern.

(42) /ʔes-{kɬ}/[15] [ʔes.kə́ɬ] 'separated'
STAT-separate BP

[13] The [u] in (39) results from vocalization of underlying /w/.
[14] Though T&T (1992) treat change-of-state (a.k.a. out-of-control) reduplication /~əC/ as a weak suffix, we omit it from the present analysis because the schwa in the reduplicant surfaces even when it is not stressed, indicating that its insertion is likely not stress-induced. See Section 4.1 for a more complete explanation.
[15] See the paragraph preceding examples (53)–(56)(53)(56) for an explanation of the curly braces { }.

(43) /kɬ-p/ [kɬə́p] ‘become separated’
separate-INCH (Hall & Phillips *this volume*)

(44) /ʔes-{kɬ-xn}/ [ʔes.kəɬ.xə́n] ‘have one’s shoes off’
STAT-separate-foot BP

(45) /kɬ-xn-m/ [kəɬx.nə́m] ‘take off one’s shoes’
separate-foot-CTR.MID BP

(46) /ƛ̓y̓kʷ/ [ƛ̓ə.y̓ə́kʷ] ‘descend / fall’
descend (T&T 1996:189)

(47) /ƛ̓y̓₁kʷ-m/ [ƛ̓i₁ʔ₁.kʷə́m] ‘take something down from above’
descend-CTR.MID (T&T 1996:178)

(48) /slk/ [sə.lə́k] ‘turn’
turn BP

(49) /slk-p/ [səl.kə́p] ‘become turned around’
turn-INCH (T&T 1996:321)

(50) /mƛ̓q̓ʷ/ [mə.ƛ̓ə́q̓ʷ] ‘dislocate’
dislocate (T&T 1996:204)

(51) /mƛ̓q̓ʷ-xn/ [məƛ̓.q̓ʷxə́n] ‘have a dislocated ankle’
dislocate-foot (T&T 1996:198)

(52) /q̓ʷʔ-xn₁-tn/ [q̓ʷəʔ.xe₁.tə́n] ‘shoelace’
lace.up-foot-INS (T&T 1996:306)

Since nearly every stressed schwa in the language is predictable, appearing immediately before the final consonant of the word, we conclude that stressed schwas are epenthetic in nɬeʔkepmxcín.[16]

The stress pattern, as described so far, is slightly complicated when unstressable morphology attaches to what would otherwise be a completely stressable stem. Recall that prefixes, clitics, and unstressable suffixes are all incapable of hosting primary stress regardless of their shape. For unstressable suffixes and enclitics, we show them to be unstressable using the pattern of stress-induced schwa epenthesis. Unstressable suffixes generally are the outermost suffixes in any given stem; enclitics, by definition, are closer to the edge of the word than any suffix. In a form containing both stressable and unstressable morphemes, a stressable morpheme is always the host for stress, even if an unstressable morpheme contains an underlying full vowel and all the stressable morphemes do not. In these cases, a stressed schwa is found immediately before the final consonant of the final weak morpheme, as if that consonant were the last one in the word. Examples are shown below in (53)–(56) with the stressable morphemes in curly braces { }.

[16] See Section 4.1 for cases that appear to deviate from this pattern.

(53) /{x̣ʷn}-t/	[x̣ʷə́nt]	'fast'	
fast-IMM	(not [x̣ʷə.nə́t])		(Hall & Phillips *this volume*)
(54) /{x̣ʷn}-t-e/	[x̣ʷə́n.te]	'Hurry!'	
fast-IMM-IMP	(not [x̣ʷn.té] or [x̣ʷə.nə́.te])		(T&T 1996:435)
(55) /e={ʕʷy-p}=us/	[e.ʕʷə.yə́.pus]	'when it burned…'	
D/C=burn-INCH=3SBJV	(not [e.ʕʷi.pús])		(Hall & Phillips *this volume*)
(56) /s={ʕʷy-p}=s/	[sʕʷə.yə́ps]	'…(and) it burned.'	
NMLZ=burn-INCH=3POSS	(not [sʕʷi.pə́s])		(Hall & Phillips 2024:150)

Prefixes, and by extension proclitics, are incapable of hosting primary stress; evidence for this comes from the position of stress when a weak root is combined with multiple ambivalent suffixes. Recall that in these cases, stress surfaces on the initial ambivalent suffix. If we assume that all weak roots lack underlying vowels, then we can generalize this pattern further by saying that in these cases, stress is assigned to the initial underlying vowel. If prefixes with underlying full vowels are added to words like this, they are "skipped" by the stress assignment. Examples of this are provided below.

(57) /ʔes-{ch-s-t-exʷ}/	[ʔes.cəs.téxʷ]	'You stored it.'	
STAT-store-CAUS-TR-2SG.ERG			(Hall & Phillips 2024:147)
(58) /ʔes-{yʕʷ-s-t-em}/	[ʔes.yəʕʷ.stém]	'He/she/they were hidden by someone.'	
STAT-hide-CAUS-TR-PASS			(Hall & Phillips 2024:151)
(59) /ʔes-{k̓łʕʷ-s-t-es}/	[ʔes.k̓łəʕʷ.stés]	'He/she/they made something uneven.'	
STAT-uneven-CAUS-TR-3ERG			(T&T 1996:111)

Furthermore, when a prefix attaches to an otherwise vowelless stem, an epenthetic schwa in the stem bears stress, even if the prefix has an underlying full vowel as in (42) and (44) above.

The combination of facts that prefixes, clitics, and unstressable suffixes are all incapable of hosting primary stress and that they are all closer to the edges of the word than any stressable morpheme, leads us to the conclusion that there is a phonological domain in which stress is assigned to stems and that weak, strong, or ambivalent morphemes are present in the input; prefixes, clitics, and unstressable suffixes are excluded from this domain. We define this as the phonological domain for stress assignment. We summarize the stressed schwa pattern as:

> *Stressed Schwa Pattern*: In the absence of underlying full vowels in the phonological domain where stress is assigned, a stressed schwa surfaces immediately before the final consonant of that domain.

3 Analysis

3.1 Theoretical assumptions

The following analysis uses Optimality Theory (Prince and Smolensky 1993/2004) to analyze schwa epenthesis and stress assignment in nłeʔkepmxcín. Syllabificiation is modeled through interactions between well-formedness constraints and restrictions on the prosodic structure of syllables. Stress-induced schwa epenthesis is modeled through interactions between preferences for rightwards-alignment of stress and maintaining underlying moraic structure.

We adopt a Moraic Theory approach to syllabification (e.g., Hyman 1985; Hayes 1989), which we pair with some crucial assumptions needed for an account of Salish syllable structure (see, e.g., Mellesmoen 2025:109–112). We assume two prosodic units under the level of the syllable: the mora and nucleus node. While onset segments are never moraic and coda segments are always moraic, nuclear segments may be either moraic or non-moraic.

We assume that full vowels (i.e., vowels other than schwa) always surface as moraic, except vowels that result from vocalization of resonants (see sections 2.2.7 and 2.2.8) and schwa colouring (see section 2.1.1). To achieve this, we posit that full vowels are distinguished with respect to phonological features. This could involve having an underlying specification for V-Place (vowel place), in the sense of Clements and Hume (1995), which consonants and schwas lack, as suggested by Mellesmoen (2025:161). However, we leave the theoretical details of these features to future work, and simply make use of constraints that are sensitive to the category of full vowels.

Lexical accent is represented as underlying moraicity, with accented vowels linked to moras in the underlying representation and unaccented vowels not linked to moras. This assumption allows us to explain why accented vowels preferentially host stress and why unaccented vowels delete. It also allows us to use a single faithfulness constraint to explain why the first full vowel both preferentially hosts stress in words with no accent in forms like (36) and (37), and is preserved, even when unaccented and unstressed, in forms (38) and (39). Finally, it suggests a mechanism for allowing glides to be incorporated into diphthongal nuclei with accented vowels (but not unaccented vowels or schwas) by allowing the underlying mora to branch and be shared by the glide. We leave the details of this last point to future work.

We follow Matthewson (1994) and Blake (2000) in assuming that schwas in Salish are epenthetic, such that they are never present in the underlying representations of lexical items. In contrast, all other vowels in the language may be present in the lexicon. However, we break from authors who posit that schwa is always non-moraic in Salish languages (Shaw 1993; Matthewson 1994; Shaw et al. 1999; Blake 2000). Specifically, we distinguish unstressed schwa, which is non-moraic, from stressed schwa, which we argue is moraic. This helps to resolve an apparent asymmetry where stressed schwa syllables seem less tolerant of complex structure than unstressed schwa syllables, which is a typologically implausible outcome (Dresher & van der Hulst 1998). It also leads to the useful generalization that stressed vowels are always moraic.

For the purposes of the present analysis, we assume that clitics, prefixes, and unstressable suffixes are outside the domain for stress. They may occur at a later stage in the derivation (e.g., at a different stratum as in Mellesmoen 2025), involve co-phonologies (see e.g., Downing 2008), or involve other constraints that refer to either specific domains or types of morphemes (e.g., constraints that refer to morphological classifications like root as in Urbanczyk 2001).

We assume that several processes which are opaque to stress and the related pattern of vowel deletion happen either at a later stage of phonological derivation or at the level of phonetics; these include nasal vocalization and glide vocalization in syllable nuclei, schwa colouring, and excrescent schwa insertion. There is some evidence that these processes may interact with segments outside the phonological domain where stress is assigned (e.g., nasal vocalization occurring in an unstressable morpheme in (31) /{qéck}-m₁p/ → [qéc.ke₁p]). We will demonstrate the opacity of these phenomena but otherwise ignore them in our analysis. Specifically, we will treat vocalized consonants as identical to syllabic consonants, coloured schwas as identical to other schwas, and excrescent schwas as non-existent.

We also do not analyze several consonantal phenomena in this paper; we consider outputs that have already undergone these processes in our candidates: deletion of the transitivizer /-t/, nasal deletion, and consonant coalescence (e.g., [ts] surfacing as the affricate [c]). We include a note when these processes occur. It is possible that some of them result from a combination of fast-speech reduction and lexicalization, though we remain agnostic as to their sequence in the derivation relative to other phenomena at present.

3.2 Schwa Epenthesis for Syllabification

In this section, we lay out phonotactic constraints that are relevant with respect to prohibited syllable structures and preferences between different tolerated marked structures in nłeʔkepmxcín. We describe how these constraints contribute to two different repair strategies: epenthesis of unstressed schwa and syllabification of consonants.

3.2.1 Constraints for Syllable Structure

A number of constraints are required to account for the patterns of stress assignment and schwa epenthesis. We first define all the constraints used in the analysis before presenting the ranking and analysis in the following sections.

The constraint in (60) prevents underlyingly non-moraic segments from surfacing as moraic in nuclei. It is violated both when moraic vowels are inserted, and when underlyingly non-moraic (i.e., unaccented) vowels are given moraicity. The latter case will become more relevant in sections 3.3 and 3.4 below.

(60) DEP-μ(N): Do not insert a mora in a nuclear position.

Mellesmoen (2025:160) uses DEPLINK-μ(N) to prevent full vowel epenthesis to account for certain types of reduplication where a floating mora is present in the input; she adapts this constraint from one used by Prillop (2013) to model phenomena related to vowel length in Estonian. Drawing insight from these analyses, we propose DEP-μ(N) to penalize the addition of a full vowel into a nuclear position, given that there is no underlying mora in the input; epenthesis of a stressed schwa or a full vowel will require epenthesis of a mora associated with a nucleus. This could not be achieved with the simpler constraint DEP-μ, which is violated by epenthesis of a mora generally, because it would also be violated by the predictable insertion and association of moras with coda consonants (i.e., weight-by-position assignment of moras). If DEP-μ were used, it would lead to a preference for parsing consonants into complex onsets rather than complex codas when both would be well-formed, which is not supported by the data.

An additional constraint pertaining to vowel weight is given in (61). Together with the constraint in (60), this constraint ensures that schwa is the default epenthetic vowel in unstressed environments by prohibiting vowels which are not schwa from surfacing as non-moraic.

(61) FULLVOWELWEIGHT [FVWT]: Every full vowel must be linked to a mora.

The constraint in (61) also leads to deletion of underlyingly non-moraic (i.e. unaccented) vowels, which will be discussed in the following sections. Note that this constraint is not violated by schwa colouring, which do not count as full vowels for the purposes of this constraint. While we do not fully analyze these cases, we assume this happens through sharing of a consonant place feature and thus does not affect this constraint. (See discussion of full vowels in 3.1.)

The constraint in (62) prohibits onset clusters of three or more consonants. It appears to be unviolated in nɬeʔkepmxcín. It is equivalent to the constraint SEGBINMAX used by Matthewson (1994:385), based on binarity constraints proposed by Hewitt (1994).

(62) ONSBINMAX: A syllable onset may not contain more than two consonants.

The constraint in (63) prohibits resonants from appearing in complex onsets. It appears to be unviolated in nɬeʔkepmxcín. Importantly, this constraint differs from the Sonority Sequencing Principle (SSP) (Clements 1990), because it is violated not only by [RO-] onsets with falling sonority profiles (which could be prohibited in onsets on the grounds of violating the SSP), but also by [OR-] onsets with rising sonority profiles (which do not violate the SSP) and [RR-] onsets with flat sonority profiles (which are tolerated in [OO-] onsets). This constraint is a variation on *COMPLEXONSET, though it rules out specific segments (resonants) in a complex onset.

(63) *BRANCHONSET(RESONANT) [*BRONS(RES)]: A syllable onset with multiple segments may not contain a resonant.

Another constraint pertaining to clusters is given in (63); this constraint also differs from the SSP because it is not only violated by [-OR] codas with rising sonority profiles (which could be prohibited in codas on the grounds of violating the SSP), but also by [-RR] codas with flat sonority profiles (which are tolerated in [-OO] codas). However, this constraint is not completely analogous to *BRONS(RES) because it is satisfied by [-RO] clusters.

(64) *CodaCR: A syllable coda may not contain a consonant followed by a resonant.

The constraint in (65) is violated by superheavy syllables, i.e., syllables with more than two moras. It accounts for the avoidance of complex codas in stressed syllables while not penalizing them in syllables with non-moraic nuclei. The effect of this constraint is roughly equivalent to that of MORBINMAX used by Matthewson (1994:385) (also cf. *UNSTRESSED$\sigma_{\mu\mu\mu}$ in Mellesmoen 2025:660).

(65) *$\sigma_{\mu\mu\mu}$: Syllables may not dominate more than two moras.

The nucleus-related constraints given in (66) are violated whenever a specific type of consonant becomes syllabic (McCarthy 2002; Levi 2008). Recall that we treat instances of resonant vocalization the same as other syllabic consonants, so these also incur violations of these constraints.

(66) {*NUC/CONS}: a consonant may not form the nucleus of a syllable

a. *NUC/GLIDE [*NUC/GL]: An underlying glide may not surface as the nucleus of a syllable.
b. *NUC/NASAL [*NUC/NAS]: An underlying nasal may not surface as the nucleus of a syllable.
c. *NUC/LIQUID [*NUC/LIQ]: An underlying liquid may not surface as the nucleus of a syllable.

The constraint in (67) is violated by complex onsets. It is standard in Optimality Theoretic accounts of syllable structure (McCarthy & Prince 1994), and is widely used in the literature on Salish languages (Blake 2000:137; Mellesmoen 2025:149).

(67) *COMPLEXONSET [*COMPONS]: An onset may not contain multiple consonants

The basic faithfulness constraints in (68) are violated when the segmental structure of the underlying representation is modified (McCarthy & Prince 1994). We will only use DEP-IO in this section to capture the avoidance of schwa epenthesis—MAX-IO is presumably ranked very high in Salish, and deletion is not a preferred repair strategy for consonant clusters.

(68) General faithfulness constraints.

a. MAX-IO: Do not delete segments.
b. DEP-IO: Do not insert segments

Before presenting the tableaux, we give a preview of the crucial rankings to we will demonstrate in this section to derive syllable structure-related schwa epenthesis:

- ONSBINMAX, *BRONS(RES), *NUC/LIQ, *$\sigma_{\mu\mu\mu}$ ≫ DEP-IO ≫ *COMPONS ≫ *NUC/NAS, *NUC/GL
- DEP-μ(N), ALIGN-R ≫ *$\sigma_{\mu\mu\mu}$

Instead of building up the analysis gradually, we provide the overall ranking at the outset. We give tableaux that establish individual rankings but include other constraint rankings that will be established at a later point in the analysis. For example, we show *COMPLEXONSET with a low ranking in the first few tableaux before we have motivated its position in the overall grammar of the language. However, all crucial rankings are justified at some point in the following sections.

3.2.2 Onsets

The tableau in (69) shows that onsets with more than two consonants are repaired by epenthesis of a (non-moraic) schwa. Without epenthesis, ONSBINMAX would be violated because there would be an onset with three consonants (candidate (69)(69)). If a non-moraic full vowel were inserted, FVWT would be violated (candidate(69)). If a moraic vowel were inserted, DEP-μ(N) would be violated (candidates (69)(69) and (69)(69)).

(69) Onset clusters of more than two consonants are prohibited.
[təq.tés] 'He/she/they touched it' (T&T 1996:351)
ONSBINMAX ≫ DEP-IO

	/tq-t-es/	ONSBINMAX	FVWT	DEP-μ(N)	DEP-IO
a.	[**tqté$_μ$s$_μ$**]	*!			
b. ☞	[təq$_μ$.**té$_μ$s$_μ$**]				*
c.	[taq$_μ$.**té$_μ$s$_μ$**]		*!		*
d.	[ta$_μ$q$_μ$.**té$_μ$s$_μ$**]			*!	*
e.	[tə$_μ$q$_μ$.**té$_μ$s$_μ$**]			*!	*

The tableau in (70) shows that onsets with two consonants are not repaired with schwa epenthesis (candidates (70) and (70)(70)), provided that both consonants are obstruents.

(70) Complex onsets are tolerated and preferred to superheavy syllables.
[kɬə́p] 'become separated' (Hall & Phillips *this volume*)
*$σ_{μμμ}$, DEP-IO ≫ *COMPONS

	/kɬ-p/	*$σ_{μμμ}$	DEP-IO	*COMPONS
a.	[**kə́$_μ$ɬ$_μ$p$_μ$**]	*!	*	
b. ☞	[**kɬə́$_μ$p$_μ$**]		*	*
c.	[kə.**ɬə́$_μ$p$_μ$**]		**!	

Tableau (71) shows that onsets which contain an obstruent are repaired by schwa epenthesis. As discussed in the following sections, a moraic schwa must be inserted to host stress. If an additional schwa were not inserted, then either a superheavy syllable would be created, violating *$σ_{μμμ}$ (candidate (71)(71)), or the complex onset [sl-] containing a resonant would be present, violating *BRONS(RES) (candidate (71)). Note that candidate (71) is ruled out despite having a rising sonority profile, supporting the inclusion of *BRONS(RES) in our analysis; onset clusters with flat or falling sonority profiles are analyzed similarly if they contain at least one resonant.

(71) Onset clusters containing resonants are prohibited.
[sə.lə́k] 'turn' BP
*BRONS(RES), *$σ_{μμμ}$ ≫ DEP-IO

	/slk/	*BRONS(RES)	*$σ_{μμμ}$	DEP-IO	*COMPONS
a.	[**sə́$_μ$l$_μ$k$_μ$**]		*!	*	
b.	[**slə́$_μ$k$_μ$**]	*!		*	*
c. ☞	[sə.**lə́$_μ$k$_μ$**]			**	

The tableau in (72) shows that when a schwa is inserted to break up a sequence of three or more consecutive consonants, the location is determined by a preference for avoiding complex onsets, unless it would violate other (higher ranked) markedness constraints. Note that it is only because the inserted schwa is non-moraic that the complex coda in (72)(72) does not create a superheavy syllable. The unattested form *[skəps.tés] (candidate (72)) presents a problem because it has the same violations as the attested candidate in (72). The analysis therefore does not select between the two forms. There are several analyses that could successfully eliminate (72), such as a weak preference for place agreement in consonant clusters (respected by [st-] but violated by [sk-]) or a weak dispreference for syllables like [skəps] with complex onsets and codas simultaneously.

(72) Complex codas are tolerated and preferred to complex onsets.
[səkp.stés] ‘He/she/they managed to hit something with a club’ (T&T 1996:320)
ONSBINMAX ≫ DEP-IO, *COMPONSET

		/sk-p-s-t-es/	ONSBINMAX	DEP-IO	*COMPONS
a.	??	[**sək$_{\mu}$p$_{\mu}$.sté$_{\mu}$s$_{\mu}$**]		*	*
b.		[skəp$_{\mu}$.**sté$_{\mu}$s$_{\mu}$**]		*	**!
c.	??	[skəp$_{\mu}$s$_{\mu}$.**té$_{\mu}$s$_{\mu}$**]		*	*
d.		[sə.kəp$_{\mu}$.**sté$_{\mu}$s$_{\mu}$**]		**!	*
e.		[**skpsté$_{\mu}$s$_{\mu}$**]	*!		*
f.		[sək$_{\mu}$.**psté$_{\mu}$s$_{\mu}$**]	*!	*	*

The tableau in (73) shows that underlying nasals will serve as nuclei to avoid prohibited syllable structures (in this case, a complex coda with resonant in non-initial position), as shown in candidates (73) and (73); a syllabic nasal is preferred over schwa epenthesis (candidate (73)(73) and (73)(73)). Depending on the context, these nuclei can surface as either syllabic nasals or vocalize to [e] (see Section 2.2.8).

(73) Both syllabic and vocalized nasals are tolerated.
[máʕ.xe.tn] ‘moon’ BP, CMA, KBG
*CODACR, DEP-IO ≫ *NUC/NAS

		/má$_{\mu}$ʕ-xn-tn/	*CODACR	*$\sigma_{\mu\mu\mu}$	DEP-IO	*NUC/NAS
a.		[**má$_{\mu}$ʕ$_{\mu}$x$_{\mu}$n$_{\mu}$t$_{\mu}$n$_{\mu}$**]	*!	*		
b.		[**má$_{\mu}$ʕ$_{\mu}$**.xn$_{N}$t$_{\mu}$n$_{\mu}$]	*!			*
c.	☞	[**má$_{\mu}$ʕ$_{\mu}$**.xn$_{N}$.tn$_{N}$]				**
d.		[**má$_{\mu}$ʕ$_{\mu}$**.xn$_{N}$.tən$_{\mu}$]			*!	*
e.		[**má$_{\mu}$ʕ$_{\mu}$**.xən$_{\mu}$.tən$_{\mu}$]			*!*	

Nasal vocalization: [máʕ.xn$_{N}$.tn$_{N}$] → [má$_{\mu}$ʕ$_{\mu}$.xe.tn$_{N}$] (note the second syllabic nasal remains unvocalized)

The tableau in (74) shows a syllabic glide. However, it does not provide conclusive evidence to support the analysis that a glide has vocalized, as the form [ƛ̓əy̓.kʷə́m] (candidate (74)) would surface as [ƛ̓iy̓.kʷə́m] through schwa colouring, which is difficult or impossible to distinguish from the surface form [ƛ̓iʔ.kʷə́m]. There is no evidence that the rimes [iy̓] and [iʔ] contrast. Therefore, this example does not provide certainty that DEP-IO crucially outranks *NUC/GL. However, more conclusive evidence is provided by reduplication, which results in [y̓] in onset position, as shown in tableau in (75).

(74) Syllabic glides are tolerated (limited evidence from non-reduplicative context).
[ƛ̓iʔ.kʷə́m][17] ‘take something down from above’ (T&T 1996:178)
{OnsBinMax, *BrOns(Res)}, Dep-IO ≫ *Nuc/Gl

/ƛ̓ỷkʷ-m/	OnsBinMax	*BrOns(Res)	Dep-IO	*Nuc/Gl
a. **[ƛ̓ỷkʷə́$_\mu$m$_\mu$]**	*!	*!	*	
b. ☞ [ƛ̓ỷ$_N$.**kʷə́$_\mu$m$_\mu$**]			*	*
c. [ƛ̓əỷ$_\mu$.**kʷə́$_\mu$m$_\mu$**]			**!	

Glide vocalization: [ƛ̓ỷ$_N$.kʷə́m] → [ƛ̓iʔ.kʷə́m]

The tableau in (75) shows that glide vocalization is indeed preferred to schwa epenthesis, as the candidate with schwa epenthesis (candidate (75)), is distinct from the surface form. This word exists as a cognate in St’át’imcets where it surfaces as [ʕʷə́ʕʷ.ỷət] without glide vocalization (Davis & Mellesmoen (2023:13).

(75) Vocalized glides are tolerated.
[ʕʷó.ʕʷiʔt] ‘take a nap’ (T&T 1996:480)
*$\sigma_{\mu\mu\mu}$, Dep-IO ≫ *Nuc/Gl

/ʕʷo$_\mu$<ʕʷ>ỷt/	*$\sigma_{\mu\mu\mu}$	Dep-IO	*Nuc/Gl
a. **[ʕʷó$_\mu$<ʕʷ>$_\mu$ỷ$_\mu$t$_\mu$]**	*!		
b. ☞ [**ʕʷó$_\mu$.**<ʕʷ>ỷ$_N$t$_\mu$]			*
c. [**ʕʷó$_\mu$<ʕʷ>**.ỷət$_\mu$]		*!	

Glide vocalization: [ʕʷó.ʕʷỷ$_N$t] → [ʕʷó.ʕʷiʔt]

The tableau in (76) shows that liquids may not become syllabic, even if a syllabic liquid would avoid schwa epenthesis while creating an otherwise unmarked syllable structure (candidate (76)).

(76) Syllabic liquids are prohibited
[səl.kə́p] ‘become turned around’ (T&T 1996:321)
OnsBinMax, *Nuc/Liq ≫ Dep-IO

/slk-p/	OnsBinMax	*BrOns(Res)	*Nuc/Liq	*$\sigma_{\mu\mu\mu}$	Dep-IO
a. **[sə́$_\mu$l$_\mu$k$_\mu$p$_\mu$]**				*!	*
b. **[slə́$_\mu$k$_\mu$p$_\mu$]**		*!		*	*
c. **[slkə́$_\mu$p$_\mu$]**	*!	*!			*
d. [sl$_N$.**kə́$_\mu$p$_\mu$**]			*!		*
e. ☞ [səl$_\mu$.**kə́$_\mu$p$_\mu$**]					**

3.2.3 Codas and Syllable Weight

The tableau in (77) shows that superheavy syllables are tolerated when possible repairs would violate high ranked constraints related to stress. A syllable with a stressed schwa would violate Dep-μ(N), as shown in candidate (77), while an unstressed schwa would violate Align-R

[17] The form [ƛ̓iʔ.kʷm$_N$] with a syllabic nasal would be optimal in terms of syllable structure alone, but with stress would violate at least one higher-ranking stress constraint (either *HdNuc/C or Align-R).

(candidate (77)). The constraint ALIGN-R will be defined in (80) below; it is only used here to illustrate a case in which a superheavy syllable is tolerated.

(77) Superheavy syllables are tolerated to satisfy stress-related constraints.
[síƛ̓q̓t] 'day' BP, CMA
DEP-μ(N), ALIGN-R ≫ *$\sigma_{\mu\mu\mu}$

/siƛ̓q̓t/	DEP-μ(N)	ALIGN-R	*$\sigma_{\mu\mu\mu}$	DEP-IO
a. ☞ **[sí$_\mu$ƛ̓$_\mu$q̓$_\mu$t$_\mu$]**			*	
b. [si$_\mu$ƛ̓$_\mu$.**q̓ə́$_\mu$t$_\mu$**]	*!			*
c. [**sí$_\mu$ƛ̓$_\mu$**.q̓ət$_\mu$]		*!		*

The tableau in (78) shows that violating ALIGN-R is tolerated to avoid a complex coda with a resonant in non-initial position. The attested form, given as candidate (78), is repaired by epenthesizing a schwa. A stressed schwa is not epenthesized, as demonstrated by candidate (78). A syllabic liquid is not an option, as shown in candidate (78).

(78) Complex codas with resonants in non-initial position are prohibited.
[ʔík^w.ləx^w] 'dream' CMA
*CODACR, DEP-μ(N) ≫ ALIGN-R
*NUC/LIQ ≫ DEP-IO

/ʔi$_\mu$k^{w}lx^w/	*CODACR	*NUC/LIQ	DEP--μ(N)	ALIGN-R	*$\sigma_{\mu\mu\mu}$	DEP-IO
a. **[ʔí$_\mu$k$^w{}_\mu$l$_\mu$x$^w{}_\mu$]**	*!				*	
b. [ʔi$_\mu$k$^w{}_\mu$.**lə́$_\mu$x$^w{}_\mu$**]			*!			*
c. ☞ [**ʔí$_\mu$k$^w{}_\mu$**.ləx$^w{}_\mu$]				*		*
d. [**ʔí$_\mu$**.k^{w}l$_N$x$^w{}_\mu$]		*!		*		

3.3 Stress Assignment at Full Vowels

In this subsection, we lay out constraints that explain the patterns of stress assignment at full vowels. We motivate stress assignment on the last accented vowel by integrating a gradient alignment constraint. Stress assignment to the initial full vowel in the absence of accent and deletion of non-initial unaccented vowels is modeled through the interaction of an anchoring constraint preserving the initial full vowel, minimal weight requirements for full vowels, and weight faithfulness in nuclei. We account for words where no full vowels are present in Section 3.4.

3.3.1 Constraints for Stress Assignment with Full Vowels

The constraint in (79) ensures that there is one and only one instance of primary stress (Alderete 2001). Given that we assume that lexical accent corresponds to an underlying mora, rather than underlying stress, no stress-related faithfulness constraints are violated if a vowel with an underlying mora does not bear stress in the surface form; the vowel will remain connected to its mora in the output. This constraint ensures that there is one head syllable, which further ensures that necessary prosodic structure will be built (and one syllable will bear primary stress).

(79) CULMINATIVITY-PRWD [CULMINATIVITY]: Every prosodic word must have exactly one head syllable.

A gradient alignment constraint (McCarthy & Prince 1993a), given in (80), prefers stress to surface on a syllable as close to the end of the word as possible. This results in stress surfacing on the rightmost vowel with an underlying mora; it will also result in epenthesis of stressed schwa in the word-final syllable. Because this constraint counts syllables, rather than segments, it does not fully account for the precise location where stressed schwa is inserted; the constraints $*\sigma_{\mu\mu\mu}$ (65), HEADNUCWT (81), and HEADSYLLWT (88) account for this. While gradient alignment constraints are generally undesirable (McCarthy 2003), we require gradience to account for cases with multiple vowels with an underlying mora where the last one is not in the rightmost syllable of the word (84). While it should be possible to achieve the same result with multiple categorical constraints,[18] we use the current analysis both for simplicity and to capture the generalization that rightwards stress alignment is always preferred in the language.

(80) ALIGN-R(σ_h, PrWd) [ALIGN-R]: Assign one violation for each *syllable* which intervenes between the right edge of each head syllable and the right edge of the prosodic word.

The constraint in (81) ensures stressed vowels are always moraic; it is unviolated in our analysis. This constraint forces all vowels, including schwa, to be moraic if they host stress. When combined with DEP-μ(N), this constraint serves the same purpose as *P/ə as used by Mellesmoen (2025:218).

(81) HEADNUCLEUSWEIGHT [HDNUCWT]: The nucleus of a head syllable must dominate a mora.

The constraint in (82) prevents syllabic consonants from bearing stress, including vocalized glides and nasals. This is consistent with how sonority-driven stress is modeled by De Lacy (2004). We chose to penalize candidates with syllabic consonants, rather than candidates with segments that bear more weight (i.e. linking to moras) for two reasons: (i) a blanket prohibition on inserting moras to associate with consonants (e.g., DEP-μ(C)) would not work, as it would be violated whenever a mora is inserted into a coda position; and (ii) a specific prohibition on linking moras to consonants in nuclei (e.g., DEPLINK-μ(N/C)) would be at odds with the way we seek to understand diphthongs via sharing an underlying mora with a neighbouring glide in a nucleus. Note that *HEADNUCLEUS/C is violated when stress is assigned to underlying resonants.

(82) *HEADNUCLEUS/C [*HDNUC/C]: The nucleus of a head syllable must not dominate a consonant.

The constraint in (83) preserves the leftmost full vowel in the input, forcing it to surface as moraic to avoid violating FVWT. This leads to stress assignment to the leftmost full vowel when there are no accented vowels present in order to satisfy weight faithfulness by avoiding linking more moras than necessary to nuclei (85). However, it is independent from stress; it still protects the leftmost full vowel when a following vowel has an underlying mora (86). It is a standard anchor

[18] E.g., a categorical alignment constraint at the syllable level could ensure stress-induced schwa epenthesis occurs in the word-final syllable, while a right-anchoring constraint on underlying moras could ensure stress surfaces on the rightmost accented vowel.

constraint (McCarthy & Prince 1993b), except that it is sensitive to a special phonological feature that distinguishes full vowels from vocalized resonants and schwas, as discussed in Section 3.1.

(83) L-ANCHOR(FULLVOWEL) [L-ANCH(FV)]: The first vowel in the input word must correspond to the first full vowel (vowel place node) in the output prosodic word.

Before presenting the tableaux, we give a preview of the crucial rankings that we motivate in the following section to derive stress assignment involving full vowels.

- *HDNUC/C, HDNUCWT, FVWT, L-ANCH(FV), DEP-μ(N) ≫ ALIGN-R
- FVWT, L-ANCH(FV) ≫ DEP-μ(N) ≫ MAX-IO(V)

3.3.2 Tableaux for Stress Assignment with Full Vowels

The tableau in (84) demonstrates how ALIGN-R interacts with DEP-μ(N) to ensure the rightmost vowel with an underlying mora receives stress. When the vowel that receives stress is not the rightmost vowel with an underlying mora, ALIGN-R is violated more times than necessary (candidates (84) and (84)); this crucially relies on the gradient nature of ALIGN-R. When the rightmost vowel with an underlying mora receives stress, ALIGN-R is still violated, as it is not the rightmost syllable (candidate (84)), but this is optimal because a syllable further to the right cannot bear stress without violating either DEP-μ(N) (candidates (84) and (84)) or HDNUCWT (candidates (84) and (84)).

(84) Rightmost vowel with an underlying mora receives stress (i.e., when there's multiple strong morphemes).
[wi.kn.wen̓.tí.ye.tm] 'They managed to see it.' BP
*HDNUC/C, HDNUCWT, DEP-μ(N) ≫ ALIGN-R

/wi$_{\mu}$k-nwe$_{\mu}$n̓-t-i$_{\mu}$yxs-n-t-em/		*HDNUC/C	HDNUCWT	DEP-μ(N)	ALIGN-R
a.	[**wí$_{\mu}$**.kn.we$_{\mu}$n̓$_{\mu}$.ti$_{\mu}$.yn$_{N}$.tm$_{N}$]				***!**
b.	[wi$_{\mu}$.kn.**wé$_{\mu}$n̓$_{\mu}$**.ti$_{\mu}$.yn$_{N}$.tm$_{N}$]				***!
c. ☞	[wi$_{\mu}$.kn.we$_{\mu}$n̓$_{\mu}$.**tí$_{\mu}$**.y$_{\mu}$n$_{N}$.tm$_{N}$][19]				**
d.	[wi$_{\mu}$.kn.we$_{\mu}$n̓$_{\mu}$.ti$_{\mu}$.**yń$_{N\mu}$**.tm$_{N}$]	*!		*	*
e.	[wi$_{\mu}$.kn.we$_{\mu}$n̓$_{\mu}$.ti$_{\mu}$.yn$_{N}$.**té$_{\mu}$m$_{\mu}$**]			*!	
f.	[wi$_{\mu}$.kn.we$_{\mu}$n̓$_{\mu}$.ti$_{\mu}$.yn$_{N}$.**tə́$_{\mu}$m$_{\mu}$**]			*!	
g.	[wi$_{\mu}$.kn.we$_{\mu}$n̓$_{\mu}$.ti$_{\mu}$.yn$_{N}$.**tém$_{\mu}$**]		*!		
h.	[wi$_{\mu}$.kn.we$_{\mu}$n̓$_{\mu}$.ti$_{\mu}$.yn$_{N}$.**tə́m$_{\mu}$**]		*!		

Nasal vocalization: [wi.kn.wen̓.tí.yn$_{N}$.tm$_{N}$] → [wi.kn.wen̓.tí.ye.tm$_{N}$]

Tableau (85) demonstrates how L-ANCH(FV) interacts with DEP-μ(N) to ensure stress surfaces on the leftmost full vowel in the absence of an underlying mora. Since there are no underlying moras, at least one nucleus must become moraic and receive stress to satisfy CULMINATIVITY and HDNUCWT (not shown), violating DEP-μ(N) once. Additionally, the leftmost full vowel must become moraic, violating DEP-μ(N) once, as it would otherwise have to surface as non-moraic,

[19] The segments /xs/ delete, but we do not attempt to determine the factors conditioning this process.

violating FVWT (candidate (85)), or delete, violating L-ANCH(FV) (candidate (85)). Therefore, the only way to avoid having two separate violations of DEP-μ(N) (candidates (85) and (85)) is for the leftmost full vowel to be the vowel which receives stress, resulting in only one violation of DEP-μ(N), but violating ALIGN-R (candidate (85)). Other full vowels must delete, because if they surfaced as moraic it would result in an additional violation of DEP-μ(N) (candidate (85)), and if they surfaced as non-moraic it would violate FVWT (candidate (85)).

(85) Leftmost input vowel without an underlying mora receives stress, others delete (i.e. in cases where the root is weak and there are multiple ambivalent suffixes).
[kəł.pék.stms] 'He dropped it.' BP
FVWT, L-ANCH(FV), DEP-μ(N) ≫ ALIGN-R
FVWT, DEP-μ(N) ≫ MAX-IO(V)

/kɬ-p-ekst-min-t-es/	FV WT	L-Anch (FV)	DEP-μ(N)	ALIGN-R	Max-IO (V)	DEP-IO
a. ☞ [kəł$_{\mu}$.**pé$_{\mu}$k$_{\mu}$**.stm$_{N}$s$_{\mu}$][20]			*	*	**	*
b. [kəł$_{\mu}$.pek$_{\mu}$s$_{\mu}$.**tmé$_{\mu}$s$_{\mu}$**]	*!		*		*	*
c. [kəł$_{\mu}$.pək$_{\mu}$s$_{\mu}$.**tmé$_{\mu}$s$_{\mu}$**]		*!	*		**	*
d. [kəł$_{\mu}$.pe$_{\mu}$k$_{\mu}$.sət.**mé$_{\mu}$s$_{\mu}$**]			**!		*	**
e. [kəł.pe$_{\mu}$k.sət.**mə́$_{\mu}$s$_{\mu}$**]			**!		**	**
f. [kəł$_{\mu}$.**pé$_{\mu}$k$_{\mu}$**.sət.me$_{\mu}$s$_{\mu}$]			**!	**	*	**
g. [kəł$_{\mu}$.**pé$_{\mu}$k$_{\mu}$**.sət.mes$_{\mu}$]	*!		*	**	*	**

The tableau in (85) also demonstrates that syllabic nasals pattern differently than full vowels; they do not undergo deletion. The nucleus [m$_{N}$] in candidate (85a)(85) surfaces unstressed, rather than undergoing deletion like the unaccented vowels. Similar examples with vocalized nasals, e.g., (31) /qéckm$_{1}$p/ → [qéc.ke$_{1}$p], demonstrate that they are also opaque to unaccented vowel deletion.

The tableau in (86) demonstrates that L-ANCH(FV) ensures that the leftmost full vowel is preserved even when unstressed. As there is a vowel with an underlying mora to the right of the leftmost full vowel, stress cannot be assigned to the leftmost full vowel as that would violate ALIGN-R too many times (candidate (86)). As in (85) above, the leftmost full vowel must become moraic, violating DEP-μ(N), as it would otherwise surface as non-moraic, violating FVWT (candidate (86)), or delete, violating L-ANCH(FV) (candidate (86)); other unaccented vowels must delete to avoid either violating FVWT (candidate (86)) or incurring unnecessary violations of DEP-μ(N) (candidate (86)).

[20] The segments /nt/ delete, but we do not attempt to determine the factors in this process.

(86) Leftmost vowel does not delete when unstressed (weak root, strong suffix after ambivalent suffixes).

[ʔes.kəɬ.pek.stm.tíy͜$_{N}$xs] ‘They dropped it.’ (Hall & Phillips 2024:134)

FVWt, L-Anch(FV) ≫ Dep-μ(N) ≫ Max-IO(V)

/kɬ-p-ekst-min-t-i$_{\mu}$yxs/	FVWt	L-Anch(FV)	Dep-μ(N)	Align-R	Max-IO(V)
a. [kəɬ$_{\mu}$.**pé$_{\mu}$k$_{\mu}$**.stm$_{N}$.ti͜y$_{N\mu}$x$_{\mu}$s$_{\mu}$]			*	*!*	*
b. ☞ [kəɬ$_{\mu}$.pe$_{\mu}$k$_{\mu}$.stm$_{N}$.**tí͜y$_{N\mu}$x$_{\mu}$s$_{\mu}$**][21]			*		*
c. [kəɬ$_{\mu}$.pek$_{\mu}$s$_{\mu}$.tm$_{N}$.**tí͜y$_{N\mu}$x$_{\mu}$s$_{\mu}$**]	*!				*
d. [kəɬ$_{\mu}$.pək$_{\mu}$s$_{\mu}$.tm$_{N}$.**tí͜y$_{N\mu}$x$_{\mu}$s$_{\mu}$**]		*!			**
e. [kəɬ$_{\mu}$.pe$_{\mu}$k$_{\mu}$.sət$_{\mu}$.mi.**tí͜y$_{N\mu}$x$_{\mu}$s$_{\mu}$**]	*!		*		
f. [kəɬ$_{\mu}$.pe$_{\mu}$k$_{\mu}$.sət$_{\mu}$.mi$_{\mu}$.**tí͜y$_{N\mu}$x$_{\mu}$s$_{\mu}$**]			**!		

Unstressable morphology: /ʔes-[kəɬ.pek.stm$_{N}$.tí͜y$_{N}$xs]/ → [ʔes.kəɬ.pek.stm.tí͜y$_{N}$xs].

The tableau in (87) demonstrates that vocalized resonants are not affected by the processes that affect full vowels without an underlying mora; vocalized glides to the left of the leftmost full vowel do not affect its preservation, even when unstressed. In candidate (87), L-Anch(FV) is violated because the leftmost full vowel [i] is deleted, even though there is a syllabic glide [w$_{N}$] (which surfaces as [u]) to its left.

(87) Leftmost vowel position is unaffected by vocalized resonants.

[cu.xi.tí͜y$_{N}$x.sne] ‘I made it for them.’ (Hall & Phillips 2024:140)

FVWt, L-Anch(FV) ≫ Dep-μ(N)

/cw-xi-t-í$_{\mu}$yxs-n-t-en(e)/[22]	FVWt	L-Anch(FV)	Dep-μ(N)	Max-IO(V)
a. ☞ [cw$_{N}$.xi$_{\mu}$.**tí͜y$_{N\mu}$x$_{\mu}$**.sn(e)][23]			*	*
b. [cw$_{N}$.xi.**tí͜y$_{N\mu}$x$_{\mu}$**.sn(e)]	!*			*
c. [cw$_{N}$x$_{\mu}$.**tí͜y$_{N\mu}$x$_{\mu}$**.sn(e)]		!*		**

Glide vocalization: [cw$_{N}$.xi.tí͜y$_{N}$x.sne] → [cu.xi.tí͜y$_{N}$x.sne].

3.4 Stress-Induced Schwa Epenthesis

In this section, we provide the constraints and crucial rankings that explain the patterns of stress-induced schwa epenthesis. We model stress-induced schwa epenthesis in the last syllable due to the right-alignment constraint introduced in the preceding section (Align-R). We explain insertion before the final consonant as following from a combination of two factors: the previously introduced maximality restriction prohibiting syllables with more than two moras (*σ$_{\mu\mu\mu}$), and a new minimality restriction for stressed syllables dispreferring stressed syllables with fewer than two moras (HdSyllWt). Recall from Section 3.1 that we assume that clitics, prefixes, and

[21] The segment /n/ deletes, but we do not attempt to determine the factors conditioning this process.

[22] The suffix /-ene/ is problematic for our analysis, as the first vowel behaves like other unaccented vowels while the second vowel fails to delete in certain circumstances.

[23] The segments /nt/ delete, but we do not attempt to determine the factors conditioning this process.

unstressable suffixes are outside the domain for stress; we do not include them in syllables when assessing minimality or maximality requirements.

3.4.1 Constraints for Stress-Induced Schwa Epenthesis

In addition to the constraints in the previous section, we also introduce the constraint in (88). Together with HDNUCWT, which ensures that stressed syllables have a moraic nucleus, HDSYLLWT prevents stressed syllables from being open, as the absence of a coda would leave the nucleus as the only mora. This explains the fact that stressed schwa can only exist in closed syllables; it replaces the proposal by Blake (2000) that the minimal weight for stressed syllables is one mora, under the assumption that stressed schwa is non-moraic. Since we argue that stressed schwa is moraic, the minimal weight becomes two. However, this leads to a new prediction that stressed full vowels in open syllables are also dispreferred.

(88) HEADSYLLABLEWEIGHT [HDSYLLWT]: A head (stressed) syllable must dominate at least two moras.

When HDSYLLWT is combined with $*\sigma_{\mu\mu\mu}$, which disprefers syllables with more than two moras, it allows for the generalization that stressed syllables prefer to have exactly two moras, and a [(C)C$V_\mu C_\mu$] structure.

The crucial rankings that we will motivate in the following section include:

- CULMINATIVITY, HDNUCWT ≫ DEP-μ(N)
- *HDNUC/C, ALIGN-R ≫ DEP-IO

3.4.2 Tableaux for Stress-Induced Schwa Epenthesis

The tableau in (89) shows that stressed moraic schwa must be inserted to bear stress when no underlying full vowel is present in the stress domain. If there is no moraic nucleus, then either there would be no stress, violating CULMINATIVITY (candidate (89)), or a non-moraic vowel would receive stress, violating HDNUCWT (candidate (89)). A consonantal nucleus cannot receive stress because it would violate *HDNUC/C (candidate (89)). A schwa in a non-initial syllable cannot receive stress because ALIGN-R would be violated, even if one instance of schwa epenthesis could be avoided (candidate (89)). Therefore, stressed moraic schwa is inserted in the final syllable, as shown in the attested candidate (89e)(89).

(89) Schwa is inserted and receives stress and moraicity when there are no eligible stress hosts.
[ʔes.kəɬ.xə́n] 'have one's shoes off' (T&T 1996:89)
CULMINATIVITY, HDNUCWT ≫ DEP-μ(N)
CULMINATIVITY, *HDNUC/C, Align-R ≫ DEP-IO

/kɬ-xn/		CULMINATIVITY	HDNUCWT	*HDNUC/C	DEP-μ(N)	ALIGN-R	DEP-IO
a.	[kəɬ$_{\mu}$.xn$_{N}$]	!*					*
b.	[**kə́ɬ$_{\mu}$**.xn$_{N}$]		!*				**
c.	[kəɬ$_{\mu}$.**xń$_{N\mu}$**]			!*	*		*
d.	[**kə́$_{\mu}$ɬ$_{\mu}$**.xn$_{N}$]				*	!*	*
e.	☞ [kəɬ$_{\mu}$.**xə́$_{\mu}$n$_{\mu}$**]				*		**

Unstressable morphology: ʔes-[kəɬ.xə́n] → [ʔes.kəɬ.xə́n].

The tableau in (90) demonstrates that stressed moraic schwa can only be inserted before the final consonant in the phonological domain where stress is assigned. If no schwa epenthesis occurs, the only option would be candidate (90), where an underlying consonant receives stress, which violates *HDNUC/C. If stressed schwa is inserted after the final consonant, it would leave an open stressed syllable, violating HDSYLLWT (candidate (90)). If stressed schwa is inserted before the last two consonants, it creates a superheavy syllable, which violates *σ$_{\mu\mu\mu}$ (candidate (90)). If only one schwa is epenthesized to receive stress, it forces the creation of an illicit onset which violates *BRONS(RES) (candidate (90)). Therefore, a second schwa must epenthesize, which yields an additional violation of DEP-IO (candidate (90)). It is also not an option for the first of two schwas to receive stress, as that would violate ALIGN-R (candidates (90) and (90)).

(90) Schwa is inserted exactly before the final consonant of the prosodic word.
[sʕʷə.yə́ps] '…(and) it burned.'
*HDNUC/C, HDSYLLWT, *BRONS(RES), *σ$_{\mu\mu\mu}$, ≫ DEP-IO

/ʕʷy-p/		*HDNUC/C	*BRONS(RES)	ALIGN-R	HDSYLLWT	*σ$_{\mu\mu\mu}$	DEP-IO	*NUC/GL
a.	[**ʕʷý$_{N\mu}$p$_{\mu}$**]	*!						*
b.	[ʕʷy$_{N}$.**pə́$_{\mu}$**]				*!		*	*
c.	[**ʕʷə́$_{\mu}$y$_{\mu}$p$_{\mu}$**][24]					*!	*	
d.	[**ʕʷyə́$_{\mu}$p$_{\mu}$**]		*!				*	
e.	☞ [ʕʷə.**yə́$_{\mu}$p$_{\mu}$**]						**	
f.	[**ʕʷə́$_{\mu}$y$_{\mu}$**.pə]			*!			**	
g.	[**ʕʷə́$_{\mu}$**.yəp$_{\mu}$]			*!	*!		**	

Unstressable morphology: s=[ʕʷə.yə́p]=s → [sʕʷə.yə́ps].

[24] Note that candidate c. looks very similar to cases we have analyzed as diphthongs. Although we do not model the restrictions against it in the present analysis, the fact that candidate c. is not selected provides direct evidence that diphthongization is not an option when a glide follows stressed schwa. We posit that this is because the mora is not underlying, and only underlying moras are permitted to branch, but it may also be the case that /y/ in underlying forms is already associated with the mora accompanying an accented vowel in some way. We do not see evidence for diphthongization of VG sequences across morpheme boundaries, as morpheme-final accented vowels are rare

3.5 Total Ranking

The ranking required to derive all elements of stress epenthesis and schwa assignment covered in this paper is:

{Unviolated constraints} ≫ DEP-μ(N) ≫ MAX-IO(V)†, Align-R ≫ $*\sigma_{\mu\mu\mu}$ ≫ DEP-IO ≫ *NUC/NAS†, *NUC/GL†, *COMPONSet

(† indicates no crucial rankings below)

Unviolated constraints

- ONSBINMAX
- *BRONS(RES)
- *NUC/LIQ
- CULMINATIVITY
- *HDNUC/C
- HDNUCWT
- FVWT
- L-ANCH(FV)

4 Discussion

4.1 Deviant and Lexicalized Cases

While the patterns of syllabification and stress-induced epenthesis described above account for most stressed schwas in nłeʔkepmxcín, there are some roots which deviate from this pattern. Some cases are loanwords, which may include lexicalized patterns (see discussion of "differential importation" in Kang 2011), or tolerate other exceptional patterns (see, e.g., Pons-Moll 2012). For example, *petə́leʔ* 'blood' is a loanword from Athapaskan (T&T 1996:232) in which the stressed schwa is not found immediately before the final consonant of the stem, as would be predicted based on the analysis in Section 3.

There are additional lexicalized cases where there is no clear source for the pattern. These stems surface with a stressed schwa that is not immediately preceding the final consonant of the stem. Some of these stems have roots behave as strong roots but surface with stressed schwas, typically retracted. We can tell these roots pattern with strong roots not only because of the underlying representations provided by Thompson and Thompson (1996) but also because of the derivations provided in their dictionary entries. As explained in Section 2.3, strong roots will have primary stress unless a strong suffix attaches to them, so if an unaccented stressable suffix (i.e. a weak or an ambivalent suffix) attaches to a root and the result is a word with stress on the root, then the root is strong. For each root in this list, at least one such derivation was found, confirming that these roots pattern with strong roots. An exhaustive list is provided below organized alphabetically with the relevant derivations.

(91) √ʔə̣́sxe	/ʔə̣́sxe-xi-t-sem-es/	[ʔə̣́s.xex.cms]	'It made me sneeze.'
	sneeze-INDR-TR-1SG.OBJ-3ERG		BP

(92) √k̓ə̣k̓ałweʔ	/k̓ə̣k̓ałweʔ-m/ weevil-CTR.MID	[k̓ə̣.k̓ał.weʔ.me]	‘weevils infest something’ (T&T 1996:107)
(93) √mxə́c̓xn̓	/mxə́c̓xn̓-m/ purple.huckleberry-CTR.MID	[mə.xə́c̓.xn̓.me]	‘visit berry patch’ (T&T 1996:208)
(94) √mə̣́ze	/mə̣́ze-n-t-em/ fly-CTR-TR-PASS	[mə̣́.zen.tm]	‘infested with flies’ (T&T 1996:200)
(95) √pcə́kł	/pcə́kł-m/ leaf-CTR.MID	[pcə́k.łm]	‘The leaves are forming’ BP
(96) √tə̣́l	/tə̣l-n_1-t-es/ unravel-CTR-TR-3ERG	[tə̣́.le_1s]	‘They unraveled something’ (T&T 1996:353)
(97) √tə̣́z	/tə̣́z-n_1-t-es/ protrude-CTR-TR-3ERG	[tə̣́.ze_1s]	‘They pushed it so it protruded’ (T&T 1996:354)

There are also some roots that cannot be confirmed to be strong, either due to a lack of available derivations or the existence of derivations which prove the root to be weak, but still surface with a stressed schwa that isn’t immediately followed by the final consonant of the stem. An exhaustive list of such cases is provided in (98)–(111), again organized alphabetically by surface realizations of the root.[25]

(98)	[kʷə́.ƛ̓uʔ]	‘therefore’	(T&T 1996:118)
(99)	[lə́.q̓ʷiʔ]	‘cedar bark’	(T&T 1996:139)
(100)	[mə́.cəkʷ]	‘blackcap berry’	BP
(101)	[nə́st]	‘right?’	CMA
(102)	[pə̣́l.qeʔ]	‘penis’	(T&T 1996:238)
(103)	[p̓ə́c̓.żeʔ]	‘rags/old clothes’	(T&T 1996:255)
(104)	[p̓ə̣́ṣ.k̓eʔ]	‘hummingbird’	(T&T 1996:257)
(105)	[qʷə́.seʔqʷ]	‘make a bed platform’	(T&T 1996:293)
(106)	[sə́.niʔ]	‘oregon grape’	(T&T 1996:322)
(107)	[stə́n.wn_N]	‘withe’	(T&T 1996:350)

[25] According to their respective dictionary entries, *stə́nwn*, *sxʷə́seʔ*, *sxʷsə́l̓ec*, and *sx̣ə́k̓iʔt* all have a lexical nominalizer /s-/. We omit a full morpheme gloss for (98)-(111) since these four are the only ones that are not monomorphemic.

(108) [w.lə́k̓.ze][26] ‘tree toad’ (T&T 1996:382)

(109) [sxʷə́.seʔ] ‘red flowering currant’ (T&T 1996:407)

(110) [sxʷsə́.l̓ec] ‘tree fungus’ (T&T 1996:411)

(111) [sx̣ə́.k̓iʔt] ‘fireweed’ (T&T 1996:421)

Since *nə́st* in (101) belongs to a functional category of words, it is perhaps possible that it was once an immediate stem that eventually became grammaticalized, thus providing a diachronic explanation for the position of the stressed schwa. For the rest of the roots though, there is no apparent reason for them to deviate from the pattern described above, so they are not accounted for in the analysis.

4.2 Future Schwa Research

As stated, the primary goal of this paper is to provide a preliminary analysis of stress assignment and schwa epenthesis in nłeʔkepmxcín. While we have accounted for schwas that host stress and schwas that repair illicit consonant clusters, we have not accounted for schwas that surface in reduplicative morphemes. This means that future research will be needed to account for this kind of schwa epenthesis in the language.

4.2.1 Reduplication

In nłeʔkepmxcín, there are four reduplication patterns that produce reduplicants containing schwas: initial (a.k.a. affective) reduplication /Cə~/, augmentative (a.k.a. plural/pluractional) reduplication /CəC~/, change-of-state (a.k.a. out-of-control) reduplication /~əC/ (or /<Cə>/), and characteristic reduplication /~CəC/.

It may be possible to explain some of the schwas in reduplicated morphemes by positing that they are inserted to host stress or repair illicit consonant clusters. However, in each of these reduplication patterns, the schwa appears regardless of whether it is stressed or required to repair an illicit consonant cluster. The change-of-state reduplicant, for example, is similar to non-reduplicative weak suffixes because a schwa can surface just before the final consonant and host stress in either case. However, this reduplication is different from non-reduplicative weak suffixation because the schwa is always inserted; it is present even if the reduplicant does not host stress. Compare (112) and (113) where the schwas host stress to (114) and (115) where they surface without stress. Intermediate forms are given in slashes (/ /). Evidence of schwas in reduplicated words are provided in Appendix B.

(112) /ʔes-{qʷz~əz}/ [ʔes.qʷə.zə́z] ‘get used’
STAT-use~COS (Hall & Phillips *this volume*)

(113) /cw~əw/ [cə.wə́w] ‘get made/grow’
do~COS (Hall & Phillips 2024:138)

[26] In their orthography, Thompson and Thompson (1992:42) write word-initial glides as glides even if they vocalize, so the /w/ in *wlə́k̓ze* may represent [wə], [wu], or [ʔu].

(114) /méƛ̓~əƛ̓/ [mé.ƛ̓əƛ̓] 'get mixed'
mix~COS (Hall & Phillips 2024:135)

(115) /ʔús~əs/ [ʔú.səs] 'get discarded'
discard~COS (Hall & Phillips 2024:135)

If the schwas found in change-of-state reduplicants were only inserted to host stress, there would be no way to explain the presence of the schwas in (114) and (115). It is also important to note that schwas in (114) and (115) do not surface to repair an illicit consonant cluster since /ss/ sequences outside of reduplication either simplify to [s] as in (116) or the latter /s/ fortifies to [c] as in (117).

(116) /t=e=s=suxʷnéʔm=s/ [te.suxʷ.né.ʔms] 'Because he was the medicine man...'
OBL=D/C=NMLZ=medicine.man=3POSS (Hall & Phillips 2024:137)

(117) /seʔlís-s/ [seʔ.lísc] 'their knife'
knife-3POSS (T&T 1992:59)

Since schwa surfaces in reduplicants without hosting stress or repairing illicit consonant clusters, it is reasonable to conclude that they are inserted to fill the nucleus of a syllable. See Mellesmoen (2025:193-263) for analyses along these lines of the reduplication patterns in closely related St'át'imcets. For descriptions of each reduplication pattern in nłeʔkepmxcín see Thompson and Thompson (1992:81-85, 88-92, 99-101, 115-116) and Mellesmoen (2025:494-501).[27] More work is required to fully account for the reduplication patterns in nłeʔkepmxcín.

5 Conclusion

We have presented a comprehensive overview of primary stress and schwa epenthesis in nłeʔkepmxcín. Our constraint-based analysis predicts the correct position of stress across words with accented, ambivalent, and weak morphemes. We propose an innovative approach to lexical stress in Salish: underlying "accented" vowels are full vowels with an underlying mora. The presence of a mora distinguishes a vowel in an accented root from an ambivalent one, which does not come pre-associated with a mora in the lexicon. Weak morphemes do not have an underlying vowel or a mora. Another finding of this investigation is that schwas may be moraic when they bear stress, which is a divergence from previous accounts of Salish syllables that propose that schwas can never license a mora on their own. Proposing underlying moras and moraic stressed schwa allows us to derive the correct positions of stress and schwas, which supports our claim that all schwas in nłeʔkepmxcín are epenthetic and that the position of stress is predictable and phonologically derived.

[27] For analyses of these patterns in which schwas are assumed to be underlying, see Jimmie (1994).

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Appendix A Table of suffixes based on their stress category

Table A1: sample of nłeʔkepmxcín suffixes based on their stress category

Stressable			Unstressable
Strong	Ambivalent	Weak	
3rd persion plural	3rd person ergative	control middle	immediate
/-íyxs/	/-es/	/-m/	/-t/
limited ctr. middle	2nd person sing. object	instrumental	imperative
/-nwéłn/	/-si/	/-tn/	/-e/
limited ctr. directive	relational	inchoative	plural (imperative)
/-nwéṅ/	/-min/	/-p/	/-uz/
reaffirmative	indirective	"foot" (lex. suffix)	3rd person possessive
/-ʔúy/	/-xi/	/-xn/	/-s/

Appendix B Supplemental phonetic evidence

The following graphics provide acoustic evidence schwa epenthesis in words with only weak morphemes. Examples are provided for each speaker.

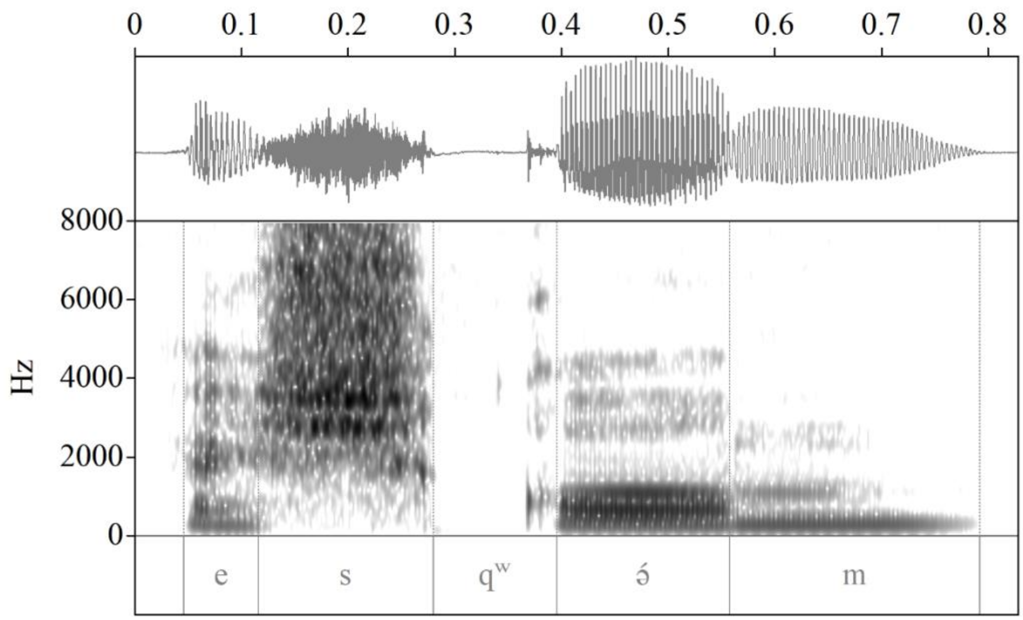

Figure B1. Waveform and spectrogram showing schwa epenthesis in *e sqʷə́m* 'mountain' produced by BP

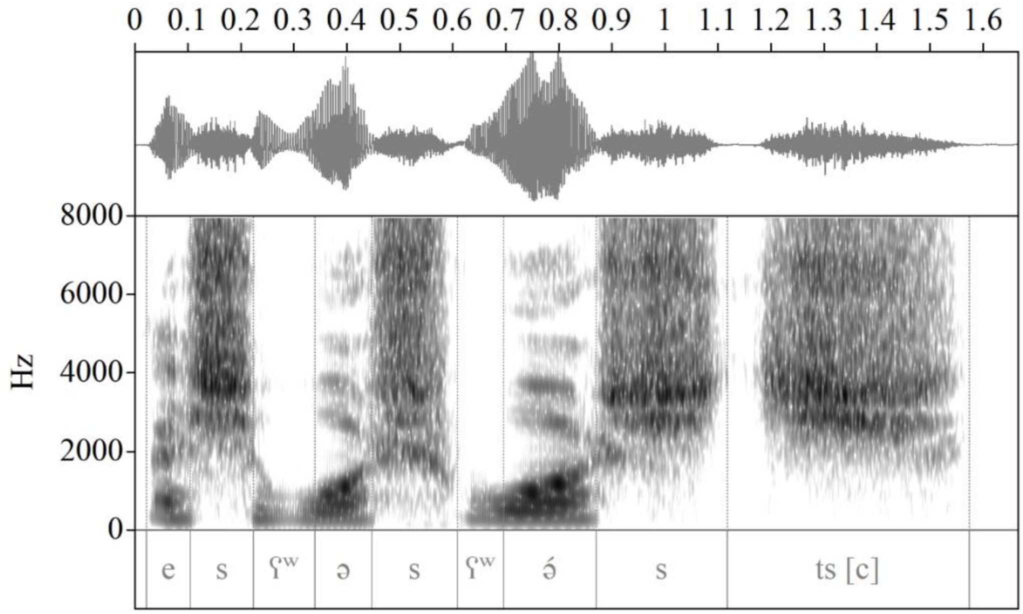

Figure B2. Waveform and spectrogram showing schwa epenthesis in *ʔe sʕʷəsʕʷə́sts* '…and it shined' produced by BP

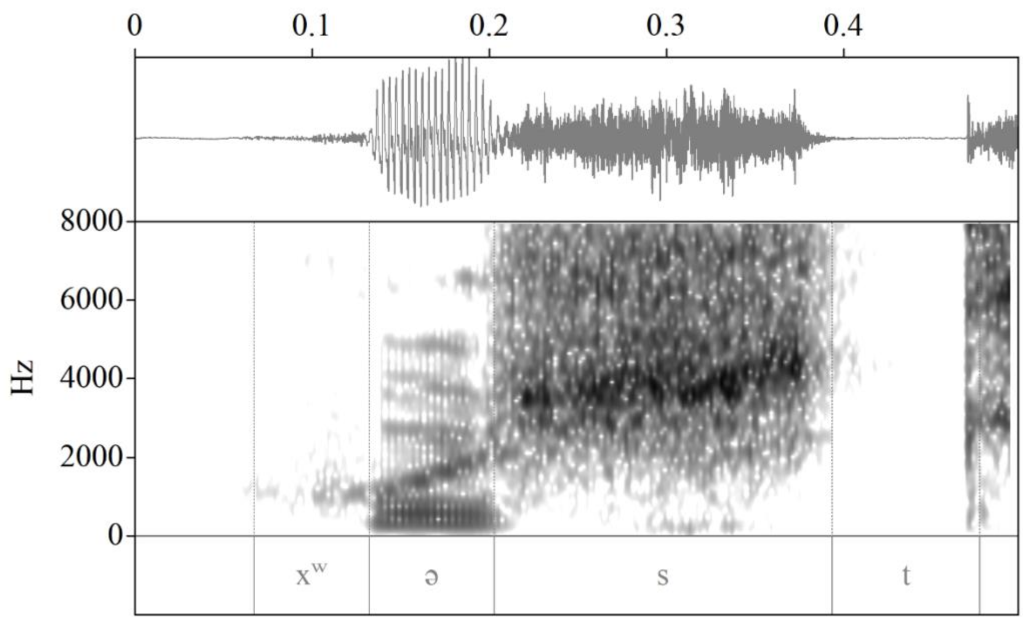

Figure B3. Waveform and spectrogram showing schwa epenthesis in *xʷə́st* 'return home' produced by BP

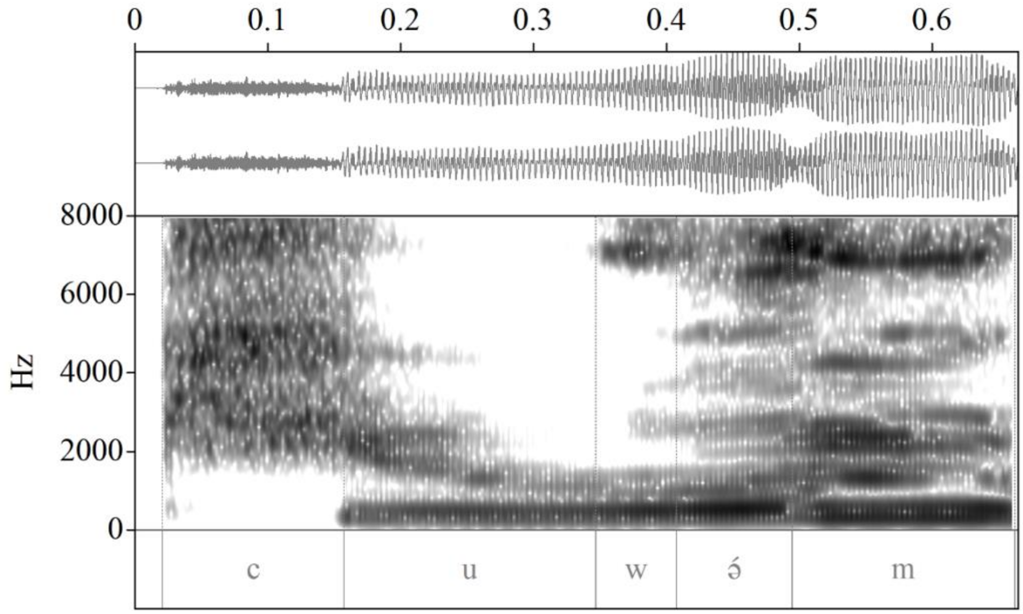

Figure B4. Waveform and spectrogram showing schwa epenthesis in *cwə́m* 'do/make' produced by CMA

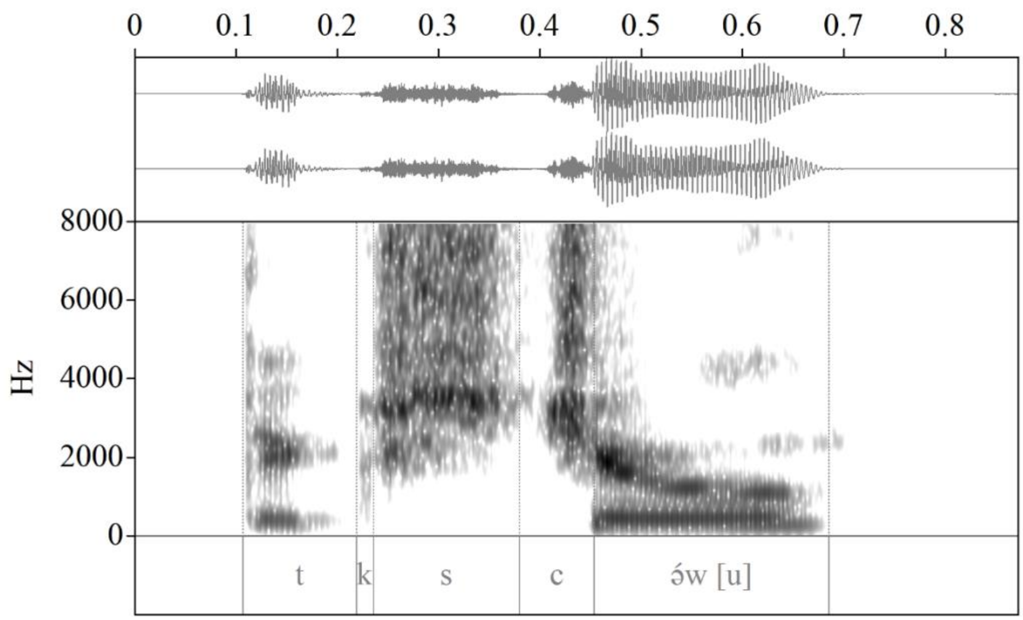

Figure B5. Waveform and spectrogram showing schwa epenthesis in *tk scúw* 'task/work' produced by CMA

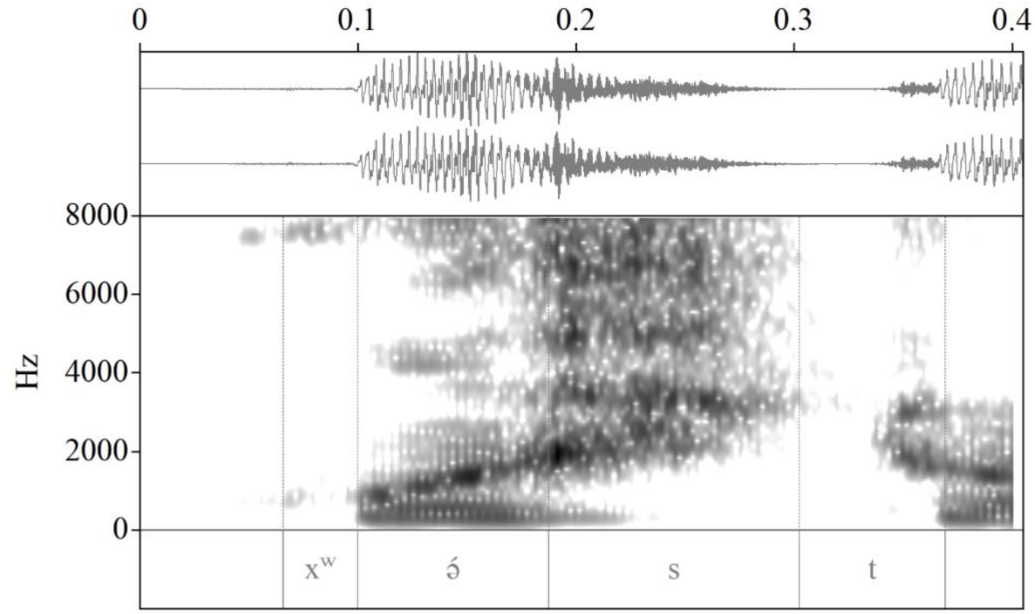

Figure B6. Waveform and spectrogram showing schwa epenthesis in *x^wə́st* ‘return home’ produced by CMA

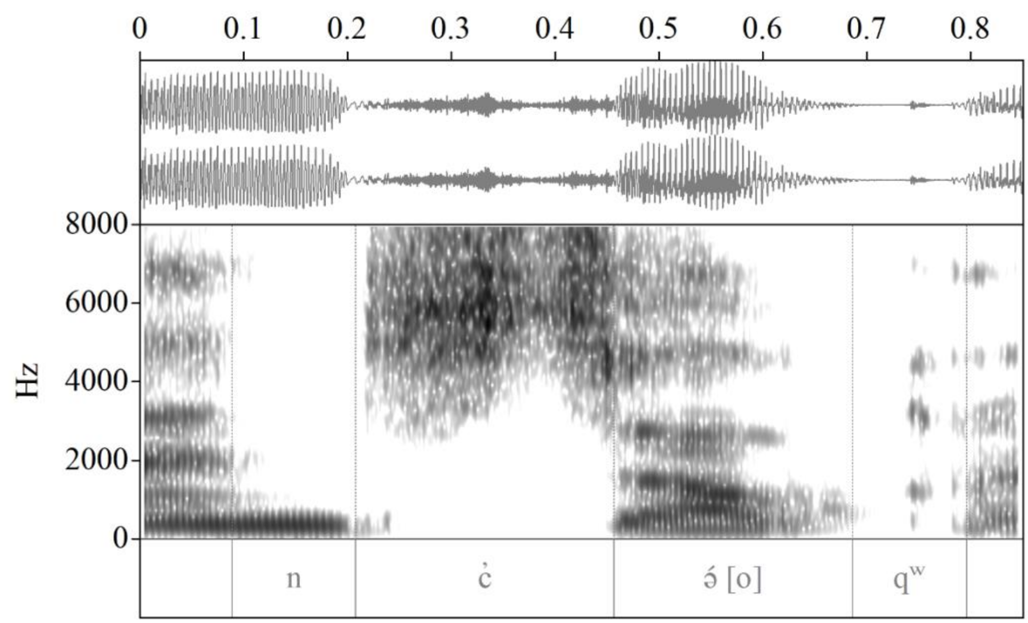

Figure B7. Waveform and spectrogram showing schwa epenthesis in *nsc̓óq*^{w} ‘my paper’ produced by KBG

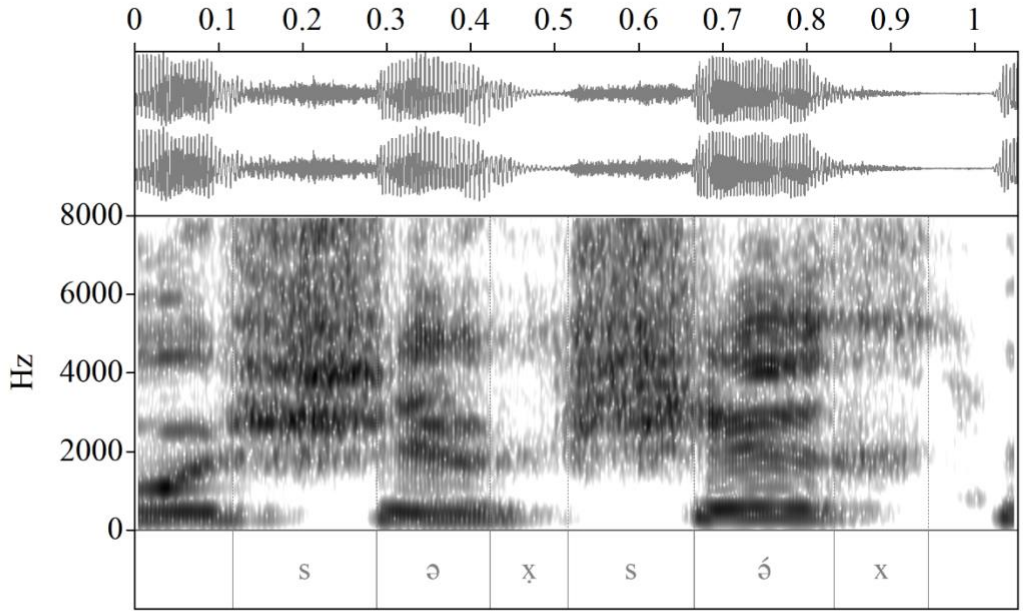

Figure B8. Waveform and spectrogram showing schwa epenthesis in *səxsə́x* 'mistaken' produced by KBG

The following graphics show acoustic evidence of schwas with change-of-state reduplication. These examples all come from BP.

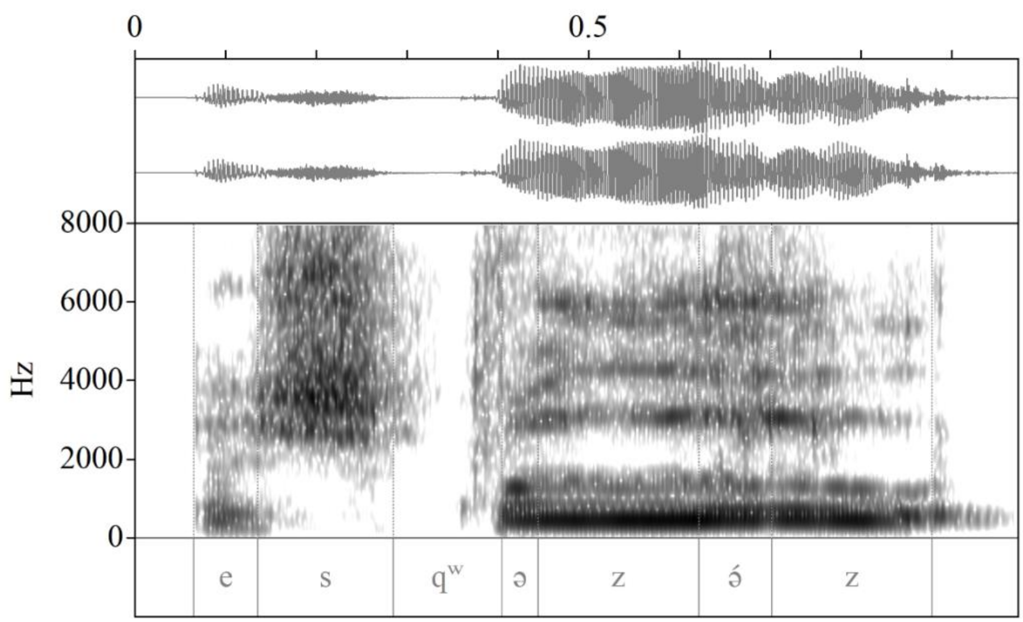

Figure B9. Waveform and spectrogram showing the presence of schwa in change-of-state reduplication for the word *qʷzə́z* 'get used'

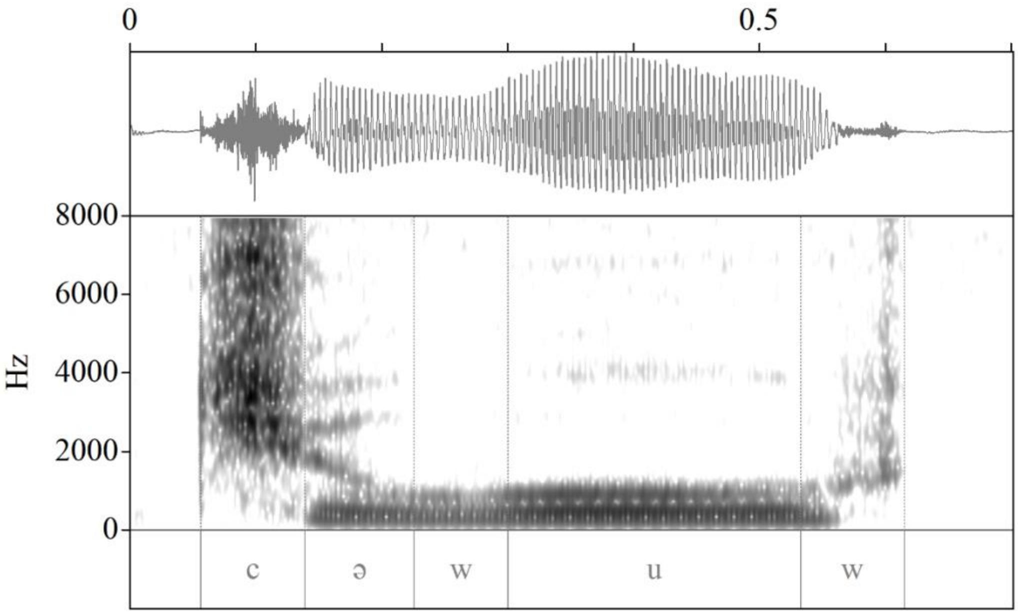

Figure B10. Waveform and spectrogram showing the presence of schwa in change-of-state reduplication for the word *cwúw* 'get made/grow'

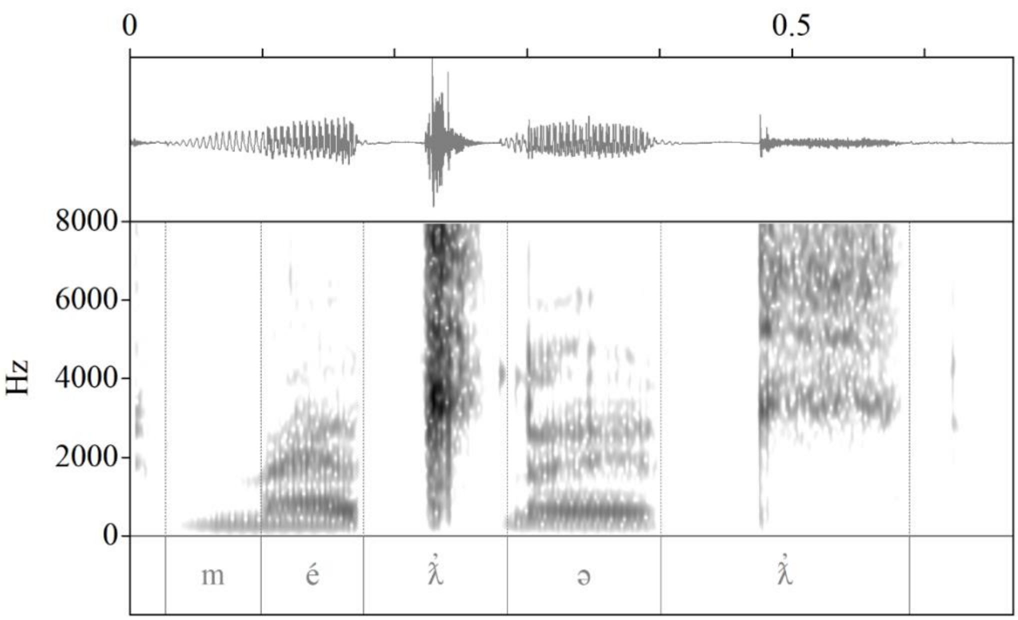

Figure B11. Waveform and spectrogram showing the presence of schwa in change-of-state reduplication for the word *méƛ̓əƛ̓* 'get mixed'

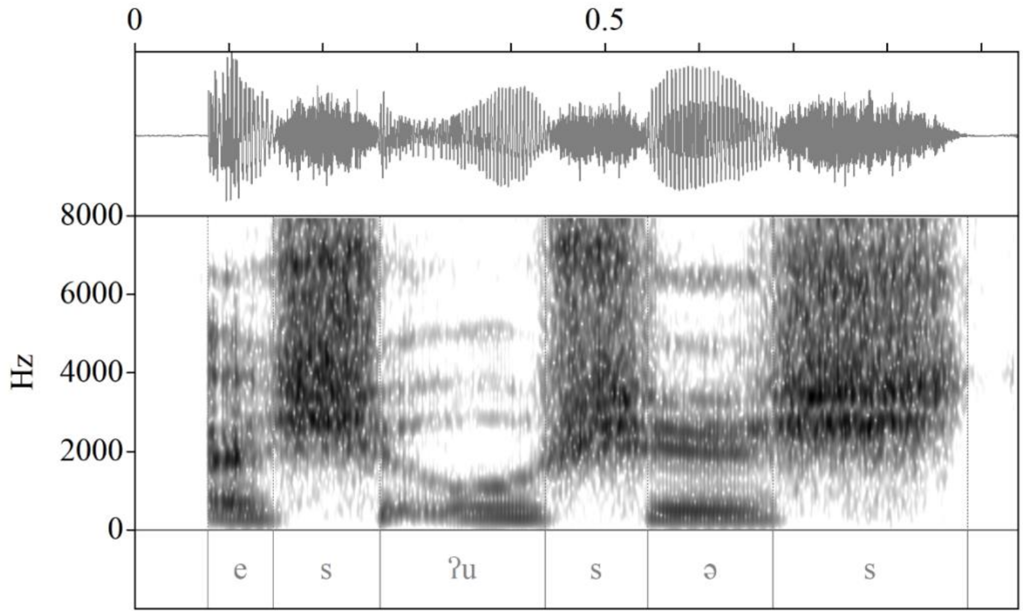

Figure B10. Waveform and spectrogram showing the presence of schwa in change-of-state reduplication for the word *ʔúsəs* ‘get discarded’