DOI: 10.6503/THJCS.202512_55(4).0003

New Vowels and the Lost Uvular Consonant in Tjuvecekadan Paiwan*

Shih-chi Stella Yeh**
Department of English
National Kaohsiung Normal University

ABSTRACT

This study examines the differing phonological effects of the uvular stop /q/ and the lost uvular fricative /ʁ/ (< *r) on adjacent vowels in Tjuvecekadan Paiwan, focusing on phonologization relative to prosodic position. The lowering of high vowels adjacent to /q/ is allophonic, whereas the lowering or retraction induced by the now-lost uvular *r is phonologized, resulting in derived vowels [e], [o], and [ɑ], which contrast with the original ones /i/, /u/, /ə/, and /a/. The degree of phonologization varies depending on prosodic position: vowels in weaker prosodic positions, such as word-finally or between identical vowels, show greater susceptibility to lowering, while those in stronger positions, such as word-initially, resist change. This study highlights the role of the lost uvular in vowel system reanalysis and asymmetries in phonological change, filling the gap in the understanding of synchronic Tjuvecekadan.

Keywords: consonant loss, uvular consonant, vowel lowering, phonologization, prosodic position, Formosan languages

* My thanks go to my main consultant Miss 湯桂英 (Eleng a Drupilian), and all the consultants for generously sharing their knowledge of the Paiwan language. I am also indebted to the two anonymous reviewers for their constructive critiques. I am grateful to Prof. Chang Yueh-chin, Prof. Hui-chuan J. Huang, and Prof. Hsieh Feng-fan for their valuable comments on earlier versions of this paper. This research was partially supported by the National Science and Technology Council of Taiwan (MOST 109-2410-H-017-022- and NSTC 111-2410-H-017-008-). All remaining errors are my own.

** Author's email address: shihchiyeh@mail.nknu.edu.tw

1. Introduction

Based on the patterns of newly derived vowels in Tjuvecekadan Paiwan, this paper examines the distinct phonological impacts of the uvular stop /q/ and the now-lost uvular fricative /ʁ/ (< *r) on adjacent vowels, and explores the degree of lowering relative to prosodic position. While the coarticulatory lowering of high vowels induced by /q/ is allophonic, the lowering or retraction effect of *r on adjacent vowels has been phonologized, leading to the emergence of new vowels [e], [o], and [ɑ]. Since the conditioning environment for lowering created by the presence of *r was eliminated by sound change, the resulting vowels contrast with the phonemes /i/, /u/, /ə/, and /a/ in certain contexts in synchronic data, and have been reanalyzed into the vowel system. Furthermore, this paper demonstrates that the loss of *r induces a variable lowering effect on adjacent vowels, with prosodic position as an important factor in the degree of impact. In word-initial position, vowels remain unaffected, while in word-final position, high vowels are more susceptible to change. When the lost *r occurs between identical vowels, the lowering effect fully expands to all adjacent vowels: high vowels become mid, the mid vowel shifts to low, and the low vowel retracts to a back position. Thus, this study fills the gap in understanding the influence of the loss of *r on vowels and explores implications for phonologization relative to prosodic position.

In the following, Section 2 offers a general introduction to the Paiwan language and the divergent phonological characteristics of the Tjuvecekadan dialect—the loss of two consonants and vowel lowering. Then a general view of vowel lowering follows. Section 3 illustrates the differing effects of the uvular stop /q/ and the uvular fricative *r on vowels. The vowel alternation associated with /q/ is predictable from context, whereas the lowering effect of *r on vowels has been restructured into the phonological system. This section further examines the degree of lowering resulting from *r, which ranges from cases where vowels resist lowering to cases of complete lowering across all vowels, and how the strength of prosodic position affects this process. Section 4 discusses the further implications of vowel lowering in Tjuvecekadan, and then Section 5 concludes.

2. Phonological Background of Tjuvecekadan and Related Phenomena

Building on the background of the Paiwan language, this section summarizes previous studies of diachronic changes in Tjuvecekadan and presents its phonological system. Additionally, it reviews vowel lowering as a common interaction between post-velar consonants and vowels across languages, connecting these general patterns with the data observed in Tjuvecekadan in Section 3.

2.1 The Lost Consonants in Tjuvecekadan

Paiwan is a Formosan language spoken in the mountainous regions of southern Taiwan, covering Pingtung (屏東) and Taitung (臺東) counties, with a population of nearly 11,000.[1] The Tjuvecekadan (七佳) village, located in the central Paiwan area (Curimudjuq et al. 2013), is in Chunri township (春日鄉), north of the boundary between Chunri and Laiyi townships (來義鄉), and east of the boundary between Pingtung and Taitung. Firsthand data for this study were collected from 2021 to 2024 in Tjuvecekadan village.

Tjuvecekadan diverges from the other dialects through the loss of the Proto-Paiwan consonants *r and *ɭ and subsequent vowel changes. The phonetic realization of *r in modern Paiwan varies; it can be a coronal sound, such as alveolar tap [ɾ], trill [r], or approximant [ɹ], or a uvular fricative, such as [ʁ] or [χ]. Approximately three-fourths of the dialects have a coronal reflex of *r, while the rest have a uvular (Cheng 2016: 138). On the other hand, *ɭ is commonly realized as a retroflex lateral [ɭ], or as a velar fricative [ɣ] in a few dialects. Tjuvecekadan is the only village dialect that has lost both *r and *ɭ (Cheng 2016: 138).

Cheng's study provides more details for the internal subgrouping of Paiwan, together with previous studies on phonology and other aspects (Ho 1977; 1978; Ferrell

[1] This statistic is from the Department of Household Registration of the Ministry of the Interior, dated September 2024.

1982; Egli 1990; Chang 2000; 2018; Early & Whitehorn 2003; C. Chen 2006; 2009; Lee 2011; Yeh 2011, and others). Regarding the characteristics of the regional group to which Tjuvecekadan belongs, Cheng (2016: 33) and Ang (2019: 215) agree that the group also includes Raxekerek (力里), Kinaximan (歸崇), and the dialects of some areas in eastern Taiwan, such as Pacavalj (大鳥). Relevant to *r and *l̩, Ang (2019: 213) mentions that liquids became fricatives (*l̩ > ɣ, *r > ʁ, *r > χ), and the lateral liquid became a glottal or disappeared (*l̩ > ʔ/φ). Similarly, Cheng (2016: 98) describes the derivations within this regional group as *r > ʁ > χ > φ and *l̩ > ɣ > φ. This sound change is ongoing in this regional group, with different dialects displaying various stages of the weakening process. Thus, Tjuvecekadan now reflects the endpoint of the weakening of Proto *r and *l̩.[2]

2.2 The Phoneme System of Tjuvecekadan Paiwan

With the loss of Proto *r and *l̩, Tjuvecekadan has twenty consonantal phonemes /p, b, t, d, c, ɟ, k, g, q, v, s, z, ʦ, m, n, ŋ, r, ʎ, w, j/, as shown in Table 1.[3] The phoneme /r/ is phonetically realized as [ɾ] or [r]. It is important to clarify that /r/ in synchronic Tjuvecekadan is derived from Proto *d̩ (Cheng 2016: 21–23; Ang 2019: 213), unlike the majority of Paiwan dialects, where /r/ < *r.[4]

Another point of confusion arises from the palatal lateral /ʎ/, the only lateral phoneme remaining in Tjuvecekadan. The articulatory contact between the tongue and hard palate is not as obvious as in other (southern) dialects; thus, it is phonetically a sound between [lʲ] and [l̩] in non-final position and a lateral fricative [ɬ] word-finally.

For the pair of palatal stops /c/ and /ɟ/, the place of articulation is not truly palatal as

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[2] This study refers to the reflex of the Proto sound *r as *r* for the general Paiwan phoneme, which was realized as [ʁ] in Tjuvecekadan before its loss, similar to the correspondence between *l̩, the phoneme *l*, and the lost realization [l̩].

[3] In the orthographic system provided by the Ministry of Education (2005), these phonemes are /p, b, t, d, tj, dj, k, g, q, v, s, z, c, m, n, ng, dr, lj, w, y/.

[4] The sound change *d̩ > r in Paiwan was recorded in Raxekerek and Pacavalj in the 1930s (Institute of Linguistics, Taihoku Imperial University 1935: 209–224, 244–249). Later works show the merge of *d̩ and *r, as in the Paiwan village (as in the village that gives its name to the language, 筏灣) (Ho 1978) and the villages in northwestern area, such as Makazayazaya (瑪家) and Ulaljuc (泰武) (Cheng 2016: 141). However, a large number of village dialects still maintain the contrast between *d̩ and *r in synchronic data.

in some southern dialects, but more forward and near post-alveolar. Contrary to Cheng's (2016: 31) view that /c, ɟ/ in the southern area are affricates [tɕ, dʑ], this study considers both stops [c, ɟ] and affricates [tɕ, dʑ] as variants of these phonemes. As indicated by Ang (2019: 213), palatal stops becoming affricates might be an ongoing process in Paiwan. The alveolar fricatives /s, z/ often exhibit rhotic characteristics [s̻, z̻] in Tjuvecekadan. This pair of fricatives palatalizes before /i/, resulting in the sounds [ɕ, ʑ] or intermediate sounds between post-alveolar [ʃ, ʒ] and palatal [ɕ, ʑ].

Table 1. Consonant phonemes in Tjuvecekadan Paiwan

	Labial	Alveolar	Palatal	Velar	Uvular
Stop	p b	t d	c ɟ	k g	q
Fricative	v	s z			
Affricate		ts			
Nasal	m	n		ŋ	
Liquid		r	ʎ		
Glide	w		j		

There are four vowel phonemes in Paiwan: /i/, /u/, /ə/, and /a/, with no contrast in length. Among them, /ə/ has a restricted distribution and cannot occur in word-initial or word-final positions (Ho 1977: 606). Unlike other village dialects, Tjuvecekadan has further developed three additional vowels: the mid front [e], the mid back [o], and the low back [ɑ], as highlighted in Table 2. These new vowels resulted from the aforementioned historical change involving the loss of *r, even though the trigger is no longer present. In synchronic Tjuvecekadan, /e/, /o/, and /ɑ/ are considered phonemic due to their contrasts with the original vowels, despite their limited distribution and number. The derivation of /e/, /o/, and /ɑ/ will be explained in the following sections.

Table 2. Vowel phonemes in Tjuvecekadan Paiwan

	Front	Central	Back
High	i		u
Mid	e	ə	o
Low		a	ɑ

The basic syllable structure in Paiwan is (C)V(C). Syllables without an onset or coda are possible (e.g., [i.ta] 'one'), but complex onsets or codas are not allowed. While any consonant from the inventory can appear word-finally, word-internal codas are confined to nasals and glides (Yeh 2011: 105). Underlying vowel sequences are prevalent in Paiwan, with the exception of morpheme-internal identical sequences and those involving a schwa (Ho 1977: 606; Ferrell 1982: 7; Egli 1990: 8, and others). Sequences of different vowels are analyzed in various ways. Ferrell (1982: 7) treats them as in separate syllables, e.g., /au/ [a.u] and /ua/ [u.a]. In contrast, Ho (1977: 605) and C. Chen (2006: 71) analyze these sequences as heterosyllabic with an intervening glide if they show rising sonority, e.g., /ia/ [i.**j**a] and /ua/ [u.**w**a]; otherwise, phonetic hiatus is observed, e.g., [au], [ai], [iu], and [ui]. Yeh (2011: 82) considers all non-identical vowel sequences to be tautosyllabic in natural speech tempo, treating them as diphthongs in a CVG(C) or CGV(C) syllable structure, e.g., /Cau/ [Caw], /Cua/ [Cwa].

Stress generally falls on the penultimate vowel of a prosodic word (Ho 1977: 601; Ferrell 1982: 9; C. Chen 2009: 597; Yeh 2011: 38). When the last two underlying vowels form a heavy syllable via glide formation or coalescence, this word-final heavy syllable attracts stress.[5]

2.3 Vowel Lowering and Retraction with Post-velars across Languages

In Tjuvecekadan, vowels are influenced by adjacent uvular consonants. This is a common process cross-linguistically, and many studies have explored vowel alternations triggered by post-velar (or guttural) sounds, including uvulars, pharyngeals, laryngeals, and emphatics[6] (Steriade 1987; Hayward & Hayward 1989; McCarthy 1989; 1994; Bessell 1992; Rose 1996; Wilson 2007; Sylak-Glassman 2014a; 2014b; Kye 2021, and others). One common phonological change is vowel lowering adjacent to post-velar

[5] Underlying vowel sequences are repaired through coalescence or glide formation. The former combines two identical vowels into a single segment, whereas the latter modifies different vowels into diphthongs (VG or GV). The coalesced output or the vowel-plus-glide combination carries two moras and, as a result, attracts stress within the last two syllables of a prosodic word (Yeh 2011: 40).

[6] Commonly found in Arabic and other Semitic languages, emphatic consonants are articulated with a constricted pharynx or a secondary articulation. They can also be produced with additional tongue root retraction or pharyngealization (Laufer & Baer 1988: 191).

sounds, as observed in Palestinian and Syrian Arabic (McCarthy 1994). Rose (1996) focuses on coarticulation effects of post-velars on vowels, especially in Semitic and Afroasiatic languages. For instance, as shown in Table 3, vowel quality often changes in post-velar contexts, with vowels lowering and/or backed, such as /i, u, a/ becoming [e, o, ɑ] between emphatics in Moroccan Arabic (see Table 3 (a)). Vowels may become lax in such contexts, as shown in Table 3 (d–e). Front vowels like /i/ and /e/ may lower to a low vowel /a/ when following a uvular, as shown in Table 3 (b); alternatively, only high vowels /i/ and /u/ may lower in the context of uvulars, leaving other vowels unchanged, as shown in Table 3 (c). Even within a single language that has several post-velars including uvular, pharyngeal, and glottal consonants, the effects of these consonants may not be identical. For example, as in Ditidaht, uvulars trigger strong backing effects, pharyngeals cause non-high vowels to centralize, and glottals lead to vowel peripheralization (Sylak-Glassman 2014a).

Table 3. Common effects of post-velars on neighboring vowels (based on McCarthy 1994; Rose 1996)

	Triggers	Affected sounds	Examples	Languages
a.	emphatics	vowels	/i, u, a/ → [e, o, ɑ]	Moroccan Arabic (Idrissi 1993)
b.	guttural consonants	vowels	/i, e/ → [a]	Palestinian and Syrian Arabic (Herzallah 1990)
c.	uvular /q/	high vowels	/i, u/ → [e, o]	Huallaga Quechua (Weber 1989: 458), Kashaya (Buckley 1994: 105–113)
d.	uvulars	adjacent vowels	/i, u, a/ → [ɪ, ʊ, ɑ]	Ayt Seghrouchen Tamazight Berber (Saib 1976)
e.	uvulars, pharyngeals, emphatics	a preceding vowel	/i, u, a/ → [ɛ, ɔ, ɑ]	Tompson and other Salish languages (Bessell 1992; Czaykowska-Higgins 1992)

There is no unified phonological pattern for the vowel alternations induced by different post-velars, and their effects seem to vary by language (see Table 3). However, Sylak-Glassman's (2014b: 60) survey of post-velars shows a general trend: vowel lowering, which applies to non-low vowels, is more prevalent, while categorical backing is less widespread than previously thought.[7]

[7] Apart from lowering and backing, vowel fronting is also observed, particularly next to pharyngeal and

In sound production, the articulation of uvular consonants retracts the tongue dorsum toward the uvula, narrowing the oropharyngeal space. This movement exerts a coarticulatory effect on adjacent vowels, preventing them from reaching their typical height. Therefore, vowel lowering or retraction is often observed cross-linguistically and is particularly common with post-velar consonants, including uvulars, which are produced in the back of the oral cavity. These articulatory effects also alter vowel acoustics by lowering F2 and raising F1, which affects vowel quality (Evans et al. 2016: 4–5).[8] In Tjuvecekadan, this vowel lowering persists even after the original uvular trigger has been lost.

3. Different Influence of Uvular Consonants on Vowels in Tjuvecekadan

This section focuses on the different effects the uvular stop /q/ and the lost uvular fricative *r (> [ʁ]) have on surrounding vowels in Tjuvecekadan. It shows that the former creates allophonic variation, whereas the latter's results were likely allophonic in the early stages but were later reanalyzed as phonological. The following subsections examine the effects. Section 3.1 presents the phonetic changes in vowels conditioned by the uvular stop /q/. Section 3.2 investigates the lowering or retraction of vowels adjacent to the lost uvular fricative *r, specifically in word-final positions and between identical vowels, and suggests that the resulting new vowels have become part of Tjuvecekadan's synchronic sound system. Section 3.3 shows the surface vowel contrast induced by the loss of *r and *l̥. Section 3.4 explores the degrees of phonologization of the derived vowels in different prosodic positions.

epiglottal consonants. Laryngealization of vowels and the epenthesis of a vocalic glide are attested in the context of pharyngeal consonants (Sylak-Glassman 2014b: 73–74).

[8] Based on their study of uvularization in two Qiang dialects, Evans et al. (2016) argue that uvularization functions as an articulatory feature of vowels, as its effects on vowel quality appear independently of consonantal influence.

3.1 Allophonic Variation Conditioned by the Uvular Stop /q/

The general tendency of post-velars to influence adjacent vowels is also observed in Tjuvecekadan. The uvular stop /q/ exhibits coarticulatory effects on both preceding and following high vowels /i/ and /u/, resulting in a lowered vowel between high vowels and /q/, as shown in (1a). This vowel alternation is predictable, conditioned by phonetic environments involving /q/. Other consonants, such as /k/, do not trigger lowering of /i/ and /u/ (e.g., [k**i**na] 'mother', [k**u**tsu] 'head louse'), as shown in (1b).

(1) Lowering of high vowels conditioned by /q/

a.	/q/			b.	/k/		
	i___	→	[i^{e}]		i___	→	[i]
	u___	→	[u^{o}]		u___	→	[u]
	___i	→	[^{e}i]		___i	→	[i]
	___u	→	[^{o}u]		___u	→	[u]

This process occurs in other dialects of Paiwan as well, usually introducing a secondary articulation of a transitional mid vowel, as shown in (2). The degree of lowering of high vowels documented in previous studies shows some variation. Like this study, K. Chen & Ma (1986: 5) and Cheng & Maljangeljang (2017: vi) transcribe vowels with secondary articulation. In contrast, Ferrell (1982: 7) and C. Chen (2006: 73) document the high vowels /i/ and /u/ becoming mid vowels [e] and [o], respectively.[9]

(2) Allophones of high vowels adjacent to /q/

	Phonetic form	Orthography	Gloss		Phonetic form	Orthography	Gloss
a.	[q^{e}i.ʎas]	*qiljas*	'moon'	e.	[ma.pi^{e}q]	*mapiq*	'tired'
b.	[q^{o}u.ma]	*quma*	'field'	f.	[pu.nu^{o}q]	*punuq*	'brain'
c.	[qə.ʎə.təp]	*qeljetep*	'to say nothing'	g.	[bə.nəq]	*beneq*	'indent (metal)'
d.	[qa.daw]	*qadaw*	'sun'	h.	[u.maq]	*umaq*	'house'

[9] Ferrell (1982: 7) also documents that /ə/ becomes [ʌ] when adjacent to /q/, while C. Chen (2006: 73) notes an optional change that /a/ becomes [ɑ] in the same context.

The allophonic variation of high vowels /i/ and /u/ is not unique to Paiwan, but commonly seen in other Formosan languages. In Atayal, /q/ and /ʔ/ lower adjacent high vowels, which are often subsequently accompanied by a secondary glide (Huang 2000: 48), while in Seediq, /q/ and /ħ/ cause adjacent high vowels to lower (Lee 2010: 128). In Kavalan, Li & Tsuchida (2006: 3) observe that /u/ is lowered to [o] and /i/ to [e] or [ə] when adjacent to the uvulars /q/ and /ʁ/. Similarly in Thao, high vowels /i/ and /u/ are lowered to [eə]/[əi] and [o] (Blust 2013: 264). Mead (2003: 72) also mentions that in the Austronesian Proto Malayo-Polynesian languages, *i and *u lower when preceding a final *q. Moreover, in Nuu-chah-nulth, a Wakashan language, /iq/ produces an intervening excrescent schwa offglide [iᵊq] (Gick & Wilson 2006: 649). These patterns show that lowering of high vowels in the presence of uvulars is a widespread phenomenon.

3.2 Vowel Lowering Resulting from *r as Phonologization

In village dialects of Paiwan where Proto *r is realized as a uvular fricative, the sound system contains two uvular phonemes: one is the uvular stop /q/, and the other is a uvular fricative /ʁ/ (or /χ/ as in Pacavalj). Tjuvecekadan belongs to the group that exhibits a diachronic change of devoicing into oblivion, *r > ʁ > χ > φ, as described in Section 2.1. In Tjuvecekadan, *r has been lost, yet its impact on nearby vowels still remains. Section 3.2.1 demonstrates the lowering effect in word-final position. Section 3.2.2 focuses on the pattern when the lost uvular is surrounded by identical vowels. Section 3.2.3 examines how the addition of new vowels is related to the loss of uvulars.

3.2.1 Lowering of High Vowels in Word-Final Position

High vowels /i/ and /u/ in word-final position preceding *r are realized as mid vowels [e] and [o], respectively, as shown in (3). The following data present the phonetic representations of Tjuvecekadan, with the neighboring dialect Raxekerek included for comparison to demonstrate the retention of *r.[10] The column of orthography is adapted

[10] Inconsistencies in the phonetic transcription of *r appear in Cheng (2016). He uses [ʁ] in *r > ʁ: uʁi ‘will’ (p. 22) and in the sound change *r > ʁ (Raxekerek) > χ (Pacavalj) > φ (Tjuvecekadan) (p. 98). However, in most of the vocabulary lists and in an earlier work on Raxekerek (Cheng 2015), [χ] is consistently

from Ferrell's (1982) dictionary and modified to align with the spelling system provided by the Ministry of Education (2005) and to correspond to the reflex of *r in Paiwan.

(3) Lowering of high vowels preceding lost word-final *r

	*r	Tjuvecekadan	Raxekerek	Orthography	Gloss
a.	i___	[ˈbə.nə.ts**e**]	bənətsiʁ	*b<en>etsir*	'to spring shot'
b.		[ˈɟa.p**e**]	ɟapiʁ	*djapir*	'twin growth (e.g., banana)'
c.		[ma.ˈʃʲe.ʃʲ**e**]	masiʁsiʁ	*ma-sirsir*	'to peel the hairs on taro using baskets'
d.		[qa.ˈʎə.ʃʲ**e**]	qaʎəsiʁ	*qaljesir*	'the sound of bells on women's clothes'
e.	u___	[ʎa.ˈʎu.k**o**]	ʎaʎukuʁ	*ljaljukur*	'an edible plant'
f.		[pa.ˈtu.d**o**]	patuduʁ	*pa-tudur*	'to design, to progress'
g.		[ˈtə.ʎ**o**]	təʎuʁ	*teljur*	'socket on belt for carrying crook-knife'
h.		[ma.ˈpo.p**o**]	mapuʁpuʁ	*ma-purpur*	'hurried'

The word-final mid vowel [e] in Tjuvecekadan consistently corresponds to the [iʁ] sequence in Raxekerek, as does [o] to [uʁ], indicating a strong influence of the uvular fricative on high vowels despite its absence in Tjuvecekadan. In contrast, the low vowel /a/ shows weaker influence, with variations between [a] and [ɑ] in different words, as in (4a–d), while schwa /ə/ remains unaffected, as shown in (4e–f).

(4) Non-high vowels preceding lost word-final *r

	*r	Tjuvecekadan	Raxekerek	Orthography	Gloss
a.	a___	[qa.ˈvu.c**ɑ**]	qavucaʁ	*kavutsar*	'field mouse'
b.		[ka.ˈɟa.p**ɑ**]	kaɟapaʁ	*kadjapar*	'ring-footed basket'
c.		[ma.ˈza.t**a**]	madataʁ	*ma-datar*	'to walk side by side'
d.		[mi.ˈnə.v**a**]	minəvaʁ	*minevar*	'to scatter'
e.	ə___	[ma.ˈka.m**ə**]	makaməʁ	*ma-kamer*	'having sunken cheeks'
f.		[ma.ˈqi.p**ə**]	mapiqəʁ	*ma-qiper*	'unlucky'

transcribed. Based on the author's field notes with the same informant, the voiced fricative [ʁ] occurs in most cases, though the voiceless counterpart [χ] can also be observed, especially in word-final position. In this study, the voiced [ʁ] is used to represent *r while it was still present in Raxekerek.

The derived vowels [e], [o], and [ɑ] emerge yet do not appear to function as allophones of the existing vowel phonemes, as their distribution is no longer predictable. They contrast with the original vowels /i/, /u/, and /a/ in word-final position in synchronic Tjuvecekadan, as shown in (5).

(5) Surface contrasts between new and original vowels in Tjuvecekadan

	Phonetic form	Gloss	Phonetic form	Gloss
a.	[ɟap**e**]	'twin growth (e.g., banana)'	[kap**i**]	'male name'
	[bənətsɛ]	'to spring shot'	[samətsɪ]	'Solanum nigrum'
b.	[ʎaʌuk**o**]	'an edible plant'	[ʎəmuk**u**]	'to stoop'
	[patud**o**]	'to design, to progress'	[madud**u**]	'to be angry'
c.	[qavuc**ɑ**]	'field mouse'	[zaqəc**a**]	'stone paving'
	[kaɟap**ɑ**]	'ring-footed basket'	[tsəmap**a**]	'to dry by fire'

The derived vowels may have been allophones of phonemic vowels induced by the uvular fricative *r at an earlier stage; however, once the conditioning environment was eliminated by sound change, the derived vowels were reanalyzed as distinct phonemes, becoming phonologized (Kiparsky 2015). As pointed out by Ohala (1993: 163), this may happen if listeners do not perceive the variation as predictable from the context, and thus adopt it into their own mental lexicons and adjust their own pronunciation to align with the new form.

3.2.2 Lowering or Retraction of Identical Vowels Flanking *r

The impact of the lost uvular fricative *r on surrounding identical vowels is even more powerful and extends to all vowels: high vowels /i/ and /u/ become mid, schwa becomes low, and the low vowel /a/ is retracted, as shown in (6). The resulting sequences [ee], [oo], [aa], and [ɑɑ] maintain not only a steady quality but also lengthened duration. They are considered two consecutive vowels in this study,[11] though morpheme-internal

[11] The derived sequences with identical vowels correlate with a falling tone (HL) in word-final position, indicating a stress-carrying constituent similar to final stress in words such as [kə.ˈ**man**] *k<**əm**>**an*** 'to eat (AV)' and [ka.kə.ˈ**san**] *ka-kə**sa**-**an*** 'cooking area'. However, when these V_iV_i sequences occur in penultimate or antepenultimate position, as in [k**ee**mu] *ki**ri**mu* 'to hurry up', the sequence is associated with a rising tone (LH) or a low tone followed by a high tone, depending on the rate of speech. The pitch

hiatus with identical vowels is illegal in Paiwan.[12]

(6) V_iV_i with lost intervocalic *r

	*r	Tjuvecekadan	Raxekerek	Orthography	Gloss
a.	i___i	[ka.ˈv**ee**]	kav**iʁi**	*ka-viri*	‘left hand’
		[ma.ˈb**ee**ts]	mab**iʁi**ts	*ma-birits*	‘ripped, torn’
		[ˈq**ee**]	q**iʁi**	*qiri*	‘a kind of freshwater fish’
b.	u___u	[ʂə.mə.ˈt**oo**ɟ]	səmət**uʁu**ɟ	*seturudj*	‘poor (with little money) (AV)’
		[ˈp**oo**]	p**uʁu**ʁ	*purur*	‘large bamboo basket’
		[tə.ˈm**oo**]	təm**uʁu**	*turu*	‘to dare (AV)’
c.	ə___ə	[ˈq**aa**.puʂ]	qəʁəpus	*qerepus*	‘cloud’
		[qə.ˈm**aa**ŋ]	qəməʁəŋ	*qereng*	‘to lie (on back) (AV)’
		[ˈɟ**aa**.ʎaj]	ɟəʁəʎaj	*djereljay*	‘algae, moss’
d.	a___a	[ˈ**ɑɑ**ɟ]	**aʁa**ɟ	*aradj*	‘dried taro’
		[ˈʂ**ɑɑ**]	ʂ**aʁa**	*sara*	‘sieve’
		[ˈc**ɑɑ**]	c**aʁa**	*tjara*	‘ring (on finger)’

The lowering or retraction induced by the lost uvular reflects the characteristics of the uvular articulation, and the quality changes by only a single step, as shown in Figure 1, moving from [i] to [e] and [u] to [o], respectively, as in (6a–b), and from mid [ə] to low [a] as in (6c). Since the low vowel [a] cannot move any lower, it becomes back [ɑ] as in (6d). The vowel [ɑ] clearly differs from [a] in that the tongue root is positioned closer to the pharyngeal cavity.

change curve shows that the penultimate mora carries the stress, usually a high tone. Correlations between the length of long vowels and suprasegmental feature can also be observed in Fataluku, a Papuan language (Stoel 2008: 75; Heston 2014: 472).

[12] Tautomorphemic sequences with identical vowels are not observed in Paiwan, but they are possible through affixation, as noted in Ho (1977: 612) and Ferrell (1982: 10). Such sequences are analyzed as coalescence in Yeh (2011: 76).

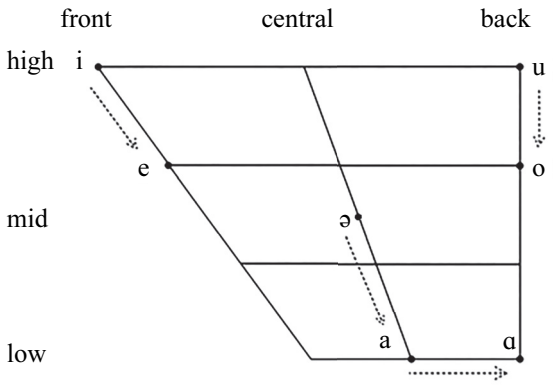

Figure 1. Changes in identical vowels with lost intervocalic *r

3.2.3 Loss of Uvulars as a Catalyst for Vowel System Expansion

The addition of the new vowels [e], [o], and [ɑ] to the Tjuvecekadan sound system is the result of a reanalysis following the loss of the uvular *r. Such developments are also found in Austronesian languages. As noted by Blust (2013: 185), mid vowels [e] and [o] appear through the lowering of high vowels, with the triggers for the change subsequently removed. Furthermore, Blevins (2021) surveys the disappearance of reflexes of Proto-Austronesian *q in Austronesian languages outside Taiwan and suggests a strong correlation between the loss of contrast between uvular and velar consonants (*q vs. *k) and the expansion of vowel systems. Specifically, in languages with a simpler vowel system, such as the inventory /i, u, a, (ə)/ commonly seen in Formosan languages, the contrast between *q and *k is maintained because the lowering effects on adjacent vowels were interpreted as being a result of the influence of *q. However, as vowel systems expanded to include mid vowels /e/ and /o/, these effects were reinterpreted as intrinsic vowel properties, depriving *q of its distinctive cues and leading to its eventual loss (Blevins 2021: 356).

Tjuvecekadan appears to have undergone a similar phonological evolution: the emergence of mid vowels and the low back vowel contributes to the weakening or loss of *r, as its effects on adjacent vowels are reinterpreted as intrinsic properties of vowels. Raxekerek, a neighboring Paiwan dialect, may currently be undergoing the same sound change that has been completed in Tjuvecekadan (*r > ʁ > χ > φ), as noted in Cheng

(2016: 98). It retains /q/, while the reflexes of *r are realized as a uvular fricative [ʁ] and its variant [χ].[13] However, in Raxekerek, the degree of uvular impact on vowels is similar, with high vowels being slightly lowered next to the still-present [q] and [ʁ]. Future investigations may shed light on this ongoing change in Paiwan by comparing the influence of the lost uvular in Tjuvecekadan with the effects of the preserved segment in other dialects in terms of articulatory and acoustic phonetics.

3.3 Vowel Contrasts Induced by the Loss of *r and *ɭ

Due to the loss of the uvular *r and the lateral *ɭ in Tjuvecekadan, identical sequences can occur within morphemes, though such sequences are not permitted morpheme-internally in Paiwan, as mentioned in Section 2.2. The lost *ɭ (*l* in orthography) does not alter vowel quality, as shown in (7), unlike the lost *r, which lowers or retracts neighboring vowels.

(7) Unchanged V_iV_i with lost intervocalic *ɭ

	*ɭ	Tjuvecekadan	Orthography	Gloss
a.	i___i	[ʂɻ.ˈm**ii**]	*sili*	‘to cause something off-balance’
		[ˈk**ii**w]	*kiliw*	‘rat-guard (piles supporting outdoor granary)’
		[qə.ˈm**ii**]	*qili*	‘to lift’
b.	u___u	[ma.ˈɟ**uu**]	*madjulu*	‘cheap, easy’
		[tsə.ˈm**uu**c]	*tsuludj*	‘to stack on’
		[min.ˈt**uu**q]	*min-tuluq*	‘to jump (across)’
c.	ə___ə	[ˈʎ**əə**t]	*ljelet*	‘lips’
		[pa.ˈt**əə**v]	*pa-telev*	‘to blacksmith’
		[ˈs**əə**p]	*Selep*	‘Female name’
d.	a___a	[ˈm**aa**p]	*m-alap*	‘to take’
		[ˈʂ**aa**c]	*saladj*	‘companion’
		[tsə.ˈm**aa**]	*tsala*	‘to fry’

Due to the differing influences of the lost *r and *ɭ on adjacent vowels, the derived

[13] Another sound change trajectory, *ɭ > ɣ > φ, which was also completed in Tjuvecekadan, is currently at the stage of [ɣ] in Raxekerek, displaying a phonemic contrast between a velar fricative and a uvular fricative.

VV sequences resulting from the loss of intervening *r contrast with those arising from the loss of *l̥. Consequently, distinctions between [ii] and [ee], [uu] and [oo], and [aa] and [ɑɑ] now appear in the surface representations, as shown in (8).

(8) Contrast between lost *r and lost *l̥ in V_iV_i

	Tjuvecekadan	Orthography	Gloss
a.	[qə.ˈm**ee**]	*qiri*[14]	‘to cheat (AV)’
	[qə.ˈm**ii**]	*qili*	‘to lift (AV)’
b.	[tə.ˈm**oo**]	*turu*	‘to dare (AV)’
	[tə.ˈm**uu**]	*tulu*	‘to teach (AV)’
c.	[ˈt**ɑɑ**ŋ]	*tarang*	‘protective talisman’
	[ˈs**aa**ŋ]	*salang*	‘storage room’
d.	[qə.ˈm**aa**ŋ]	*qereng*	‘to lie (on back) (AV)’
	[kə.ˈm**əə**m]	*kmelem*	‘to hit with a club (AV)’

Since the original trigger for lowering or retraction (the lost *r) is no longer recoverable in synchronic data, the derived vowels [e], [o], and [ɑ] have been restructured into the phonological grammar, as suggested by minimal pairs such as [tə.ˈm**oo**] ‘to dare (AV)’ and [tə.ˈm**uu**] ‘to teach (AV)’.

3.4 Degrees of Reanalysis Related to Prosodic Position

It is not the case that vowels lower or retract in all contexts where *r has disappeared in Tjuvecekadan. Asymmetries in different prosodic positions, such as word-initial and word-final positions, suggest that the relative strengths of certain positions lead to distinct degrees of phonologization. Section 3.4.1 compares the lowering effect in word-initial and word-final positions, while Section 3.4.2 examines the difference in results when *r occurred between identical vowels versus between distinct full vowels /i, u, a/.

[14] This word cannot be found in Ferrell’s (1982) dictionary and in Raxekerek. The author hypothesizes the form /qəmiri/ based on regular phonological changes in vowels.

3.4.1 Resistance to Phonologization in Word-Initial Position versus Complete Reanalysis in Word-Final Position

The lowering effect of *r on adjacent vowels varies according to their prosodic position. As mentioned in (3) and (4) in Section 3.2.1, the impact of *r on preceding vowels in word-final position is obvious: high vowels become mid (e.g., [ɟap**e**] *djapir* ‘twin growth (e.g., banana)’, [ʎaʎuk**o**] *ljaljukur* ‘an edible plant’), and the low vowel varies between a retracted [ɑ] and an unaffected [a] (e.g., [kaɟap**ɑ**] *kadjapar* ‘ring-footed basket’, [minəv**a**] *minevar* ‘to scatter’). Nevertheless, vowels retain their qualities when preceded by the lost *r, as shown in (9).

(9) Vowels following lost word-initial *r

	*r	Tjuvecekadan	Raxekerek	Orthography	Gloss
a.	___i	[ˈ**i**.tsiŋ]	ʁitsiŋ	*ritsing*	‘branch of tree’
b.	___u	[ˈ**u**.ni]	ʁuni	*runi*	‘squash’
		[ˈ**u**.muk]	ʁumuk	*rumuk*	‘bamboo fish-basket’
c.	___ə	[ˈ**ə**.ŋəŋ]	ʁəŋʁəŋ	*rengreng*	‘obstruction’
		[**ə**.ˈku.can]	ʁəkucan	*rekutj-an*	‘to be afraid’
d.	___a	[ˈ**a**.ɟaj]	ʁaɟaj	*radjay*	‘sharp (knife)’
		[**a**.ˈka.tsan]	ʁakatsan	*rakats-an*	‘brave’

Regarding phonetic realization, Cheng & Maljangeljang (2017: iv) mention that a very weak frication of the uvular [ʁ], the reflex of *r, is observed in Tjuvecekadan, as in [ʶitsiŋ] ‘branch of tree’. However, they do not transcribe it, as this sound is indeed lost in a large number of words. This study agrees with Cheng & Maljangeljang (2017: iv) that an extremely subtle articulation in the uvular area can sometimes be perceived. Additionally, this study finds that the location of stress influences the possible realization of the lost uvular. When the lost uvular occupies the onset position of a stressed syllable, a lengthened vowel accompanied by a rising tone tends to occur, as in (9d) [ˈ**a**.ɟaj] ‘sharp (knife)’. Conversely, no influence from the lost uvular on a following vowel is observed when the vowel is in a pre-tonic position. In such cases, there is no change in vowel quality, extended duration, or tonal cue, as seen in words like [**ə**.ˈku.can] ‘to be afraid’ and [**a**.ˈka.tsan] ‘brave’ in (9c) and (9d). Since stressed positions (i.e., foot heads) are also contexts of greater strength, the effect of *r is more prominent in stressed syllables than

in unstressed ones.

The data above reveal differing degrees of phonologization: the process is fully realized in word-final position but not in word-initial position. This difference can be analyzed in terms of prosodic strength (Beckman & Edwards 1994; Keating 1995; Fougeron & Keating 1997, among others). Word-initial position is generally strong, preserving distinctions and enhancing the perceptibility of sounds, which likely leads to the retention of vowel quality in this environment. In contrast, word-final position is weaker, making it more susceptible to lowering. Complete phonologization word-finally reflects this position's receptivity to such changes, where the influence of the lost uvular on vowels has progressed to a stabilized phonological outcome. Conversely, the complete absence of phonologization word-initially demonstrates initial position's resistance to significant alterations, maintaining the original vowel qualities. This asymmetry in lowering effects illustrates how the varying degrees of phonologization in Tjuvecekadan are influenced by prosodic position.

3.4.2 Complete Phonologization versus No Reanalysis with *r between Vowels

Parallel to the differing degrees of vowel lowering in word-initial versus word-final position, another asymmetrical pattern is observed in intervocalic position. Vowel lowering or retraction is thorough when the lost uvular occurred between identical vowels, resulting in the lowering or retraction of all adjacent original vowels (/i/, /u/, /a/, and /ə/), as shown in (6) and (10).

(10) Lowering with lost intervocalic *r

	*r	Tjuvecekadan	Raxekerek	Orthography	Gloss
a.	i___i	[gə.ˈm**ee**ŋ]	gəm**iʁi**ŋ	*giring*	'to growl'
b.	u___u	[sə.ˈm**oo**p]	səm**uʁu**p	*surup*	'to sip, to suck'
c.	ə___ə	[qə.ˈm**aa**ŋ]	qəm**əʁə**ŋ	*qereng*	'to lie (on back) (AV)'
d.	a___a	[ʎa.ˈv**ɑɑ**n]	ʎav**aʁa**n	*ljavar-an*	'speech'

In contrast, vowels remain unaffected when the lost *r occurred between different full vowels /i, u, a/, as shown in (11).

(11) Unchanged V_iV_j with lost intervocalic *r

	*r	Tjuvecekadan	Raxekerek	Orthography	Gloss
a.	a___i	[ˈ**ai**ts]	**a**ʁ**i**ts	*arits*	‘diaphragm’
b.	i___a	[ma.ˈ**i**.j**a**w]	ma-**i**ʁ**a**w	*ma-iraw*	‘(ice) to melt’
c.	a___u	[ˈv**au**ŋ]	v**a**ʁ**u**ŋ	*varung*	‘chest, mind’
d.	u___a	[ka.ˈm**ua**w]	kam**u**ʁ**a**w	*kamuraw*	‘pomelo’
e.	i___u	[ɟau.ˈʎ**iu**.ʎi]	ɟaruʎ**i**ʁ**u**ʎi	*djaruljirulji*	‘bivalve shell’
f.	u___i	[ˈq**ui**p]	q**u**ʁ**i**p	*qurip*	‘scales (of fish or pangolin)’

Thus, phonologization is complete when *r was lost between identical vowels but does not occur when *r was between different full vowels. Although the prosodic strength of word-internal position is generally considered weaker than that of word-initial and word-final positions, details regarding the relative strength of various intervocalic positions are limited. The different patterns in (10) and (11) could be related to processes of articulation. The position between identical vowels appears to facilitate steady articulatory gestures, as the identical environments reinforce duration and coarticulatory patterns. This stability may enhance the phonetic realization of the characteristics of the lost uvular, resulting in a greater degree of vowel lowering or retraction. In contrast, different full vowels require distinct articulatory positions and a transition between them, creating less stable gestures. The resulting instability may make these vowels resistant to lowering and help preserve their original qualities. Thus, the differing behavior of vowels in these contexts suggests that prosodic strength in intervocalic position may be influenced by articulatory stability and phonological context.

4. Discussion

This section discusses three aspects of the aforementioned phenomena in Tjuvecekadan. First, feature specifications illustrate the difference between /q/ and uvular continuants. Second, articulatory grounds may explain why some consonants but not others trigger lowering in Tjuvecekadan, though this is not necessarily the case in other languages. Third, phonemic contrasts in other Paiwan dialects, such as V*r, V*l̩, and V,

have been neutralized due to the loss of consonants, creating confusion in interpreting underlying distinctions.

4.1 Feature Specifications That Differentiate /q/ from Uvular Continuants

This subsection first addresses the different feature specifications of uvular consonants as discussed in previous studies, which may correlate with the distinct behaviors of /q/ and *r in Tjuvecekadan. It then focuses on the process of vowel lowering or retraction, analyzed as the spreading of the [Retracted Tongue Root] feature (henceforth [RTR]; Elorrieta 1992; Halle 1995: 17–18; Halle et al. 2000: 427) onto vowels.

The feature specification and behavior of post-velar sounds have long been debated. Laryngeals and pharyngeals are treated as [+low], while uvulars are characterized as [−low] due to the raising of the back of the tongue body toward the uvula (Chomsky & Halle 1968: 305; Ladefoged & Johnson 2011: 170). Thus, the feature [low] is insufficient to group post-velars as a natural class. However, similar to laryngeals and pharyngeals, uvulars also exhibit lowering effects on adjacent vowels. The [Tongue Root] feature has been proposed to include post-velars (Sagey 1990: 205), but it fails to include laryngeals, which do not involve tongue root articulation.

McCarthy (1994) proposes a cover feature, [pharyngeal], for all post-velars, effectively distinguishing gutturals from non-gutturals. He also splits the Place node in two: the uvular stop /q/ and emphatics have both Oral and Pharyngeal nodes, while uvular continuants (/χ, ʁ, ʀ/), pharyngeals, and laryngeals are associated only to the Pharyngeal node. This separation reflects the asymmetrical behavior of /q/, which patterns with velars in root structure constraints but parallels with post-velars in vowel lowering in the Semitic languages. In other words, having both Oral and Pharyngeal under the Place node allows /q/ to alternate between behaving as an oral and post-velar consonant. Articulatorily, Moisik (2013: 463) observes that /q/ has only very weak tongue retraction, whereas uvular fricatives show more prominent retraction gestures. The pattern in Tjuvecekadan as discussed in Section 3 may reflect the distinction between /q/ and uvular continuants in their feature specifications: /q/ causes relatively minor changes in adjacent vowels, producing only a secondary mid vowel, while *r significantly lowers or retracts

vowels.

Building on McCarthy's (1994) insight, Rose (1996) argues that [RTR] is dominated by the Pharyngeal node and can spread to adjacent vowels, causing them to become backed and/or lowered, as shown in Figure 2.[15] Setting [RTR] as a dependent of the Pharyngeal node not only enables interaction between post-velars and vowels but also accounts for the varying behavior of post-velars.[16] Rose (1996: 109) further claims that '[RTR] may be an inherent feature on consonants, but is never underlyingly specified on vowels. Its effect on vowels is to retract them, producing a range of different types of backed, lowered vowels', as observed in languages with various types of post-velar consonants.

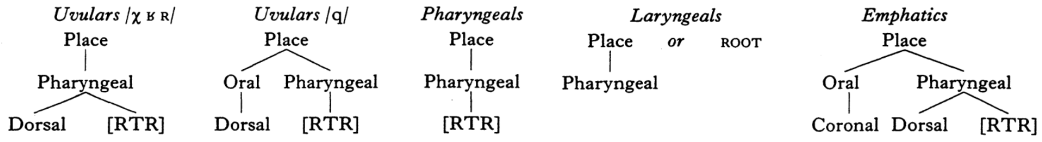

Figure 2. Feature specifications of the post-velar consonants (Rose 1996: 80 (16))

Following Rose's analysis, this study considers lowering to be a result of feature spreading. The lost *r, considered a uvular fricative, carried an [RTR] feature. It is possible that [RTR] became linked to adjacent vowels while *r was undergoing a weakening process leading to its eventual loss, or that [RTR] detached from the uvular as it was lost and then spread locally to neighboring vowels.

Rose (1996: 89–90) points out that the phonetic realization of vowels with [RTR] does not yield a uniform result; nor do the effects of spreading [RTR] from various post-velar consonants. She indicates that 'spreading [RTR] to vowels derives new, often non-

[15] Rose's (1996: 81) feature specification predicts that uvulars, emphatics, and pharyngeals may spread [RTR] and retract vowels. All post-velars, including pharyngeal laryngeals and laryngeals, may spread the Pharyngeal node and lower vowels.

[16] Regarding the natural classes among post-velar consonants, a key argument in Rose (1996: 73) is that 'the representation of laryngeals is intrinsically tied to the range of guttural consonants in a given language'. In other words, glottal consonants (such as [h, ʔ]) are placeless only when there is no consonants that bear the Pharyngeal node in the inventory.

underlying vowels' (p. 89).[17] In the case of Tjuvecekadan, the realization of [RTR] on vowels typically involves a decrease in vowel height, lowering the non-low vowels /i/, /u/, and /ə/ to [e], [o], and [a], respectively. Retraction occurs only when further lowering is not possible. Therefore, the central low vowel /a/ shifts backward to [ɑ]. Thus, the spreading of [RTR] indeed results in the appearance of the new vowels [e], [o], and [ɑ] in Tjuvecekadan, which were later reanalyzed into the sound system of Tjuvecekadan as shown in Table 2.

4.2 Lowering Induced by *r but Not by *ɭ

The differing impact of the lost *r and *ɭ on vowels in Tjuvecekadan can be attributed to the articulatory characteristics of these two consonants. The uvular fricative *r is produced by pulling the tongue back toward uvula and making a tight constriction, while the retroflex lateral *ɭ is articulated by curling the tongue tip or blade toward the post-alveolar area, with the sides of the tongue lowered. Since *r is pronounced at the back of the oral cavity, it naturally influences neighboring vowels by decreasing vowel height or retracting the tongue, as in the vowel lowering or retraction observed in Tjuvecekadan. However, vowels do not show these effects when surrounding *ɭ.

It is not unusual for a high vowel to become lowered next to a liquid (*r* or *l*). In the Uma Juman dialect of Kayan (Austronesian), high vowels /i, u/ are lowered to [e, o] before word-final *l*, *r*, *h*, and *ʔ*, e.g., [bak**o**l] *bakul* 'basket', [tum**e**ɾ] *tumir* 'hell', [hiv**e**h] *hivih* 'lower lip', and [lak**e**ʔ] *laki?* 'male' (Blust 2013: 264). In Thao, another Formosan language, high vowels /i, u/ are lowered to mid vowels [e, o] when adjacent to a uvular stop /q/ or an alveolar flap /r/ ([ɾ]) (Blust 2013: 264). For example, [ɾ**e**ma] *rima* 'five', [ɾ**o**saw] *rusaw* 'fish', [ɬm**e**ɾ] *lhmir* 'grass', and [t**o**ɾ**o**] *turu* 'three'. Another language belonging to the western plains (Li 2004: 941), Pazih also exhibits this change: high vowels /i, u/ are lowered to mid vowels [e, o] when adjacent to a pharyngeal fricative /h/ or an alveolar flap /r/ ([ɾ]) (Blust 1999: 329–331; Lin 2000: 60–61). It is expected for the

[17] Despite this, it is interesting to note that Sylak-Glassman (2014b) proposes a new featural representation, [±constricted epilarynx], to capture the articulation of pharyngeal in both consonants and vowels based on a typological survey of attested phonemic contrasts among post-velars. While this is an insightful and enhanced perspective on post-velar consonants, several concepts introduced as part of the analysis extend beyond the primary focus of this study.

articulatory gestures of post-velars to influence vowels and lower them. However, vowel lowering triggered by an alveolar flap, which typically does not involve tongue back movement, is difficult to explain from an articulatory perspective based on synchronic data.

Kaxabu, another language closely related to Pazih, lost the flap corresponding to /r/ in Pazih, leaving the appearance of mid vowels [e] and [o] unconditioned. However, unlike the consistent pattern in Tjuvecekadan Paiwan, the emergence of mid vowels and the changes resulting from the lost flap in Kaxabu are far more complex and less systematic.[18] For a thorough investigation of phonological changes in synchronic and diachronic Kaxabu, see Lim (2016; 2022: 41–91).

4.3 Neutralization Resulting from the Loss of *r and *ɻ in Tjuvecekadan

As *r and *ɻ are now absent, the underlying contrast between them has been preserved synchronically by distinct vowel qualities in word-final position and between identical vowels, as mentioned in (5) and (8) and partly repeated in (12). The emergence of the new vowels [e], [o], and [ɑ] thus suggests the former presence of *r, even though it is no longer extant.

(12) Preserved contrasts between *r and *ɻ

	Tjuvecekadan	Orthography	Gloss
a.	[bənətsɛ]	*b<en>etsir*	‘to spring shot’
	[pitsɨ]	*pitsil*	‘taro bulb’
b.	[ʎaʎuko]	*ljaljukur*	‘an edible plant’
	[maɟuku]	*ma-djukul*	‘to be beaten’
c.	[qə.ˈmɛɛ]	*qiri*	‘to cheat (AV)’
	[qə.ˈmɨɨ]	*qili*	‘to lift (AV)’
d.	[tə.ˈmoo]	*turu*	‘to dare (AV)’
	[tə.ˈmuu]	*tulu*	‘to teach (AV)’

[18] High vowels in word-final position may or may not be lowered due to a following lost /r/, as shown in the contrast [makatoo] < *makatur ‘to shave’ and [sasipuu] < *sasipur ‘fish net’.

However, apart from the contexts in which *r triggers lowering, the contrast between *l̩ and *r is no longer preserved. As indicated by the boldfaced vowels in (13), neutralization occurs in word-final position following /ə/ as in (13a), in word-initial position as in (13b–c), and between different full vowels as in (13d).

(13) Neutralization of lost *r and lost *l̩

	Tjuvecekadan	Orthography	Gloss
a.	[ri.p**ə**]	*dripel*	‘hem’
	[ma.qi.p**ə**]	*ma-qiper*	‘unlucky’
b.	[**ə**.mə.va]	*leva*	‘to cause happiness’
	[**ə**.mə.gəm]	*regem*	‘extremely cold’
c.	[**i**.kuz]	*likuz*	‘behind’
	[**i**.kits]	*rikits*	‘scar’
d.	[ɟ**au**t]	*djalut*	‘slippery’
	[ɟ**au**.nuq]	*djarunuq*	‘free fungus’

It is also worth noting that there is no surface contrast between a vowel with and without a following *l̩ because the loss of the lateral does not leave any trace on neighboring sounds, as shown in (14). Additionally, in a few cases, *r, *l̩, and the absence of a consonant surface identically in word-initial position or between different full vowels, as shown in (15).

(14) No contrast between vowel-final and *l̩-final

	Tjuvecekadan	Orthography	Gloss
a.	[samətsi]	*sametsi*	‘Solanum nigrum’
	[pitsi]	*pitsil*	‘taro bulb’
b.	[tutsu]	*tutsu*	‘this, just now’
	[putsu]	*putsul*	‘knuckle’

(15) Neutralization between *r, *l̩, and zero consonant

	Tjuvecekadan	Orthography	Gloss
a.	[uni]	*runi*	‘squash’
	[uni]	*luni*	‘earthquake’
	[uni]	*uni*	‘juvenile form of female name Sauni’

	Tjuvecekadan	Orthography	Gloss
b.	[g**au**ts]	*garuts*	'comb'
	[**ɟau**t]	*djalut*	'slippery'
	[v**au**c]	*vaudj*	'vine'

Overall, contrast between the lost uvular *r and lateral *ɭ is preserved only in specific contexts, and frequent neutralization eliminates underlying distinctions, underscoring the complexity of phonological alternations in Tjuvecekadan.

4.4 Supplementary Data: Comparing *r and *ɭ between Vowels

Previous sections have discussed the distinct impacts of the loss of *r and *ɭ between identical vowels: *r lowers or retracts surrounding vowels, while *ɭ has no influence on adjacent vowels. Consequently, contrasts between [e, o, ɑ] and [i, u, a] emerge. It has also been noted that between different full vowels, both consonants are lost without affecting the vowels. This subsection completes the picture by providing details of instances where *r and *ɭ are lost between a variety of different vowel pairs.

In Tables 4 and 5 below, V1 and V2 represent the first and second vowels in sequences resulting from the loss of an intervocalic consonant. Shaded cells in Table 4 highlight significant quality changes involving the lowering of identical vowels. Dotted squares bring attention to the fact that vowels lower or assimilate when a schwa /ə/ is involved. For the cells without marks, the vowels remain unchanged.

Table 4. Vowel sequences with lost intervocalic *r

		V2			
*r		/a/	/ə/	/i/	/u/
V1	/a/	[ɑɑ]	[ɑɑ]	[ai]	[au]
	/ə/	[əa]	[aa]	[ɑi]	[oo]~[au]
	/i/	[ia]	[ia]	[ee]	[iu]
	/u/	[ua]	[oo]	[ui]	[oo]

When the uvular fricative *r is lost between a full vowel and a schwa, the schwa assimilates and both vowels are lowered or retracted. An exception is i*rə, in which schwa is the only affected vowel, as shown in (16c).

(16) Və sequences with lost intervocalic *r

	*r	Tjuvecekadan	Orthography	Gloss
a.	a___ə	[ˈt**ɑɑ**v]	*tarev*	‘child-in-law’
b.	u___ə	[bəˈn**oo**ʂ]	*b<en>ures*	‘to spill or to sprinkle water’
c.	i___ə	[k**ia**.ˈvu.tsi]	*ki-re-vutsi*	‘to get ahead’

In contrast, əV sequences do not follow a consistent pattern. Different outcomes are observed across words rather than within individual words: the schwa variably assimilates to the following full vowel, remains intact, or lowers independently, as shown in (17).

(17) əV sequences with lost intervocalic *r

	*r	Tjuvecekadan	Orthography	Gloss
a.	ə___a	[tsi.ˈm**aa**w]	*tsimeraw*	‘to have eyes open’
		[ʂu.ˈqə.**a**m]	*suqeram*	‘to dislike’
b.	ə___u	[bəˈn**oo**ŋ]	*b<en>erung*	‘to make a hole’
		[ma.ˈʂ**au**ts] (*[ma.ˈʂ**oo**ts])	*ma-seruts*	‘(fruits) to fall before ripe’
c.	ə___i	[ˈk**ɑi**ʎ]	*kerilj*	‘sparrow’
		[ˈqə**i**r] (*[ˈq**ɑi**r])	*qeridr*	‘skin of pig’

Turning to the lost lateral, the full range of its resulting sequences is displayed in Table 5. Interestingly, changes in Və sequences (indicated by dashed squares) are observed, even though the lost *l is not expected to influence adjacent vowels.

Table 5. Vowel sequences with lost intervocalic *l

		V2			
	*l	/a/	/ə/	/i/	/u/
V1	/a/	[aa]	[aa]	[ai]	[au]
	/ə/	[əa]	[əə]	[əi]	[əu]
	/i/	[ia]	[ii]~[iə]	[ii]	[iu]
	/u/	[ua]	[uu]~[uə]	[ui]	[uu]

Variations in Və sequences with *l suggest that the schwa assimilates to its preceding full

vowel; however, this process is unstable, as shown in (18).[19] The quality of the first vowel appears to influence the probability of assimilation: about 87% of /aə/ sequences assimilate in Tjuvecekadan, while only around half of /iə/ and /uə/ sequences do. Thus, a weak schwa /ə/ following the sonorous vowel /a/ is more likely to assimilate.[20] In contrast, the reverse sequence, əV, remains unchanged after the loss of *l̪, as shown in (19).

(18) Assimilation of schwa to preceding V with lost intervocalic *l̪

	*l̪	Tjuvecekadan	Orthography	Gloss
a.	a___ə	[ˈd**aa**k]	*dalek*	'dew'
		[v**a**.ˈ**a**.ʂa]	*valasa*	'intestinal worms'
		[m**a**.ˈ**ə**.mu]~[m**a**.ˈ**a**.mu]	*ma-ləmu*	'to be sudden (death)'
b.	i___ə	[ˈp**ii**d]	*piled*	'hive'
		[m**ii**.ˈʂu.vuŋ]	*mi-le-suvung*	'to get blisters'
		[ma.ʃ**i**.ˈ**ə**.va]	*ma-si-leva*	'to be glad'
c.	u___ə	[pə.ˈn**uu**t]	*p<en>ulet*	'to tread on to remove husks'
		[ʃi.ˈt**uu**k]	*si-tulek*	'index finger'
		[ma.ˈʂ**u**.**ə**m]	*ma-sulem*	'darkness falls'

(19) Unassimilated schwa before V with lost intervocalic *l̪

	*l̪	Tjuvecekadan	Other dialects	Orthography	Gloss
a.	ə___a	[tə.mə.ˈv**ə**.**a**]	təməv**ə**l̪**a**	*tevela*	'to answer'
b.	ə___i	[ʂu.ˈk**ə**.**i**p]	suk**ə**l̪**i**p	*su-kelip*	'to be heavy-eyed'
c.	ə___u	[p**ə**.ˈ**u**.ʂəq]	p**ə**l̪**u**səq	*pe-luseq*	'to shed tears'

A further generalization that can be drawn from these data is that the progressive effect of a full vowel on a following schwa is stronger than that of a full vowel on a preceding schwa. This finding is based on the patterns of vowel sequences containing a

[19] Affixes may not be the deciding factor in whether assimilation applies, since variations occur both within morphemes and across morpheme boundaries. The Və sequence does undergo the process in many words (e.g., [m**aa**.dəp] *ma-ledep* 'sun goes down').

[20] Additionally, the number of available examples of /aə/ sequences is considerably greater than that of /iə/ and /uə/ sequences.

schwa,[21] which are prohibited in other Paiwan dialects but have emerged in Tjuvecekadan due to the loss of consonants. Thus, it is possible to observe all vowel combinations in this dialect.

5. Conclusion

Based on the interactions between the lost uvular fricative *r and newly derived vowels, this study has explored the distinct impacts of the uvular stop /q/ and the now-lost *r in Tjuvecekadan Paiwan, focusing on their influence on adjacent vowels and the degree of lowering relative to prosodic position. The lowering of high vowels adjacent to /q/ is predictable as allophonic variation, whereas vowel lowering adjacent to *r has been restructured into the phonological system. The elimination of the conditioning environment led to phonologization, illustrated by distinctions between new vowels /e/, /o/, and /ɑ/ and the original phonemes /i/, /u/, and /a/. Thus, the loss of uvular consonants may accelerate the expansion of the vowel system, as observed in several Austronesian languages (Blevins 2021). Furthermore, this study has examined varying degrees of resistance to phonologization across different prosodic positions. Following the loss of *r in weaker positions, such as word-finally or between identical vowels, the remaining vowels exhibit higher susceptibility to lowering or retraction effects. In contrast, vowels left in stronger positions, such as word-initially, demonstrate greater resistance, preserving their qualities. This asymmetry reflects the tendency to enhance perceptual information in stronger positions and to reduce it in weaker ones. Finally, this study has filled the gap in understanding the sound alternations resulting from the loss of both *r and *l̥, and provided a comprehensive view of the synchronic phonological system of Tjuvecekadan.

[21] Compared with the full vowels /i, u, a/ in Paiwan, schwa is both weaker and more restricted. It seldom occurs in word-final open syllables or word-initial positions (Ho 1977: 606), rarely forms diphthongs with other vowels, and even avoids stress in a small number of dialects in the central area of Paiwan (C. Chen 2006: 80–85; Yeh 2011: 115–116).

References

Ang Uijin 洪惟仁. *Taiwan yuyan de fenlei yu fenqu: lilun yu fangfa* 臺灣語言的分類與分區：理論與方法, *Taiwan shehui yuyan dilixue yanjiu* 臺灣社會語言地理學研究, vol. 1. Taipei 臺北: Qianwei chubanshe 前衛出版社, 2019.

Beckman, Mary E., and Jan Edwards. "Articulatory Evidence for Differentiating Stress Categories," in Patricia A. Keating (ed.), *Phonological Structure and Phonetic Form: Papers in Laboratory Phonology III*. Cambridge: Cambridge University Press, 1994, pp. 7–33. doi: 10.1017/CBO9780511659461.002

Bessell, Nicola Jane. "Towards a Phonetic and Phonological Typology of Post-velar Articulation," Ph.D. Dissertation, Vancouver: University of British Columbia, 1992. doi: 10.14288/1.0086353

Blevins, Juliette. "Uvular Reflexes of Proto-Austronesian *q: Mysterious Disappearance or Drift toward Oblivion?," *Oceanic Linguistics*, 60.2, 2021, pp. 335–366. doi: 10.1353/ol.2021.0019

Blust, Robert. *The Austronesian Languages*. Canberra: Research School of Pacific and Asian Studies, Australian National University, 2013.

———. "Notes on Pazeh Phonology and Morphology," *Oceanic Linguistics*, 38.2, 1999, pp. 321–365. doi: 10.2307/3623296

Buckley, Eugene. *Theoretical Aspects of Kashaya Phonology and Morphology*. Stanford, CA: Center for the Study of Language and Information, Leland Stanford Junior University, 1994.

Chang, Anna Hsiou-chuan 張秀絹. *Paiwanyu cankao yufa* 排灣語參考語法, *Taiwan Nandao yuyan* 臺灣南島語言, vol. 9. Taipei 臺北: Yuanliu chuban 遠流出版, 2000.

———. *Paiwanyu yufa gailun* 排灣語語法概論, *Taiwan Nandao yuyan congshu* 臺灣南島語言叢書, vol. 9. New Taipei 新北: Yuanzhu minzu weiyuanhui 原住民族委員會, 2018.

Chen Chun-mei. "A Comparative Study on Formosan Phonology: Paiwan and Budai Rukai," Ph.D. Dissertation, Austin: University of Texas at Austin, 2006.

———. "The Phonetics of Paiwan Word-Level Prosody," *Language and Linguistics*, 10.3, 2009, pp. 593–625.

Chen Kang 陳康 and Ma Rongsheng 馬榮生 (eds.). *Gaoshanzu yuyan jianzhi (Paiwanyu)* 高山族語言簡志（排灣語）. Beijing 北京: Minzu chubanshe 民族出版社, 1986.

Cheng Chung-hua 鄭仲樺. "Paiwanyu fangyan yanjiu 排灣語方言研究," Ph.D. Dissertation, Beijing 北京: Beijing daxue 北京大學, 2016.

———. *Paiwanyu Lili fangyan fenlei cihui shouce* 排灣語力里方言分類詞彙手冊. Pingtung 屏東: Xiangyuan chubanshe 香遠出版社, 2015.

Cheng Chung-hua 鄭仲樺 and Sakenge Maljangeljang 楊愛珠 (eds.). *Paiwanyu Qijia fangyan fenlei cihui shouce* 排灣語七佳方言分類詞彙手冊. Pingtung 屏東: Pingdongxian zhengfu 屏東縣政府, 2017.

Chomsky, Noam, and Morris Halle. *The Sound Pattern of English*. New York: Harper & Row, Publishers, 1968.

Czaykowska-Higgins, Ewa. "Placelessness, Markedness, and Polish Nasals," *Linguistic Inquiry*, 23.1, 1992, pp. 139–146.

Early, Robert, and John Whitehorn. *One Hundred Paiwan Texts*. Canberra: Research School of Pacific and Asian Studies, Australian National University, 2003.

Egli, Hans. *Paiwangrammatik*. Wiesbaden: Otto Harrassowitz, 1990.

Elorrieta, Jabier. "The Feature Specification of Uvulars," in Dawn Bates (ed.), *Proceedings of the Tenth West Coast Conference on Formal Linguistics*. Stanford, CA: Center for the Study of Language and Information, Leland Stanford Junior University, 1992, pp. 139–149.

Evans, Jonathan P., Jackson T.-S. Sun, Chiu Chenhao, and Michelle Liou. "Uvular Approximation as an Articulatory Vowel Feature," *Journal of the International Phonetic Association*, 46.1, 2016, pp. 1–31. doi: 10.1017/S0025100315000146

Ferrell, Raleigh. *Paiwan Dictionary*. Canberra: Department of Linguistics, Research School of Pacific Studies, Australian National University, 1982.

Fougeron, Cécile, and Patricia A. Keating. "Articulatory Strengthening at Edges of Prosodic Domains," *Journal of the Acoustical Society of America*, 101.6, 1997, pp. 3728–3740. doi: 10.1121/1.418332

Gick, Bryan, and Ian Wilson. "Excrescent Schwa and Vowel Laxing: Cross-Linguistic Responses to Conflicting Articulatory Targets," in Louis Goldstein, D. H. Whalen, and Catherine T. Best (eds.), *Laboratory Phonology 8*. Berlin: Mouton de Gruyter, 2006, pp. 635–659. doi: 10.1515/9783110197211.3.635

Halle, Morris. "Feature Geometry and Feature Spreading," *Linguistic Inquiry*, 26.1, 1995, pp. 1–46.

Halle, Morris, Bert Vaux, and Andrew Wolfe. “On Feature Spreading and the Representation of Place of Articulation,” *Linguistic Inquiry*, 31.3, 2000, pp. 387–444. doi: 10.1162/002438900554398

Hayward, K. M., and R. J. Hayward. “‘Guttural’: Arguments for a New Distinctive Feature,” *Transactions of the Philological Society*, 87.2, 1989, pp. 179–193. doi: 10.1111/j.1467-968X.1989.tb00626.x

Herzallah, Rukayyah S. “Aspects of Palestinian Arabic Phonology: A Nonlinear Approach,” Ph.D. Dissertation, Ithaca, NY: Cornell University, 1990.

Heston, Tyler. “The Nature and Underlying Representations of Long Vowels and Diphthongs in Fataluku,” *Oceanic Linguistics*, 53.2, 2014, pp. 467–479. doi: 10.1353/ol.2014.0018

Ho Dah-an 何大安. “Paiwanyu Danlu fangyan de yinyun xitong 排灣語丹路方言的音韻系統,” *Zhongyang yanjiuyuan lishi yuyan yanjiusuo jikan* 中央研究院歷史語言研究所集刊, 48.4, 1977, pp. 595–618. doi: 10.6355/BIHPAS.197712.0595

———. “Wu zhong Paiwan fangyan de chubu bijiao 五種排灣方言的初步比較,” *Zhongyang yanjiuyuan lishi yuyan yanjiusuo jikan* 中央研究院歷史語言研究所集刊, 49.4, 1978, pp. 565–681.

Huang, Lillian M. 黃美金. *Taiyayu cankao yufa* 泰雅語參考語法, *Taiwan Nandao yuyan* 臺灣南島語言, vol. 1. Taipei 臺北: Yuanliu chuban 遠流出版, 2000.

Idrissi, Ali. “Sur l’emphase et la propagation de l’emphase,” unpublished manuscript, Montreal: Université du Québec à Montréal, 1993.

Institute of Linguistics, Taihoku Imperial University 臺北帝國大學言語學研究室. *Gengo ni yoru Taiwan Takasagozoku densetsushū* 原語による臺灣高砂族傳說集. Tokyo 東京: Tōkō shoin 刀江書院, 1935.

Keating, Patricia A. “Effects of Prosodic Position on /t, d/ Tongue/Palate Contact,” in Kjell Elenius and Peter Branderud (eds.), *Proceedings of the XIIIth International Congress of Phonetic Sciences*, vol. 3. Stockholm: Department of Speech Communication and Music Acoustics, Royal Institute of Technology, and Department of Linguistics, Stockholm University, 1995, pp. 432–435.

Kiparsky, Paul. “Phonologization,” in Patrick Honeybone and Joseph Salmons (eds.), *The Oxford Handbook of Historical Phonology*. Oxford: Oxford University Press, 2015, pp. 563–579. doi: 10.1093/oxfordhb/9780199232819.013.017

Kye, Ted. “Effects of Uvular Consonants on Vowel Quality in Lushootseed,” *Anthropological Linguistics*, 63.3, 2021, pp. 292–317. doi: 10.1353/anl.2021.a903294

Ladefoged, Peter, and Keith Johnson. *A Course in Phonetics*. Boston: Wadsworth, 2011.

Laufer, Asher, and Thomas Baer. "The Emphatic and Pharyngeal Sounds in Hebrew and in Arabic," *Language and Speech*, 31.2, 1988, pp. 181–205. doi: 10.1177/002383098803100205

Lee, Amy Pei-jung. "Phonology in Truku Seediq," *Taiwan Journal of Indigenous Studies*, 3.3, 2010, pp. 123–168. doi: 10.29910/TJIS.201009.0005

———. "Taidongxian Paiwanzu fangyan diaocha yu bijiao yanjiu 台東縣排灣族方言調查與比較研究," National Science Council–funded research project report, NSC 99-2420-H-259-002-2R, 2011.

Li, Paul Jen-kuei. "The Internal Relationships of Six Western Plains Languages," in *Selected Papers on Formosan Languages*, vol. 2, part 1. Taipei: Institute of Linguistics, Academia Sinica, 2004, pp. 941–952.

Li, Paul Jen-kuei, and Tsuchida Shigeru. *Kavalan Dictionary*. Taipei: Institute of Linguistics, Academia Sinica, 2006.

Lim Hong-sui 林鴻瑞. "Gahawuyu cankao yufa: yi ge jidu binwei de Taiwan Nandaoyu 噶哈巫語參考語法：一個極度瀕危的臺灣南島語," Ph.D. Dissertation, Nantou 南投: Guoli jinan guoji daxue 國立暨南國際大學, 2022. doi: 10.6837/ncnu202200371

———. "Gahawuyu yinyun yanjiu 噶哈巫語音韻研究," MA Thesis, Hsinchu 新竹: Guoli qinghua daxue 國立清華大學, 2016.

Lin Ying-chin 林英津. *Bazehaiyu* 巴則海語, *Taiwan Nandao yuyan* 臺灣南島語言, vol. 3. Taipei 臺北: Yuanliu chuban 遠流出版, 2000.

McCarthy, John J. "Linear Order in Phonological Representation," *Linguistic Inquiry*, 20.1, 1989, pp. 71–99.

———. "The Phonetics and Phonology of Semitic Pharyngeals," in Patricia A. Keating (ed.), *Phonological Structure and Phonetic Form: Papers in Laboratory Phonology III*. Cambridge: Cambridge University Press, 1994, pp. 191–233. doi: 10.1017/CBO9780511659461.012

Mead, David. "The Saluan-Banggai Microgroup of Eastern Sulawesi," in John Lynch (ed.), *Issues in Austronesian Historical Phonology*. Canberra: Research School of Pacific and Asian Studies, Australian National University, 2003, pp. 65–86. doi: 10.15144/PL-550.65

Ministry of Education 教育部. "Yuanzhu minzu yuyan shuxie xitong 原住民族語言書寫系統" (2005), https://ws.moe.edu.tw/001/Upload/6/RelFile/6508/7828/aboriginal.pdf, last accessed on 8 March 2025.

Moisik, Scott Reid. "The Epilarynx in Speech," Ph.D. Dissertation, Victoria, BC: University of Victoria, 2013.

Ohala, John J. “Coarticulation and Phonology,” *Language and Speech*, 36.2–3, 1993, pp. 155–170. doi: 10.1177/002383099303600303

Rose, Sharon. “Variable Laryngeals and Vowel Lowering,” *Phonology*, 13.1, 1996, pp. 73–117. doi: 10.1017/S0952675700000191

Sagey, Elizabeth. *The Representation of Features in Non-linear Phonology: The Articulator Node Hierarchy*. New York: Garland Publishing, 1990.

Saib, Jilali. “A Phonological Study of Tamazight Berber: Dialect of the Ayt Ndhir,” Ph.D. Dissertation, Los Angeles: University of California, Los Angeles, 1976.

Selep · Curimudjuq 趙秀英, Buka Parigur 廖秋吉, and Calivat · Gadu 鍾興華. *Paiwanzu tjuvecekadan (Lao Qijia) buluo* 排灣族 tjuvecekadan（老七佳）部落. Pingtung 屏東: Xingzhengyuan yuanzhu minzu weiyuanhui wenhua yuanqu guanliju 行政院原住民族委員會文化園區管理局, 2013.

Steriade, Donca. “Locality Conditions and Feature Geometry,” in Joyce McDonough and Bernadette Plunkett (eds.), *Proceedings of NELS 17*, vol. 2. Amherst: Graduate Linguistic Student Association, Department of Linguistics, South College, University of Massachusetts, Amherst, 1987, pp. 595–617.

Stoel, Ruben. “Fataluku as a Tone Language,” in Paul Sidwell and Uri Tadmor (eds.), *SEALS XVI: Papers from the 16th Annual Meeting of the Southeast Asian Linguistics Society 2006*. Canberra: Research School of Pacific and Asian Studies, Australian National University, 2008, pp. 75–84.

Sylak-Glassman, John. “The Effects of Post-velar Consonants on Vowels in Ditidaht,” *University of British Columbia Working Papers in Linguistics*, 37, 2014a, pp. 17–38.

Sylak-Glassman, John Christopher. “Deriving Natural Classes: The Phonology and Typology of Post-velar Consonants,” Ph.D. Dissertation, Berkeley: University of California, Berkeley, 2014b.

Weber, David John. *A Grammar of Huallaga (Huánuco) Quechua*. Berkeley: University of California Press, 1989.

Wilson, Ian. “The Effects of Post-velar Consonants on Vowels in Nuu-chah-nulth: Auditory, Acoustic, and Articulatory Evidence,” *Canadian Journal of Linguistics*, 52.1–2, 2007, pp. 43–70. doi: 10.1017/S0008413100004199

Yeh, Shih-chi Stella. “Issues in Paiwan Phonology,” Ph.D. Dissertation, Hsinchu: National Tsing Hua University, 2011.

排灣語七佳方言的新興元音與丟失的小舌輔音

葉詩綺
國立高雄師範大學英語學系
shihchiyeh@mail.nknu.edu.tw

摘　要

本文探討七佳排灣語中小舌塞音 /q/ 與已消失的小舌擦音 /ʁ/ (< *r) 對鄰近元音所帶來不同程度的影響，並著重於音系化過程與韻律位置的關係。當 /q/ 促使鄰近的高元音下降被視為同位音變化，而已消失的小舌擦音 *r 使元音下降或後縮被分析為音系化的結果，就產生了與原本音位 /i/、/u/、/ə/ 和 /a/ 形成對比的新元音 [e]、[o] 和 [ɑ]。音系化的程度也因韻律位置而有所差異：元音處於韻律強度較弱的位置（如詞尾或同元音之間）時，一定受影響而下降；元音處於韻律強度較強的位置（如詞首）時，舌位高度傾向於不變。本研究聚焦於小舌擦音丟失後對元音系統造成的音系化作用，以及此作用受制於韻律位置而展現的程度差異，補足了對七佳排灣語共時音韻的理解。

關鍵詞：輔音丟失，小舌輔音，元音下降，音系化，韻律位置，臺灣南島語

（收稿日期：2024. 9. 1；修正稿日期：2025. 3. 9；通過刊登日期：2025. 5. 5）